INTERNATIONAL ENERGY AGENCY

ENERGY IN THE WESTERN BALKANS

The Path to Reform and Reconstruction

In co-operation with the
United Nations Development Programme

ENERGY IN THE WESTERN BALKANS

The Path to Reform and Reconstruction

The Western Balkans – composed of Albania, Bosnia and Herzegovina, Croatia, the Former Yugoslav Republic of Macedonia, Montenegro, Serbia and Kosovo – is a complex region facing significant energy challenges. The conflicts over the break-up of the former Yugoslavia damaged much of the energy infrastructure and compounded the challenge of providing reliable energy supply. Electricity systems in many parts of the region remain fragile and in need of investment.

A priority across the region is to put into place the institutions, infrastructure and policies that can support the provision of reliable, affordable and sustainable energy. For the Western Balkans as a whole, a key element of the reform effort is the Energy Community Treaty – a regulatory and market framework to which the entire region has now subscribed. This Treaty aims to create an integrated regional market for electricity and gas compatible with the European Union's internal energy market.

This Energy Policy Survey is the first comprehensive review of energy policies and strategies in the Western Balkan region, and also covers important cross-cutting topics such as co-operation and energy trade, oil and gas transportation, and the links between energy and poverty. It identifies and assesses the reforms that are still needed to deliver efficient, modernised energy systems that can assist economic development, address energy poverty and reduce the environmental impacts of energy use.

OECD

9 789264 042186

(61 2008 05 1 P1) €100 ISBN 978-92-64-04218-6

INTERNATIONAL ENERGY AGENCY

ENERGY IN THE WESTERN BALKANS

The Path to Reform and Reconstruction

In co-operation with the
United Nations Development Programme

INTERNATIONAL ENERGY AGENCY

The International Energy Agency (IEA) is an autonomous body which was established in November 1974 within the framework of the Organisation for Economic Co-operation and Development (OECD) to implement an international energy programme.

It carries out a comprehensive programme of energy co-operation among twenty-seven of the OECD thirty member countries. The basic aims of the IEA are:

- To maintain and improve systems for coping with oil supply disruptions.
- To promote rational energy policies in a global context through co-operative relations with non-member countries, industry and international organisations.
- To operate a permanent information system on the international oil market.
- To improve the world's energy supply and demand structure by developing alternative energy sources and increasing the efficiency of energy use.
- To promote international collaboration on energy technology.
- To assist in the integration of environmental and energy policies.

The IEA member countries are: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Republic of Korea, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, United Kingdom and United States. Poland is expected to become a member in 2008. The European Commission also participates in the work of the IEA.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

The OECD is a unique forum where the governments of thirty democracies work together to address the economic, social and environmental challenges of globalisation. The OECD is also at the forefront of efforts to understand and to help governments respond to new developments and concerns, such as corporate governance, the information economy and the challenges of an ageing population. The Organisation provides a setting where governments can compare policy experiences, seek answers to common problems, identify good practice and work to co-ordinate domestic and international policies.

The OECD member countries are: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Republic of Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, United Kingdom and United States.
The European Commission takes part in the work of the OECD.

International Energy Agency (IEA),
Head of Communication and Information Office,
9 rue de la Fédération, 75739 Paris Cedex 15, France.

INTRODUCTION

The International Energy Agency (IEA), in co-operation with the United Nations Development Programme (UNDP), conducted a survey of the energy sectors and policies of the Western Balkan region[1] over the period from July 2006 to early 2008. Support was also provided by the Energy Charter Secretariat.

This energy policy survey is the first comprehensive survey of the energy policies and strategies of the Western Balkan region. It follows other regional reviews undertaken by the IEA, including the *Caspian Oil and Gas: The Supply Potential of Central Asia and Transcaucasia* (1998) and the *Black Sea Energy Survey* (2000).

The Survey's perspective draws on the 30 years of energy policy co-operation among IEA member countries and on the IEA Shared Goals,[2] which are summarised by the "three E's" of balanced energy policy making: energy security, economic development and environmental protection. Through this Survey, the IEA aims to contribute to the energy policy development of the Western Balkan region and, ultimately, to assist its economic revival through improved efficiency of energy use, modernised energy systems, lower environmental impacts of energy use and reduced energy poverty.

The UNDP recognises that promoting a sustainable energy sector is crucial for achieving the UN Millennium Development Goals (MDGs). As part of this effort, states in the Western Balkans must urgently co-ordinate their energy sector strategies with those for poverty reduction, human development, governance, and the environment. In the Western Balkan region, UNDP works to develop national capacity for sustainable growth in the energy sector.

In conducting this Survey, the IEA sent out energy review questionnaires to the governments in the region in July 2006. Some administrations completed these questionnaires in a thorough and comprehensive manner; others struggled to do so, reflecting *inter alia* the weakness or absence of relevant statistical data.

Independent consultants hired by the IEA and UNDP carried out missions in the region in 2006/07. They met decision makers within energy administrations, regulatory bodies and agencies for energy efficiency. They also met with domestic energy companies, foreign companies with interests in the Western Balkans, non-governmental organisations, international financial institutions and donors.

1. The Western Balkan region comprises Albania, Bosnia and Herzegovina, Croatia, the Former Yugoslav Republic of Macedonia, Montenegro, Serbia and Kosovo. At the time of preparation of this Survey, Kosovo was under the administration of the United Nations Interim Administration in Kosovo (UNMIK), according to the terms of UN Security Resolution 1244 of June 1999.

2. The IEA Shared Goals are included in Annex II.

ACKNOWLEDGEMENTS

This Survey could not have been completed without the co-operation, insight and input provided by energy administrations, non-governmental organisations and industry officials across the Western Balkan region. The authors express their appreciation to the contacts (and their teams) at the energy ministries for their assistance with information, organisation of meetings, and comments on the text:

Fatjon Tugu, Ministry of Industry and Energy, Albania

Mubera Bicakcic, Ministry of Foreign Trade and Economic Relations, Bosnia and Herzegovina

Krešimir Cerovac, Ministry of Economy, Labour and Entrepreneurship, Croatia

Violetta Keckarovska, Ministry of Economy, FYR Macedonia

Miodrag Canovic, Ministry of Economic Development, Montenegro

Biljana Ramic, Ministry of Mining and Energy, Serbia

Salvador Elmazi, Ministry of Energy and Mining, Kosovo

Daniel-Alexander Schroth, United Nations Mission in Kosovo (UNMIK).

Thanks are due to representatives at various international funding institutions and donor organisations for their constructive comments, including Robert Ichord (USAID), Slavtcho Neykov (Energy Community Secretariat), Davor Percan (EC Delegation in Croatia), and Judith Selman and Kjartan Bjornsson (EC Delegation in Bosnia and Herzegovina). Thanks also to Krisztina Kasza and Andrea Farkas (Energy Regulators Regional Association) and Gary A. Goldstein (International Resources Group).

The principal authors of this Survey are Emmanuel Bergasse and Alexander Kovacevic, independent consultants for the IEA and UNDP, respectively. Boyko Nitzov of the Energy Charter Secretariat played an active role in the drafting of the chapters on Energy Co-operation and Trade, and on Oil and Gas Transportation in Southeast Europe. Miroslav Maly (ENVIROS CZ) drafted the survey of Kosovo; Besim Islami contributed to the survey of Albania.

Within the IEA, Isabel Murray and Tim Gould of the Office of Global Energy Dialogue played key roles in developing the analysis and the text. This Survey also benefited from the input of numerous IEA colleagues. Special thanks go to William C. Ramsay and to Ann Eggington for their supervision, support and advice, and also to Ellina Levina and Sally Wilkinson. The Energy Statistics Division of the IEA also provided invaluable support, in particular Roberta Quadrelli for her insights and thorough review, as well as Yuichiro Torikata and Christine Caralis.

Other IEA staff without whom this Survey could not have been completed include Andreas Biermann, Catherine Hunter, Margarita Pirovska, Dan Simmons, Ulrik Stridbaek, François Nguyen and Christof van Agt. The IEA's Communication and Information Office provided key support: Rebecca Gaghen and Sylvie Stephan of the provided guidance on the key messages; Bertrand Sadin prepared all maps and figures; Corinne Hayworth designed the cover; and Muriel Custodio and Sophie Schlondorff supervised the production stage. Marilyn Smith gave invaluable assistance in editing the Survey.

The support of UNDP offices in the region was of great value, and special thanks go to the following individuals: Milada Sladkova (Bratislava Regional Centre for Europe and the CIS); Adriana Micu and Elvita Kabashi (Albania); Milena Kozomara and Goran Vukmir (Bosnia and Herzegovina); Dunja Fadljevic (Croatia); Anita Kodzoman and Akihito Kono (FYR Macedonia); Sanja Bojanic and Milica Begovic (Montenegro); and Aleksandar Macura (Serbia).

The Survey benefited from financial support from the government of Norway, which is gratefully acknowledged.

TABLE OF CONTENTS

3. At the time of preparation of this Survey, Kosovo was under the administration of the United Nations Interim Administration in Kosovo (UNMIK), according to the terms of UN Security Resolution 1244 of June 1999. This territory is referred to as Kosovo in this Survey.

List of Tables

List of Figures

List of Maps

List of Boxes

KEY MESSAGES

The Western Balkans[4] are on the road to rebuilding their energy systems. They have chosen a way forward within the framework of the 2005 Energy Community Treaty, which expresses a shared commitment to market reforms and the operation of an integrated regional market. The twin goals of reform and integration are the right ones, and offer the best opportunity to build sustainable, reliable and efficient energy sectors that can support development and recovery. What is needed now is to integrate these goals into broad, coherent and robust energy strategies for each market, and to ensure a sustained commitment to their practical implementation. To date, progress in these areas has been patchy and uneven.

This Survey highlights the need to strengthen public energy administrations and market institutions across the Western Balkans, including a clear separation of the functions of policy making, regulation and ownership. This means ensuring that administrations have the capacity, resources and statistical data to develop strategies and implement policies in a wide range of areas – not only in market regulation, but also in terms of energy efficiency, energy security, energy poverty and the impact of energy use on the environment. Such policies and strategies must be formulated in a transparent way that involves broad public consultation. The establishment of fully independent and empowered regulators must also be a priority.

Leaving the reform process unfinished would perpetuate current vulnerabilities and leave fragmented markets open to the risk of being controlled by under-regulated monopolies and dominant suppliers. This Survey underlines the need to follow through with market-based reforms in order to attract and optimise the new investments needed to establish a firm foundation for more sustainable and reliable energy supply. It also suggests that the Western Balkans have much to gain from a regional approach to energy security and greater integration of markets. Enhanced regional co-operation is an effective way to achieve a diversified energy mix and to optimise use of regional supply and production capacities.

Southeast Europe (SEE) as a whole,[5] including the Western Balkans, has a strategic position on trans-European oil and gas transportation routes. Markets in the region should offer transparent conditions for investment and trade so that potential projects can compete on a commercial basis to demonstrate their viability. In the case of natural gas, a well-functioning market – both in the Western Balkans and in Europe – depends on securing adequate supply and on promoting the enhanced reliability and market performance that can be offered by diversified sources of supply.

4. At the time of preparation of this Survey, Kosovo was under the administration of the United Nations Interim Administration in Kosovo (UNMIK), according to the terms of UN Security Resolution 1244 of June 1999. This territory is referred to as Kosovo in this Survey.

5. For the purposes of this Survey, Southeast Europe refers to the Western Balkans plus Bulgaria, Greece and Romania.

Map 1.................. The Western Balkan region

The boundaries and names shown and the designations used on maps included in this publication do not imply official endorsement or acceptance by the IEA.

OVERVIEW

This Survey reviews the energy sectors and policies of the Western Balkan region, with a focus on key policy challenges that need to be addressed over the next five to ten years (a summary of these challenges is included in this Overview). Geographically, this Survey covers:

- Albania
- Bosnia and Herzegovina
- Croatia
- Former Yugoslav Republic of Macedonia[6]
- Montenegro
- Serbia
- Kosovo under UN administration[7]

Much of the energy infrastructure in the Western Balkans was damaged during the conflicts related to the break-up of the Socialist Federal Republic (SFR) of Yugoslavia in the 1990s. The rebuilding process has been long and difficult. Consequently, these countries have initiated energy reforms at a later stage than other European economies in transition. Electricity systems in some parts of the region remain fragile: low system reliability and low efficiency impede economic recovery. Reliable and affordable energy supply is crucial for economic development and social welfare across the Western Balkan region.

This Survey is structured in a way to help the reader understand the key energy challenges facing the region as a whole, and to assess the main energy features of each market. It includes analysis of energy policy challenges as well as recommendations on the development of sound and comprehensive energy strategies and policies.

Following this overview, the Survey offers insight and information on three cross-cutting regional issues:

- Energy co-operation and trade
- Oil and gas transportation in Southeast Europe[8]
- Energy and poverty

Subsequent chapters examine the current state of the energy sector in each individual market, focusing on six main areas:

- Domestic energy policy and institutional reform
- Market reform and regulations
- Energy security
- Energy efficiency

6. Admitted to membership of the United Nations under General Assembly Resolution 47/225 as the Former Yugoslav Republic of Macedonia. It is referred to as FYR Macedonia in this Survey.
7. At the time of preparation of this Survey, Kosovo was under the administration of the United Nations Interim Administration in Kosovo (UNMIK), according to the terms of UN Security Resolution 1244 of June 1999. This territory is referred to as Kosovo in this Survey.
8. The Western Balkans plus Bulgaria, Greece and Romania.

- Energy and the environment
- Developments within energy sub-sectors (coal/lignite, oil, gas, electricity, heat and renewable energy)

The entire Western Balkan region has subscribed to the Energy Community Treaty,[9] which aims to create a regional energy market compatible with the internal energy market of the European Union. The Treaty provides an essential framework for regional co-operation and integration; however, much work still needs to be done to implement the commitments made under the Treaty.

The Western Balkans are strategically located between hydrocarbon-rich regions (including Russia, the Caspian basin and the Middle East) and key energy-consuming regions of Western and Central Europe. Thus, the Western Balkan region is well positioned to play an important role in the transit of hydrocarbon resources and in the diversification of oil and gas supply, both for the region itself and for Europe as a whole. At present, gas markets in the Western Balkans are small or non-existent but have potential for strong growth.

Many markets in the region depend heavily on lignite for electricity generation. Cost-effective expansion of generating capacity would produce a more diversified mixture, including more efficient lignite power plants, gas-fired combined cycle and CHP, and renewables including hydropower, with the balance being determined by the prevailing prices for fuel and for trading of CO_2. This would support a more sustainable energy future for the region and would lower its carbon intensity.

THE ECONOMIC LANDSCAPE

The Western Balkan region includes two EU candidate countries (Croatia and FYR Macedonia, which have started accession negotiations), four potential candidate countries (Albania, Bosnia and Herzegovina, Montenegro and Serbia), and a territory (Kosovo) whose status had yet to be determined at the time this Survey was conducted. The region is of key importance to the European Union because of its location; this makes it imperative for EU countries to support post-conflict reconciliation and development. The EU Stabilisation and Association Process is designed to encourage and support domestic reform. In the long run, this process offers the prospect of full integration into the European Union, provided that potential candidates meet certain political and economic conditions.

The region suffered heavily during the violent conflicts of the 1990s. All the energy markets require significant domestic and foreign investment to refurbish existing infrastructure and to build new energy facilities for production, generation, transmission and distribution. At the same time, these countries need to demonstrate their political

9. The Energy Community Treaty entered into force in July 2006 with the following parties: the European Community, Albania, Bosnia and Herzegovina, Bulgaria, Croatia, FYR Macedonia, Montenegro, Romania, Serbia and Kosovo. Romania and Bulgaria joined the European Union in January 2007, and have since been classed as 'participants' in the Community, along with other EU member states. Moldova, Norway, Turkey and Ukraine were granted observer status in November 2006, as was Georgia in December 2007.

stability and economic reform to compete successfully within the world market for investment capital.

The markets of the Western Balkan region are diverse in terms of their size, wealth and development (Table 1). Serbia is the largest and most populated country (accounting for one-third of the region's population); Montenegro is the smallest (less than 3% of the regional total). Croatia is the second most populated (18%), with the largest GDP (45% of total) and highest GDP per capita. Overall, economies across the region have sustained rapid economic growth (averaging 4.5% in 2005 and 4.8% for the period 2000-2006). However, unemployment remains high.

Table 1 ....Main economic data across the Western Balkan region, 2005

	Population million	GDP billion USD (2000)	GDP PPP billion USD (2000)	GDP (PPP) per Capita (USD)	Rate of GDP growth (%)	Unemployment
Albania	3.13	4.79	14.80	4 700	4.5%	13%
Bosnia and Herzegovina	3.91	6.44	25.80	6 600	5.0%	40%
Croatia	4.44	23.16	51.55	11 600	4.3%	13%
FYR Macedonia	2.03	3.84	13.03	6 400	3.6%	37%
Montenegro	0.63	2.10	3.80	6 000	8.0%	28%
Serbia	7.40	8.77	40.50	5 500	5.5%	20%
Kosovo	2.40	2.00	4.80	1 600	-1.0%	40%
Total	**23.90**	**51.10**	**154.28**	**-**	**-**	**-**

Note: Data on Serbia are based on the official submission of the Ministry of Mining and Energy of Serbia. For the purpose of this Survey, data directly from the administrations in Montenegro and Kosovo were used. Serbian GDP PPP data are based on the CHELEM[10] database (as of February 2008).
Sources: IEA statistics; IMF; OECD; MONSTAT; CHELEM; Ministry of Mining and Energy of Serbia; UNMIK.

THE ENERGY LANDSCAPE

A common feature of the Western Balkan region is that key elements of the energy infrastructure (*e.g.* major thermal power plants) were built in the 1960s and 1970s, with standard Eastern Block technology. This concentration in age and type of technology, combined with inadequate maintenance in the 1990s, is now creating serious policy challenges. There is an urgent need for widespread rehabilitation and replacement of infrastructure. Some markets are particularly affected by low day-to-day efficiency and the constant risk of technical failure.

A second common feature is that all Western Balkan markets depend heavily on hydrocarbons imported from outside the region. Shared infrastructure also creates a high level of interdependence within the region itself (*e.g.* all countries participate in extensive daily and seasonal exchanges of electricity; Serbian oil refineries rely on deliveries through the Croatian pipeline network).

10. Information on the CHELEM database is available at www.cepii.fr/anglaisgraph/bdd/chelem.htm.

Table 2 ....Main energy data across the Western Balkan region, 2005

Mtoe	TPES	Domestic production	Imports	Exports	Net imports	Import dependency	Total final consumption
Albania	2.4	1.2	1.2	0.0	1.2	51%	2.1
Bosnia and Herzegovina	5.0	3.3	1.9	0.3	1.6	32%	3.0
Croatia	8.9	3.8	7.8	2.6	5.2	58%	7.1
FYR Macedonia	2.7	1.5	1.6	0.3	1.2	45%	1.7
Montenegro	1.0	0.6	0.5	0.1	0.4	40%	0.8
Serbia	16.7	11.4	6.4	1.1	5.3	32%	9.7
Kosovo	2.0	1.2	0.9	0.1	0.8	40%	1.0
Total	**38.7**	**23.0**	*	*	*	*	**25.4**

* Not summed up to avoid double counting due to intra-regional trade.

Notes: Import dependency is calculated as net imports/TPES.

Data on Serbia are based on the official submission of the Ministry of Mining and Energy of Serbia. For the purpose of this Survey, data directly from the administrations in Montenegro and Kosovo were used.

Sources: IEA statistics; MONSTAT; Ministry of Mining and Energy of Serbia; UNMIK.

At the same time, there are significant differences across the region in terms of total primary energy supply (TPES), energy mix, volumes of domestic energy production, and energy import dependence (Table 2).

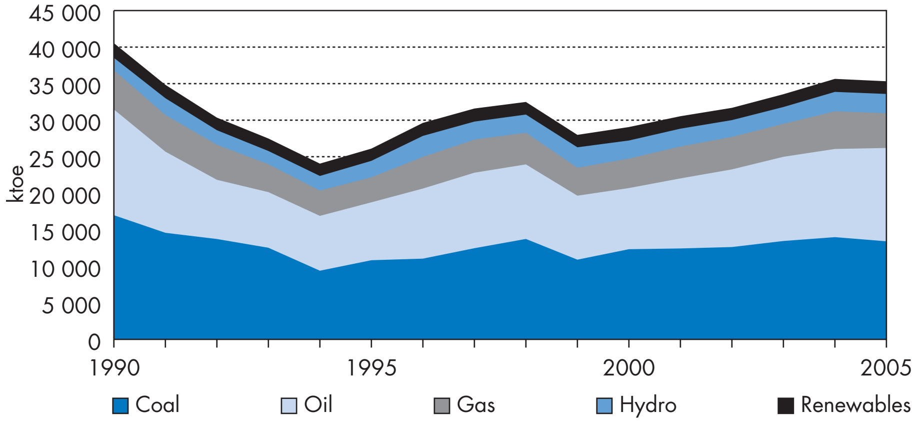
Oil and gas production is limited and located mostly in Albania, Croatia and Serbia. Natural gas production in Croatia is the region's most significant hydrocarbon resource, with production of 2 bcm per year, accounting for 80% of Croatia's natural gas consumption. Montenegro shows some small potential for offshore oil and gas development. To date, only Croatia and Serbia are significant consumers of natural gas; markets in Bosnia and Herzegovina and FYR Macedonia are small, whereas Albania, Montenegro and Kosovo are not gasified.

Coal (mostly lignite) dominates the primary energy supply in the Western Balkan region, accounting for 38% of TPES in 2005, followed by oil (37%, which has risen rapidly since 2001), natural gas (13%), hydropower (7%) and other renewables (5%) (Figure 1). By 2005, the TPES of the region had reached almost 90% of the 1990 level.

A snapshot, taken in the year 2005, of inputs to the electricity mix shows significant diversity across the region (Figure 2). Serbia, which has the largest total installed generation capacity (7.1 GW), depends mainly on lignite-fired thermal power plants (TPPs). Despite considerable overhauls and improvements (supported by donors), the overall fuel efficiency and utilisation rates of Serbia's TPPs remain low. This is common to lignite power plants across the region and an important priority for future assistance. Bosnia and Herzegovina and FYR Macedonia also rely heavily on lignite-powered generating capacity; Kosovo is almost entirely dependent on lignite for electricity generation.

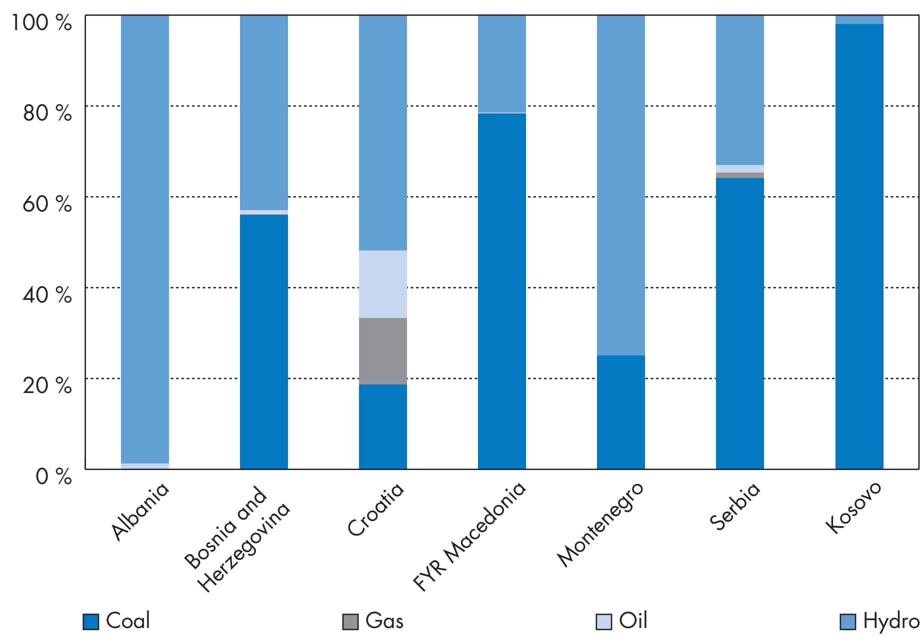
By contrast, Albania derives almost all of its electricity generation from hydropower. In 2005, Albania's installed generation capacity was about 1.5 GW with three key hydropower plants (HPPs) providing more than 85% of total generation. Albania's electricity plants were built between the 1960s and the early 1980s, using mostly Soviet or Chinese technology; their condition in 2008 reflects a severe lack of maintenance. Bosnia and Herzegovina, Croatia and Montenegro also have significant hydropower capacity.

Figure 1 .... Total primary energy supply for the Western Balkan region, 1990-2005 (ktoe)



Note: TPES excludes electricity trade.
Sources: IEA statistics; MONSTAT; Ministry of Mining and Energy of Serbia; UNMIK.

Figure 2 .... Share of electricity output by fuel across the Western Balkan region, 2005 (%)



Sources: IEA statistics; MONSTAT; Ministry of Mining and Energy of Serbia; UNMIK.

Until 1992, the electricity network of the former SFR Yugoslavia was interconnected with the Union for the Co-ordination of Transmission of Electricity (UCTE) – *i.e.* the Western European grid. Energy infrastructure in Serbia, Kosovo and Bosnia and Herzegovina, which had already suffered from a lack of maintenance, was severely damaged during the wars of the 1990s. In 1992, the grid was separated. In the west, Croatia and the Federation of Bosnia and Herzegovina (*i.e.* the southern/western part of Bosnia and Herzegovina) remained connected to UCTE Zone 1. The Republika Srpska (*i.e.* the northern/eastern part of Bosnia and Herzegovina), Serbia and FYR Macedonia, together with Bulgaria, Romania and Greece, made up the Southeast European UCTE Zone 2.

Since the early 2000s, electricity transmission system operators (TSOs) in the region have prioritised the rehabilitation of national grids and interconnections, an effort that received support from governments, donors, the UCTE and the European Transmission System Operators (ETSOs). These joint efforts led to the reconnection (in 2004) of the two sub-regional networks (UCTE Zones 1 and 2) and their re-synchronisation with UCTE. This has improved security of supply, diversified supply and exports options, and enabled further trade within the region and beyond its borders.

Oil refineries in the Western Balkan region lacked adequate maintenance and investment to modernise equipment and processing during the 1990s, and oil infrastructure was damaged in the conflicts (*e.g.* in 1999, Serbia's two oil refineries, in Pancevo and Novi Sad, and oil tank capacities were demolished). At present, only 40% of regional refinery capacity is in use. Refineries operate with low energy performance and high environmental impact, yet their output is also of low quality. The refineries often fail to comply with EU standards for fuel quality and emissions. Recent decisions to invest in modernising and expanding refineries in Bosnia and Herzegovina and Croatia should increase production (currently 10 Mt/y) and advance progress toward meeting EU specifications.

KEY REGIONAL ENERGY CHALLENGE 1: CAPACITY BUILDING AND POLICY FORMULATION

The energy policy objectives now being pursued in the Western Balkans are largely compatible with the goals and principles of the IEA, and include a medium-term vision to build sustainable, reliable and efficient energy sectors, as well as patterns of energy use, that support development and recovery. This stronger alignment of goals and principles has facilitated the launch of energy reforms, including the re-structuring of state energy companies, the adoption of new regulatory frameworks, and the implementation of policies to enhance energy efficiency.

Reforms in another key area – creating more open, liberalised and competitive energy markets – are still at an intermediate stage of development and progress. These reforms are particularly challenging because of the need to link them with goals for high energy efficiency and low environmental impacts. Public energy administrations and policies are yet to be fully established in several countries; countries that have such policies in place are not always able to ensure they are effectively enforced. Croatia is the most advanced in many respects but still has progress to make, notably on the implementation side.

Energy administrations need to be reinforced to ensure that they have the capacity and means to develop strategies and implement policies in a wide range of areas, including not only market regulation but also energy efficiency, energy security, energy poverty and the impact of energy use on the environment. Understaffing of energy administrations (including regulators) is a serious problem across the region: employment conditions need to be adequate to attract and retain staff with the required skills and knowledge. Institutions also need to build capacity and enhance mechanisms to increase transparency and public consultation on strategy and policy development, particularly in seeking input from academia, energy and environmental associations, and consumer organisations.

Reliable and detailed data are critical for informed policy decision making, a well functioning market and effective regulation. This implies a high level of expertise in the collection, analysis and dissemination of energy statistics on both supply and demand sides. Overall, energy data systems in the Western Balkans are weak and fragmented. As a result, reliable and comprehensive national energy balances or data sets are not available on a regular basis. This lack of data has prevented the development of national and regional economic tools (energy demand forecasts, least-cost plans, etc.) to assist policy, regulatory and investment decision making. Relevant public authorities, supported by international donors, are making efforts to upgrade energy data systems to international standards by 2009.

Recommendations.......*Building institutional capacity and improving policy formulation*

For energy reforms to be effective and successful, they should be part of a coherent overall energy strategy. Formulation, analysis and enforcement of both strategy and policy depend, in turn, on adequate staff and financial resources, as well as reliable and regular statistical data.

- *Authorities across the Western Balkans should establish comprehensive and coherent energy strategies, balancing the policy objectives of energy security and of economic and environmental performance in convergence with EU policy and legislation. The elaboration of an energy strategy should be based on effective consultation in line with the Aarhus Convention,[11] along with monitoring of its implementation.*

- *Energy policy should be co-ordinated with other policy areas such as the environment, housing, transport, social and regional development, and with research and development in science and technology.*

11. The UNECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters; adopted in June 1998 in Aarhus (Denmark) at the Fourth Ministerial Conference in the 'Environment for Europe' process (www.unece.org/env/pp).

- *The reform process must seek to complete the separation of various government roles in the energy sector (i.e. as policy maker, regulator and owner of state companies).*

- *In order to fulfil an increasingly complex range of tasks at national and regional levels, it is necessary to provide adequate funding and training for the staff of ministries, regulators and other government agencies with responsibilities in the energy sector.*

- *Despite some progress in recent years, more needs to be done to provide statistical bodies of the region with the capacity to collect, process and publish comprehensive sets of energy statistics in accordance with Eurostat/IEA/UNECE methodology.*

KEY REGIONAL ENERGY CHALLENGE 2: ENERGY MARKET REFORM AND REGULATION

Energy reforms are still at early or intermediate phases in the Western Balkans. The two EU candidate countries, Croatia (in particular) and FYR Macedonia are the most advanced in many respects but still have progress to make, notably with regards to implementation. Across the region, reform of the electricity sector has advanced most quickly: all the markets now have primary legislation for this sector, as well as a regulatory authority. By contrast, Croatia and Serbia (to a lesser extent) are the only countries with well-developed legislation for the gas sector.[12]

In 2002, the European Commission put forward proposals to establish a regional electricity market in Southeast Europe (SEE), which would be compatible with the internal energy market of the European Union. The same year, a memorandum of understanding (the Athens Memorandum) was signed,[13] with the European Commission and the Stability Pact[14] acting as sponsors. The approach was extended to natural gas in 2003. The "Athens Process", as it became known, led to the negotiation and signature (in 2005) of the Energy Community Treaty, which provides a legal framework for regional integration and trade on the basis of a competitive energy market that is compatible with EU rules. Since 2002, the process of energy market and regulatory reform in the Western Balkans has been driven by the Athens Process and the Energy Community Treaty.

12. For details on the situation as of November 2007, see the *Report on the Implementation of the Acquis under the Treaty Establishing the Energy Community*, presented to the Ministerial Council Meeting of the Energy Community on 18 December 2007. The report is available online at: www.energy-community.org.

13. The signatories of the Athens Memorandum were: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Federal Republic of Yugoslavia, Greece, Italy, FYR Macedonia, Romania, Turkey and Kosovo (signatory pursuant to UN Resolution 1244).

14. The Stability Pact was launched in 1999 as an international conflict-prevention effort. It promotes regional co-operation and integration in Southeast Europe (www.stabilitypact.org).

Recommendations*.......Implementing energy market reform and regulation*

A co-ordinated process of energy market reform and effective regulation is essential to sustainable economic development and reconstruction in the Western Balkans. Failure to follow through and implement market reforms carries the risk of perpetuating current weaknesses in energy infrastructure and supply. Robust, market-based regulatory frameworks are essential to attract new investment (in generation, transmission and storage), to ensure system reliability, and to guard against the abuse of market power by incumbents and/or dominant external suppliers.

- *Public authorities must establish a clear and effective market-based regulatory framework for the energy sector, as well as independent and empowered regulatory bodies. Primary (where this is outstanding) and secondary legislation should be adopted in order to meet commitments made under the Energy Community Treaty. Such legislation must be implemented effectively. Provisions on unbundling of monopoly activities (e.g. electricity and gas transmission and distribution) and regulated third-party access are of key importance for a well-functioning competitive market.*

- *The re-structuring process for state-owned energy companies should be continued in order to ensure transparency and accountability, and to improve economic, social and environmental performance.*

- *Credible and predictable frameworks for private investment are needed, along with mechanisms for timely, judicial remedy in case of disputes. These are critical elements to build investor confidence.*

- *Energy prices should be adjusted to adequately cover costs; cross-subsidies amongst consumers should be progressively eliminated and measures put in place to enforce payment discipline. Separate programmes should be established to provide targeted and effective support to vulnerable segments of the population (see chapter on Energy and Poverty).*

KEY REGIONAL ENERGY CHALLENGE 3: ENERGY SECURITY

Lack of reliable electricity supply is a serious obstacle to economic development and investment in the Western Balkan region. A contributing factor is the erratic electricity consumption pattern of the poorer parts of the population,[15] which exacerbate seasonal and weather-related peaks in electricity demand (particularly for space and water heating). Extreme peaks can lead to black-outs and/or electricity rationing. To ensure continued service, vertically integrated utilities are forced to maintain considerable reserve capacity, which reduces their potential for exports and revenues. Lack of reliable electricity supply has a deleterious effect on industry and the livelihood of

15. Poorer parts of the population depend mostly on fuelwood for their heating needs. However, during the winter heating season, electric heaters are often used when fuelwood demand spikes or fuelwood supply becomes limited.

individuals. Also, low tariffs and payment discipline limit revenues across the electricity sector, having a negative impact on maintenance and investment.

Dependence on imported energy is certain to remain high in the case of oil, and to increase with the projected growth of demand for natural gas. Thus, authorities across the region are monitoring their security of supply,[16] and, where possible, taking steps to diversify sources of supply and create links to new bulk gas transmission lines. Market actors need to assess supply options on a commercial basis. At the same time, public authorities should be attentive to the benefits of having multiple sources of supply, and prioritise those projects that can enhance energy security by improving the operation of a competitive energy market.

Building an open and competitive regional energy market, based on the principle of non-discrimination, is an overall objective for the region. Foreign investment and foreign ownership of energy assets will likely play an important role in regional reconstruction and development. However, authorities need to be aware of the risks that arise when a significant share of national oil and gas assets is sold to a single foreign company. A case in point is the anticipated sale of a controlling stake in the Serbian oil-refining monopoly, Naftna Industrija Srbije (NIS), to Russia's Gazpromneft.[17]

In the absence of robust regulatory structures, the possibility that a single company – of any nationality – might control the major part of oil, gas or electricity assets in a market reduces the likelihood of developing market-based approaches to energy policy. Regulatory and anti-monopoly frameworks need to be reinforced across the Western Balkan region to ensure a sustained commitment to market openness and transparency – including the possibility for competing suppliers to enter the market and to have access to networks and storage facilities.

IEA experience has shown that a comprehensive and coherent national energy policy is critical to defining and realising the objectives, priorities, means, institutional organisation and responsibilities for energy security. Precise functions will depend on the circumstances of each market, but an energy security policy should clearly define advisory and co-ordination roles for emergency situations, establish the mechanisms for demand constraint measures, and give one agency a clear mandate to monitor the establishment and management of strategic oil stocks.

Renewable energy sources can make an important contribution to regional energy supply and security. In the Western Balkan region, hydropower and biomass already account for significant shares of the electricity mix and household heating needs, respectively. Illegal logging and inefficient use of fuelwood need to be addressed in order to ensure that this resource is used without endangering the environment. To enhance energy security, countries in the Western Balkan regions should explore the significant untapped potential of hydropower (particularly small- to medium-sized

16. Article 29 of the Energy Community Treaty required contracting parties to submit statements on monitoring security of supply one year after the entry into force of the Treaty, *i.e.* July 2007. These statements cover diversity of supply, technological security and geographical origin of imported fuels. They are to be updated every two years and are available online at: www.energy-community.org.

17. See the sections on *Energy Security* and on *Crude Oil and Oil Products* in the Energy Policy Survey of Serbia.

HPPs) and other renewable energy sources (notably biomass and solar). Many of these can be developed on a commercial basis and used in de-centralised ways.

Recommendations*.......Enhancing energy security*

Integration and reform, the main themes underpinning the Energy Community Treaty, are also the keys to enhanced energy security in the Western Balkans at both national and regional levels. In this context, public authorities should:

- *Strengthen tools for energy security, including policies and programmes to support the diversification of energy sources and imports, and enhance energy efficiency; pursue commercial development of renewable energy sources, particularly biomass (agriculture and wood waste), solar water heaters and small hydropower.*

- *Develop institutions and systems for emergency and crisis management in line with EU standards, including the development of emergency oil stocks.*

- *Ensure that policy is in place for a 'supplier of last resort' once electricity and gas markets are liberalised.*

KEY REGIONAL ENERGY CHALLENGE 4: ENERGY EFFICIENCY

The Western Balkan region is characterised by relatively high energy intensities (Table 3): levels range up to 2.5 times higher than the average for OECD Europe (which is 0.15 toe per thousand USD of GDP). This can be attributed to three main factors: the degraded state of the energy infrastructure; high energy losses in transformation, transmission and distribution; and inefficiency in the end-use sector. Based on the ratio of total final energy consumption to total primary energy supply (TFC/TPES), overall efficiency of the energy systems range from lows of 50% (Kosovo) and 58% (Serbia and Montenegro) to a regional high of 80% (Croatia).

Croatia has one of the more energy-efficient economies in the Western Balkan region, with an energy intensity of 0.17 toe per thousand USD of GDP (PPP year 2000), which is just over 10% higher than the average for OECD Europe. Nevertheless, Croatia's estimated energy saving potential is significant – in the range of 25% of TPES.[18] Extrapolating such levels across the region would produce savings of around 5 Mtoe, which is equivalent to Serbia's annual imports of crude oil and natural gas combined. Reducing the high network losses (22% of TFC in the region) in the electricity sector is another important source of energy saving. The region could save an additional 5 TWh per year by bringing these losses down to the level of Croatia (the best regional performer), which has losses of 14% of TFC.

18. These figures are based on studies, audits and estimates of the Croatian National Energy Programmes and are also found in the *In-depth Review of Energy Efficiency Policies and Programmes of Croatia* (Energy Charter Secretariat, 2005).

Table 3 ....Main energy and environment indicators across the Western Balkan region, 2005

	TPES/GDP in toe per USD thousand (PPP)	**Electricity* consumption** in TWh	**Electricity intensity** in kWh/GDP (PPP)	**CO_2** in Mt	**Carbon intensity** in CO_2/GDP (PPP)
Albania	0.16	3.7	0.25	4.6	0.31
Bosnia and Herzegovina	0.19	9.1	0.35	15.9	0.62
Croatia	0.17	15.4	0.30	20.8	0.40
FYR Macedonia	0.21	6.9	0.53	8.3	0.64
Montenegro	0.26	3.8	1.00	2.5	0.66
Serbia	0.41	29.1	0.72	50.4	1.24
Kosovo	0.42	3.2	0.67	3.9	0.81

* Production + imports – exports – transmission/distribution losses.

Note: Data on Serbia are based on the official submission of the Ministry of Mining and Energy of Serbia. For the purpose of this Survey, data directly from the administrations in Montenegro and Kosovo were used. Serbian GDP PPP data are based on the CHELEM database (as of February 2008).

Sources: IEA statistics; IMF; OECD; MONSTAT; CHELEM; Ministry of Mining and Energy of Serbia; UNMIK.

All markets in the region would benefit from enhanced efforts on the demand side, particularly in terms of developing synergies with other sectoral policies (*e.g.* security and environment) and integrating energy efficiency into transport and building policies. These policies should be backed up by robust action plans for policy implementation with ambitious quantitative and sectoral objectives. The effort should be supported by a national energy agency and a network of local agencies.

Recommendations*.......Improving energy efficiency*

The Western Balkan region has significant potential to improve energy efficiency. Effective policies and programmes are needed to realise this potential, and should be integrated into the overall strategy for economic development. In particular, this Survey urges attention to:

- *Adopting robust action plans for energy efficiency with clear timelines and responsibilities; ensuring these action plans are backed by national and local energy agencies with adequate human and financial resources.*

- *Developing a system to monitor implementation of efficiency programmes and to assess their cost effectiveness.*

- *Accelerating the harmonisation of regulation with the EU acquis communautaire and ensuring the effective implementation of regulations, notably in relation to buildings and space heating, and to labelling schemes. Public authorities should take the lead in procuring energy-efficient products and technologies, and adopting the most energy efficient standards for public buildings.*

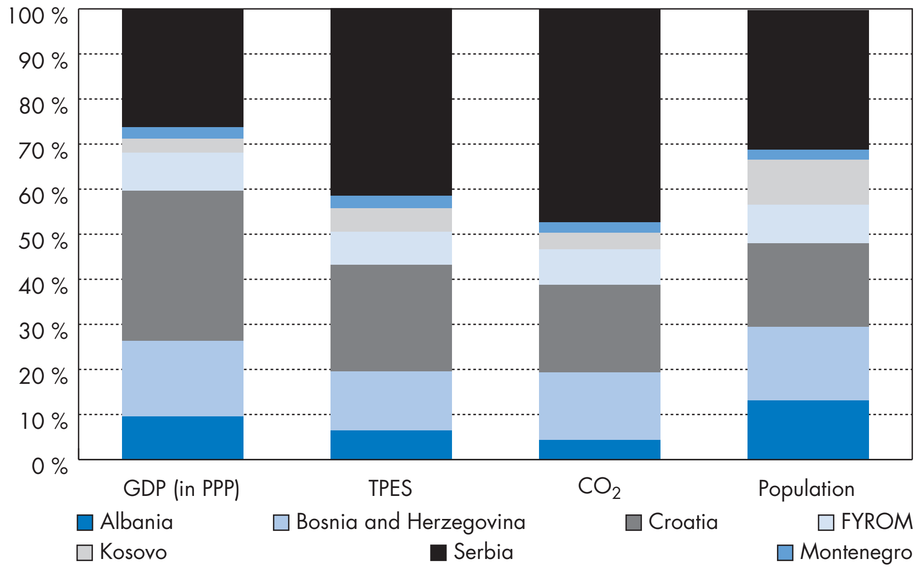
- *Setting up or reinforcing financing schemes to support energy efficiency, with sufficient direct funding (*e.g. *a levy on pollutant emissions).*

KEY REGIONAL ENERGY CHALLENGE 5: ENVIRONMENTAL POLICY AND CLIMATE CHANGE

Current patterns of energy use in the Western Balkans lead to significant impacts on the environment. The region as a whole has high carbon intensity due to its heavy dependence on lignite. Other environmental concerns include pollution from energy combustion (*e.g.* indoor and local air pollution from inefficient and improperly used stoves), deforestation and land degradation (from excessive use of wood for fuel). These patterns of energy use also have harmful consequences for human health – often with a disproportionate effect on poorer parts of the population.

In 2005, CO_2 emissions in the Western Balkan region ranged from a low of 3.9 Mt in Kosovo to a high of 50.4 Mt in Serbia, which accounts for almost half the region's emissions (Figure 3). Serbia also has the highest CO_2 intensity, reflecting the fact that it produces a smaller volume of GDP in PPP terms. Croatia, by contrast, emits a much smaller volume of CO_2 compared to its larger share of regional GDP. Albania emits the lowest amount of CO_2 and its GDP is less CO_2 intensive, reflecting the fact that its electricity is almost entirely based on hydropower.

Figure 3............... Cross-regional comparison of GDP in PPP, TPES, CO_2 emissions and population, 2005



Sources: IEA statistics; IMF; OECD; MONSTAT; CHELEM; Ministry of Mining and Energy of Serbia; UNMIK.

Governments in the region are aware of how energy production and use affect the environment. Many countries have developed and implemented national action plans to tackle tough environmental challenges. Many have also become signatories to various international environmental agreements and are working hard to meet their commitments. Unlocking the region's huge energy efficiency potential and diversifying the energy mix – including the commercial development of renewable energy sources – will help to mitigate environmental impacts.

Recommendations.......Prioritising environmental and climate change policies

Public authorities in the Western Balkan region should give a high political priority to environmental and climate change issues associated with energy production and use. Specifically, they should make efforts in the following areas:

- *Ensure the adoption and implementation of national environmental action plans and multi-sector air quality protection plans; establish quantitative targets and ensure adequate monitoring.*

- *Apply relevant regional and international agreements, notably EU standards (including the EU Directive on large combustion plants) and limits on urban pollutant emissions, as well as the Convention on Long-Range Trans-boundary Air Pollution (CLRTAP).*

- *Monitor the development of modern environmental control technologies and governance practices relating to lignite power stations; consider introducing more advanced generation technology wherever it is economically feasible.*

- *Adopt a climate change strategy and/or action plan, including cost-effective measures to reduce CO_2 emissions; provide adequate financial resources; prepare for effective participation in the EU Emission Trading Scheme and in projects using the flexibility mechanisms of the Kyoto Protocol.*

KEY REGIONAL ENERGY CHALLENGE 6: ENERGY POVERTY

Energy and poverty in the Western Balkans are interrelated in complex ways. Various studies, including those of the UNDP (2004), estimate more than 16% of people in the Western Balkan region are exposed to energy poverty, meaning they do not have access to sufficient energy services to ensure a healthy lifestyle for themselves and their families.[19] The cumulative effect of high energy prices and high energy consumption (which is exacerbated by inadequate building insulation and low-efficiency appliances, particularly stoves and boilers) puts heavy pressure on the household budget of poorer segments of the population, often leaving insufficient funds for adequate food, clothing and education.

More efficient use of energy would go a long way to reducing the heavy share of energy products in the basket of basic household needs. In addition, providing poor families with more energy-efficient devices, along with appropriate information and advice, could support other types of social assistance programmes.

19. See the *Poverty Reduction Strategy Papers* (PRSPs) for various countries, as well as country reports prepared by the International Monetary Fund.

Governments in the region have used various tools to address the issue of energy poverty. Electricity prices in Bosnia and Herzegovina are uniformly low, facilitating access to energy services but distorting the operation of the energy market. Albania, Serbia and Kosovo have applied block electricity tariffs with a lower first-tier level of pricing. These are designed to provide households with a minimum of electricity supply at affordable prices while avoiding a subsidy on all consumption. In FYR Macedonia, the government intends to replace general energy subsidies (which result from relatively low electricity prices for all consumers) with a more targeted social assistance scheme. In Montenegro, electricity tariffs reflect a cross-subsidy between industry and households; the government plans to eliminate the cross-subsidies over the next five years and replace them with targeted subsidies for the poor. Household surveys in Croatia indicate that electricity prices do not have a significant impact on household budgets, reflecting the relatively low use of electricity for space and water heating.

The impacts of energy poverty extend beyond the energy prices and household budgets. They also include negative health impacts – and health care costs – associated with burning fuelwood in inefficient wood stoves. In addition, poorer households often live closer to industrial areas of cities and are, therefore, subjected to the health risks and costs associated with lignite-fired power plants. Unsustainable (and often illegal) wood cutting leads to deforestation, which disproportionately affects poorer segments of the population in rural areas by degrading the productivity of agricultural land.

This Survey assumes that persons living below the national poverty line are also exposed to energy poverty and acknowledges analyses indicating that people living above the national poverty line can also be exposed to energy poverty. Studies show that, in several parts of the region, up to 40% of households are not able to ensure sufficient space heating and also suffer from indoor air pollution caused by inefficient cooking stoves.

Countries with a high incidence of energy poverty face difficult policy constraints and challenges. The lack of reliable energy statistics makes it even more difficult to establish effective policies to alleviate the situation and to set the framework for sustainable energy development. Public authorities should support regular national energy poverty surveys in order to facilitate appropriate analyses and regional comparisons.

Recommendations.......*Reducing energy poverty*

Energy poverty is a significant problem in parts of the Western Balkans. It is exacerbated by – and also contributes to – the unreliability of the energy system. Programmes to reduce energy poverty should be integrated into energy and energy efficiency strategies, and also linked to investments in generation and infrastructure. Public authorities should:

- *Co-ordinate energy policies and programmes with national poverty reduction strategies.*

- *Tackle energy poverty within the overall context of cost-reflective energy prices, using targeted support or subsidies for vulnerable segments of the population. Block tariffs can be an appropriate policy response in some markets.*

- *Introduce programmes to increase energy efficiency (e.g. through better building insulation, more efficient wood/LPG stoves) as part of a coherent approach to reducing energy poverty.*

- *Take steps to address energy poverty issues associated with the affordability of fuelwood and its impact on electricity demand and household expenses. Also consider related problems such as indoor and outdoor air pollution, deforestation and land degradation. Introduce measures to limit illegal logging and fuelwood trade, along with programmes to increase energy efficiency of wood stoves and the use of wood waste.*

KEY REGIONAL ENERGY CHALLENGE 7: ENERGY CO-OPERATION AND TRADE

Due to historic political tensions and unresolved commercial issues, energy co-operation within the Western Balkan region was limited in scope and intensity in the second half of the 1990s. Countries were focused on national problems, in particular how best to re-establish full energy services after the devastation of internal and regional conflicts. In an effort to catch up with reform processes that were well advanced in the neighbouring countries of Central Europe, they also sought to re-establish (or, indeed, establish for the first time) institutions focused on energy reform and regulation.

Starting in 1996 and particularly after 2001, regional co-operation became more active. This was largely due to the support of international donors, bilateral and regional relations, and the influence of the Athens Process. Initially focused on electricity interconnections, relations extended to a broad range of areas, most notably the establishment of a common regulatory framework and the construction of new supply and transmission infrastructure. This co-operation highlighted the strong synergies and complementarities of the region's energy systems – and of public energy policies.

Energy exchange and trade at the regional level can play a key role in supplying secure, diversified and, often, least-cost energy, thereby contributing to the stability and economic development of the Western Balkans and of Southeast Europe. A solid regional energy market will also have greater capacity to attract the investments needed to develop the oil and gas infrastructure. This will help to diversify the region's energy mix and facilitate the development of alternative transportation routes for energy supplies to Central and Western Europe.

The main frameworks for regional co-operation are the Athens Process and the 2005 Energy Community Treaty, which was the first legally binding regional agreement for the Western Balkans since the wars of the 1990s. The Energy Community Treaty provides a regulatory framework for the energy sector of the Western Balkan region that is compatible with the internal market of the European Union. It also established a mechanism for co-operation and dialogue among governments, regulatory authorities, industry and international donors. The entry into force of the Energy Community Treaty and the creation of functioning institutions – in particular the Energy Community Secretariat – has strengthened the reform process by providing a focal point and a central co-ordinator.

Given a legacy of mistrust and conflict in the Western Balkan region, individual countries might be tempted (politically) to aim for self-sufficiency in power generation and to limit reliance on regional electricity trade. Such temptation comes with a significant price tag attached – a price that the region can ill afford. In reality, relatively few investors are attracted to the small, individual markets of the Western Balkans. Regional scope and scale are necessary to create a large enough market for commercial interest. A 2005 Power Generation Investment Study conducted for the World Bank[20] estimated that operating the SEE power system as a single, fully interconnected network would reduce investment requirements and save approximately EUR 3 billion – or around 10% of total electricity expenses during the period 2005-20. The savings would derive mainly from reducing the need for new power generating capacity. The Energy Community, supported by the European Union and by international donors, can help to realise these gains in efficiency.

There has been major progress in refurbishing and strengthening the electricity infrastructure in the region, particularly the re-interconnection of the various grids with the UCTE. Nonetheless, multiple physical and market barriers limit the opportunity for new market entrants and competitive electricity supply. Some of these barriers include relatively low levels of regulated end-use tariffs and low collection rates, the continued dominance of vertically integrated companies, and weak market rules. Obstacles to increased regional trade include congestion of cross-border capacities (which are difficult to access for new entrants), a lack of reliable and accessible market data, a lack of regional/cross-border market regulation and enforcement, and an overall lack of transparency. Many of these issues are being tackled through the development of EU-based regulatory frameworks as envisaged in the Energy Community Treaty.

Persistent load shedding and electricity rationing have stalled economic development in some parts of the region. These problems could be alleviated through investment in new generating capacity, effective policies on the demand side, and integrated operation of the Western Balkan power system with sufficient interconnection to power markets outside the region. Such initiatives would also allow the region as a whole to benefit from the respective endowments of its constituent parts, *e.g.* large reserves of relatively cheap coal in some areas, hydropower potential and/or storage capacity in others.

Over time, investment choices are likely to produce a more diversified electricity mix. The legislative framework for environmental issues, greenhouse gas emissions and renewable energy will influence the development of the electricity mix. However, a

20. *Electricity Generation Investment Study for South East Europe* includes the countries covered by this Survey plus Bulgaria and Romania. Published in June 2005, it is available online at: www.worldbank.org.

lack of clarity over the legal and policy framework that will apply in these areas creates uncertainty in the medium term, which could delay investment decisions and hinder development of the region's potential for renewable energy.

Much work remains to be done in the implementation phase of the Energy Community Treaty; this is an essential task to which public authorities in the region and international donors need to remain fully committed. If effectively implemented, the stabilisation and reforms of the energy sector will assist in the long-term, macro-economic revival of the Western Balkan region, contributing to economic growth, enhanced efficiency, lower environmental impacts of energy use and reduced energy poverty.

Recommendations.......*Developing regional co-operation and trade*

A key message of this Survey, and an insight that is at the heart of the Energy Community process, is that the Western Balkans have much to gain from a regional, co-operative approach to energy trade. In this context, public authorities should:

- *Promote the creation of an integrated regional energy market, anchored within the broader European internal market, to achieve a diversified energy mix, improve utilisation of supply and production capacities, and optimise future investments. This objective requires thorough and sustained domestic policy and regulatory reforms, as well as enhanced market transparency.*

- *Ensure a sustained political commitment to the institutions and mechanisms for regional co-operation now in place, primarily through the Energy Community Treaty and with the Energy Community Secretariat acting as focal point and co-ordinator.*

- *Dedicate sufficient resources to ensure that regional and international commitments are implemented in a timely manner.*

KEY REGIONAL ENERGY CHALLENGE 8: OIL AND GAS TRANSPORTATION IN SOUTHEAST EUROPE[21]

The Western Balkan region is strategically located between the resource-rich regions of the Caspian basin and the Middle East, and key energy consumers in Western and Central Europe. Thus, it has potential to play an important role in the transportation of oil and gas to international markets. At present, Russia is a major supplier of oil to Southeast Europe and the dominant supplier of natural gas to these markets.

If all the planned oil and gas transportation projects in Southeast Europe were built, existing transit capacity in the region would more than double over the coming decade.

21. The chapter on Oil and Gas Transportation in Southeast Europe covers the Western Balkans plus Greece, Bulgaria and Romania.

However, many of the proposed oil and gas transit projects are competing for the same sources of oil and gas and the same markets. Thus, it is clear that not all projects currently under discussion or development will go ahead.

With regard to crude oil, there are several pipeline projects that cross at least a part of Southeast Europe. A common characteristic is that they are designed to carry crude oil from Russia and/or the Caspian basin, and are all at least partially justified as means of relieving transport congestion in the Turkish Straits.

With regard to natural gas, the small size of the markets in the Western Balkans makes it difficult (at least at this stage) to envisage building new bulk transmission lines for these markets alone. However, a number of pipeline proposals currently being considered would cross Southeast Europe to supply the main European markets. This opens the possibility for spur lines to supply small but growing gas markets along the route. Diversification of sources of supply is critical to market opening in downstream markets and to establishing a regional gas market as envisaged by the Athens Process.

The development of new natural gas routes (even with modest initial capacities) from the Caspian basin and the Middle East would diversify sources, suppliers and routes for consumers in Europe, including those in the Western Balkans. These projects must prove their reliability and economic viability compared to existing and potential competing routes, as well as against competing supply sources (*e.g.* LNG). They must meet the triple challenge of securing sufficient resources from the Caspian basin and the Middle East, mitigating transit risk, and countering the influence of the incumbent supplier, Gazprom. Based on its very strong resource base in Russia, Gazprom has a variety of commercial tools to slow alternative gas supply development: its influence in the resource-rich Caspian basin; its control over existing transportation routes; its sponsorship of major new projects (*e.g.* South Stream); and its growing presence in downstream transportation and distribution markets. This underlines the need for effective regulation across the region to ensure the operation of an open, transparent and competitive energy market that is accessible to new market entrants.

Public authorities in the Western Balkan region should provide an effective and transparent regulatory framework for investment in and operation of cross-border energy projects. This framework should be consistent with the principles of the Energy Community Treaty and the Energy Charter Treaty.[22] Progress in these areas varies across the Western Balkan countries. Some are lagging behind in terms of developing a legal framework for investment and transit (*e.g.* Serbia and Montenegro have not yet acceded to the Energy Charter Treaty). The most advanced countries have established attractive conditions for investment, often through co-ordinated and sustained market reform undertaken in preparation for EU membership.

22. The Energy Charter Treaty is a broad multilateral agreement for the energy sector, which has provisions on investment protection, transit and energy efficiency (www.encharter.org). Albania, Bosnia and Herzegovina, Croatia and FYR Macedonia are parties to the Treaty, as are all other countries along the potential energy supply chain from the Caspian region to Southeast Europe.

Recommendations.......Facilitating trans-European transportation of oil and gas

Southeast Europe is set to play an important role in new oil and gas transportation routes that link existing and new suppliers to the main European markets. Public authorities should carefully assess long-term costs and benefits in relation to proposed projects and potential partners. They should also act to strengthen regulatory institutions and frameworks in line with commitments arising from membership in the European Union, the Energy Community Treaty and the Energy Charter Treaty.

- *Clear and transparent rules for investment and trade will facilitate assessment of various projects on a comparable and commercial basis. Countries in the region that have not done so should accede to the Energy Charter Treaty as a means of reducing the risks associated with cross-border investment and trade.*

- *Strong regulatory frameworks are needed to ensure that control of existing or new infrastructure in the regional market is not left open to abuse by a dominant supplier. Public authorities should reinforce and harmonise regulatory institutions and frameworks to ensure a sustained commitment to open and transparent market operation.*

- *In the case of natural gas, diversification of sources of supply will be critical to establishing a competitive regional gas market. Where commercial opportunities exist, public authorities should promote the enhanced market performance that can be offered by diversified suppliers of natural gas competing for market share.*

PART I. REGIONAL PERSPECTIVES

I. ENERGY CO-OPERATION AND TRADE

INTRODUCTION

Most of the countries of the Western Balkan region inherited energy infrastructure (*e.g.* for oil, gas and electricity) from the Socialist Federal Republic (SFR) of Yugoslavia. Overcoming the mistrust engendered by regional conflict, governments of various countries have built upon the synergies and complementary aspects of the energy systems to undertake joint regional initiatives and projects, particularly over the last decade, in the Western Balkans and in Southeast Europe (SEE)[23] as a whole.

Energy exchange and trade can play a key role in the stability and economic development of the Western Balkan and SEE regions by supplying secure, diversified and, often, least-cost energy. A consolidated energy market will enhance the region's capacity to attract investments to support the development of oil and gas infrastructure, thereby diversifying the region's energy mix. An improved infrastructure will also act as an important alternative transit route for energy supplies to Central and Western Europe. Regional co-operation can also help to tackle some specific energy and environment concerns of the Western Balkan region, which is characterised by heavy use of lignite in old thermal power plants (TPPs) and by extensive use of fuelwood (often in inefficient wood stoves).

Starting in 1996 and particularly after 2001, bilateral and regional relations and co-operation became more active, largely due to increased support of international donors and the framework set out by the Athens Process.[24] Relations initially focused on electricity interconnections, but then extended to a broader range of areas, most notably the establishment of a common regulatory framework and the construction of new supply and transit gas pipelines. These initiatives highlighted the strong synergies and complementarities of energy systems in the region, as well as the growing convergence of public energy policies.

The 2005 Energy Community Treaty, to which all of the Western Balkans has subscribed, aims to create the legal framework for an integrated European market for electricity and gas and to establish a regional energy market that is compatible with the internal energy market of the European Union. The Treaty refers to the relevant *acquis communautaire* on energy, environment and competition, which will also be implemented in the Western Balkan region, and should enhance market opening, investment guarantees and regulatory control of the energy sectors. It also creates a policy framework for international donors to support infrastructure investments.

23. The Western Balkans plus Bulgaria, Greece and Romania.

24. The Athens Process was initiated following the signature of an 'Athens Memorandum' in 2002 that first outlined the concept of a Southeast European regional energy market (see below for more details).

The Treaty is in its implementation phase: much work remains to ensure that market opening is part of a consistent, overall strategy for energy market reform and re-structuring. If effectively implemented, the Treaty will support long-term stabilisation of the energy sector through macro-economic revival of the Western Balkan region. It will contribute to economic growth, more efficient energy use, lower environmental impacts from energy use, and reduced energy poverty.

REGIONAL ENERGY TRADE

Electricity, oil products and fuelwood are the most traded energy products amongst countries in the Western Balkan region. However, there is a lack of reliable data on intra-regional trade in these commodities due to the lack of resources at customs and national statistics offices, and to widespread illegal trade. Estimates indicate that intra-regional energy trade[25] accounts for about 13 % of the region's energy needs (4.8 Mtoe), broken down as follows: electricity (41%), oil products (52%) and fuelwood (7%).

Electricity

Current patterns of electricity consumption and trade

During the 1990s, the structure of electricity consumption in the Western Balkans changed dramatically. Industrial demand dropped sharply due to the closure and re-structuring of the heavy industrial sector. In contrast, household demand increased rapidly – rising by 60% in FYR Macedonia and Serbia, and by a staggering 350% in Albania. Households now represent the largest share of electricity consumption in most countries and account for up to 75% in Albania and Kosovo, which drives the regional average to more than 50% (Table 4), as compared to 29% in OECD Europe. Such extensive use of electricity is stimulated by low electricity prices and by low payment discipline on the part of consumers. In turn, high consumption leads to peaking, which overloads the system, while low payment reduces revenues across the electricity sector, having a negative impact on maintenance and investment.

In 2005, network losses accounted for 22% (15 TWh)[26] of the region's total final consumption (TFC) (Table 4). Lack of maintenance and replacement of outdated equipment contribute to low performance. Technical losses in transmission and distribution account for around 25% of total electricity consumption in several systems. When commercial losses (non-payment or illegal connections) are added, losses on these networks can climb to more than 35%.

Reducing peak demand and network losses – for example, to levels similar to that of the Croatian network (14%) – would generate savings of 5 TWh per year (almost 8% of total regional electricity consumption) with multiple benefits for both customers (better reliability and quality of supply) and the electricity sector (reduced investments in network replacement and reinforcement, and peak generation). TSOs across the

25. Regional energy trade is calculated as imports only.

26. OECD Europe average: 8% (2005).

region have already set a priority to reduce network losses and have developed specific investment programmes. Implementing energy efficiency programmes and providing households with alternative fuels (*e.g.* LPG, gas) to replace electric heating will further reduce peak demand, thereby helping to reduce the stress to the electricity systems across the region.

Table 4 ....Electricity demand and network losses, in the Western Balkan region, 2005

	Peak demand	Final electricity consumption* (FEC)	Share of residential in FEC	Network losses**	
	GW	TWh	%	%***	TWh
Albania	1.3	3.6	75%	36%	1.30
Bosnia and Herzegovina	1.7	7.7	52%	28%	2.16
Croatia	3.0	14.4	44%	14%	2.02
FYR Macedonia	1.4	6.2	48%	22%	1.36
Montenegro	0.8	3.8	30%	29%	1.10
Serbia	6.9	25.6	55%	21%	5.38
Kosovo	1.3	3.2	73%	37%	1.18
Total/Average (%)	**16.4**	**64.5**	**52%**	**22.5%**	**14.5**

* Calculated as: gross production + import – export – network losses – energy used in electricity production.
** Transmission and distribution technical losses, as well as commercial losses.
*** % of final electricity consumption.
Sources: IEA statistics; UNMIK, country data.

In 2006, electricity trade within the Western Balkan region was 15.8 TWh or 23% of FEC (Table 5), with Serbia accounting for 56% of total exports and Croatia for 42% of total imports. FYR Macedonia is the only country not exporting within the Western Balkan region; it exports primarily to Greece.

Table 5 ....Electricity trade in the Western Balkan region, 2006 (TWh)

	Exporter						
	Albania	Bosnia and Herzegovina	Serbia*	Croatia	FYR Macedonia	Montenegro	Total
Importer							
Albania			0.3				**0.3**
Bosnia and Herzegovina			2.3	0.7			**3.0**
Serbia*	0.4	0.7				1.0	**2.1**
Croatia		3.6	3.0				**6.6**
FYR Macedonia			2.1				**2.1**
Montenegro	0.2	0.3	1.2				**1.7**
Total	**0.6**	**4.6**	**8.9**	**0.7**	**0.0**	**1.0**	**15.8**

* Kosovo data not distinguished from Serbia.
Sources: UCTE, MONSTAT.

Overall, the SEE region remains a net electricity exporter (1 TWh in 2006). However, the closure of several generation plants, notably Bulgaria's Kozloduy nuclear power plants (NPPs) in 2006, has reduced regionally traded volumes, as well as exports outside the region. As a result, trading prices have increased from EUR 0.02 to 0.05/kWh over 2000/2004 to EUR 0.08 to 0.11/kWh in 2007.

For the most part, traded electricity is base load. Peak capacities (mostly in Bosnia, Croatia and Montenegro) are traded implicitly within framework contracts or as an emergency stop-gap measure to meet surges in domestic electricity demand. Thus, there is limited exchange of peak services with the Alps region or Central Europe. These demand surges usually occur during cold snaps when use of electricity for space and water heating becomes widespread as a means to supplement fuelwood, the price of which soars during such periods. Heavy reliance on electricity is due largely to the lack of alternative heating options for households, the low efficiency of energy end-use (*i.e.* inefficient wood stoves) and low payment discipline. The other main drivers for trade are the frequent technical failures and/or plant outages, which can be attributed to lack of refurbishment and inadequate maintenance budgets.

Status of regional interconnection

The former central Yugoslavian transmission line was a 400 kV network spanning 800 km. This network had two primary interconnections, the Adriatic Line connecting to Croatia, Montenegro, Serbia, and Greece, and the Northeast Line via Ernestinovo in Croatia, which is part of the former central Yugoslavian transmission line (Map 2). The electricity grid of the former SFR Yugoslavia was initially interconnected and synchronised with the Union for the Co-ordination of Transmission of Electricity[27] (UCTE). In 1991, this grid and the UCTE system in the region as a whole were split into two separately operating synchronous zones. Croatia and the Federation of Bosnia and Herzegovina within Bosnia and Herzegovina became part of UCTE Zone 1, and Republika Srpska within Bosnia and Herzegovina, Serbia and FYR Macedonia together with Bulgaria, Romania and Greece became UCTE zone 2. SUDEL was the regional transmission system operator (TSO) for UCTE Zone 2, with the Electricity Co-ordination Centre (EKC) in Belgrade acting in a technical co-ordination role (focusing on communication between dispatch centres).

In October 2004, the two UCTE zones were successfully re-connected to UCTE and re-synchronised,[28] thus removing a major barrier to the creation of a regional electricity market with strong linkages to its neighbours. The Energy Community noted that the transmission network in SEE is now in a position to handle a significant increase in trading volume. This increase, however, is conditional on two factors: the development of a reliable regulatory framework and unbundling of power companies; and ensuring an appropriate market design and establishing trading mechanisms that optimise the use of available capacity and provide reliable signals for building new capacity.

Available high-voltage electricity grid capacity for electricity trade within the Western Balkan region is in the order of 5 800 MW of interconnections (net transmission capacity or NTC) or around 35% of total peak demand (Figure 4). This low level of

27. The Union for the Co-ordination of Transmission of Electricity (UCTE) is the association of transmission system operators in continental Europe (www.ucte.org).

28. The Albanian system was not reconnected immediately pending reliability tests, which began in 2004.

interconnection constrains capacity and flows between countries. Major efforts and investments (both national and regional) have been made to improve and increase the grid capacity and interconnections; others are ongoing or in the planning phase. The administrative nature of the TSO organisation and the complexity of the unbundling process limit cross-border capacities to only physical high-voltage lines. There is no co-ordination about possible shifts in water inflow in major shared power plants along the Danube or Drina Rivers, the use of which is, therefore, largely neglected.

Figure 4...............Net transfer capacity (MW) for Southeast Europe, 2007 Q1

The boundaries and names shown and the designations used on maps included in this publication do not imply official endorsement or acceptance by the IEA.

Unbundling and regulation

The Energy Community Treaty provides the overall legal and regulatory framework for the development of an efficient and integrated regional electricity market. By opening upstream and downstream segments of the electricity market to competition, the Treaty aims to ensure efficient and reliable electricity supply (within an appropriate regulatory framework) while also promoting sustainable energy use and meeting high environmental standards. Separating out monopolised and competitive activities in incumbent, vertically integrated companies is an essential part of this process.

Most of the Western Balkan markets have made significant progress towards unbundling and establishing the independence of TSOs, although Albania, Croatia and Montenegro have yet to finalise the process. To date, Croatia is the only country that has formalised the unbundling of its distribution system operator (DSOs).

Unbundling of network operators is key to providing non-discriminatory access to networks and ensuring that operators do not favour their affiliates. Experience with the EU internal market shows that, in practice, this has been difficult to achieve. The current situation in the Western Balkans shows incomplete or inadequate unbundling of network operators in most markets. Failure to make additional progress in this area will leave a systemic conflict of interest and distort incentives for operation and investment, thereby deterring new market entrants.

Regulation is another key aspect to consider. All markets in the region have established a regulatory authority for electricity. However, questions remain in most cases about the true independence and actual authority of these bodies. Properly empowered regulators are crucial to the functioning of a transparent and non-discriminatory market. It is equally important to align regulatory powers to facilitate co-ordination and co-operation across the Western Balkans.

Market opening

The deadlines for electricity market opening in the Energy Community Treaty were set as 1 January 2008 for non-residential customers and 1 January 2015 for households. However, as noted in a report to the Energy Community ministerial meeting in December 2007, "the regional outlook indicates significant challenges ahead with the process" and "timely implementation of the Treaty's provisions on electricity and gas market opening is not likely in practical terms from today's perspective". Such a conclusion was unavoidable given that only Bosnia and Herzegovina and Croatia had established a timetable for opening up the electricity market (and no countries had established timetables for opening of natural gas markets). Timetables and eligibility thresholds for market opening remain to be defined; this will need to be co-ordinated across the region and sequenced carefully with other aspects of the market reform process.

Market design and cross-border trade

A first-order challenge for electricity trade in SEE is the status of the overall system in terms of both generation and transmission capacity. This is closely associated with challenges related to markets for balancing, as well as reserve and transmission capacity. Within the region, most electricity is handled by traders under contracts with utilities and TSOs, causing no imbalances. Trades are primarily in base-load products, in bands for a day, week(s) or month(s). Due to public procurement regulations imposed throughout the region, trading is based on framework contracts that lack clear distinctions of traded products (*e.g.* peak, base load, off peak). This generates numerous side arrangements during the execution of trades. Dispatch scheduling often remains within the TSO, despite the adoption of bilateral contract models. As market rules are weak or non-existent, the risks for market actors, including new entrants, are significant (SEETEC, 2006).

Day-ahead markets typically have a few advance trades, but voluntary exchanges remain small. The markets are not easily accessible to foreign operators, in part due to a lack of transparency that results in a wide range of regional prices. This is also a feature of the wholesale supply prices (on both regulated and open markets), which vary from EUR 24 to EUR 80/MWh. There is significant competition on short-term adjustments that are bilaterally contracted and bartered between parties.

The overall shortage of generation capacity in all energy sectors limits the potential benefits of competition in the Western Balkan region. In the electricity sector, there have been efforts to take a regional perspective on key investment decisions and priorities for both generation and transmission, with a priority to promote investment in rehabilitation and new capacity. Co-operation on investment issues within the framework of the Energy Community Treaty is described in more detail below.

Barriers and challenges to electricity trade in Southeast Europe

To date, relatively little of the wholesale electricity market activity in SEE is actually open to competition. Distribution companies are often not able to participate or are integrated with companies also engaged in electricity generation activities. The situation in each market is described in more detail in the individual survey chapters.

Transparency is a major problem. There is a lack of reliable and timely information about the fundamentals of the electricity system, particularly data relating to operation of generation capacity and availability of network capacity. Most markets have plans to begin publishing such data in the short or longer term; however, many will have to overcome considerable obstacles before sufficient data are available. Moreover, it is essential to establish relevant regulatory requirements, to harmonise transparency standards and to develop a common approach for publishing relevant market data (EURELECTRIC, 2006).

Weak judicial systems, coupled with the lack of effective regulation and enforcement, have left ample room for illegal trade, unfair practices and corruption. Little official information is available on corporate governance standards in the sector. However, several reports suggest serious financial failures and mismanagement in electricity power companies and electricity trade activities. In the case of Bosnia and Herzegovina, such reports were backed up by audits of the Office of the High Representative (OHR) and reports by various non-governmental organisations (Bank Watch, 2005).

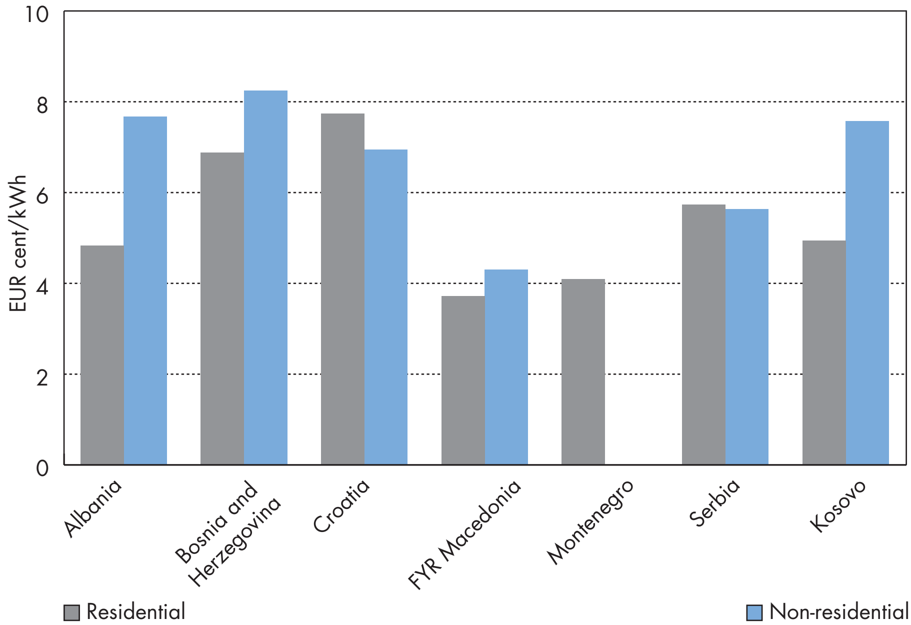
In a 2006 assessment, the Council of European Energy Regulators (CEER) described the SEE regional market as a number of national electricity markets in various stages of development with a low overall degree of market integration. Wholesale market structures across the region vary from day-ahead pools to bilateral contracts to integrated generator-supplier structures (CEER, 2006). The reasons given for these differences were technical (availability of interconnection capacity) or market-related (market structure, availability of information), or had to do with overall energy policy and the desire, in some cases, to maintain energy self-sufficiency.

The absence of cost-reflective tariffs and the persistence of low payment discipline remain serious problems across the region. Both must be addressed to reduce high and inefficient use of electricity, particularly for heating, but should be combined with targeted support to vulnerable segments of the population (see chapter on Energy and Poverty). Electricity prices in 2005 (Figure 5) indicated progress towards full cost recovery, particularly in Bosnia and Herzegovina and Croatia. However, cross-subsidies from business customers to households remain significant across the region. Individual countries face specific challenges in these areas:

- Albania is in the process of installing meters for all customers. However, billing systems are still under development and collection rates are still relatively low. There are plans to raise prices to cost-recovery levels by 2008-2010.
- Bosnia and Herzegovina's electricity tariffs are still below costs, despite attempts by the regulator to introduce cost-reflective pricing. Efforts to improve collection rates need to be accompanied by measures to protect vulnerable customers.
- Croatia plans to introduce cost-reflective prices by 2010, and is elaborating incentives to ensure a reasonable level of reserve generation capacity.
- FYR Macedonia needs to improve payment collection.

- Montenegro has in place a programme for payment reform, and the Regulatory Energy Agency has approved new price regulations.
- Serbia has a high tariff collection rate but still needs to raise tariffs to cost-reflective levels.
- Kosovo faces multiple challenges of insufficient metering, low prices and high non-payment, all of which result in high demand and low revenues for the power company, leading to electricity shortages.

Figure 5...............Electricity prices across the Western Balkan region, 2005 Q4



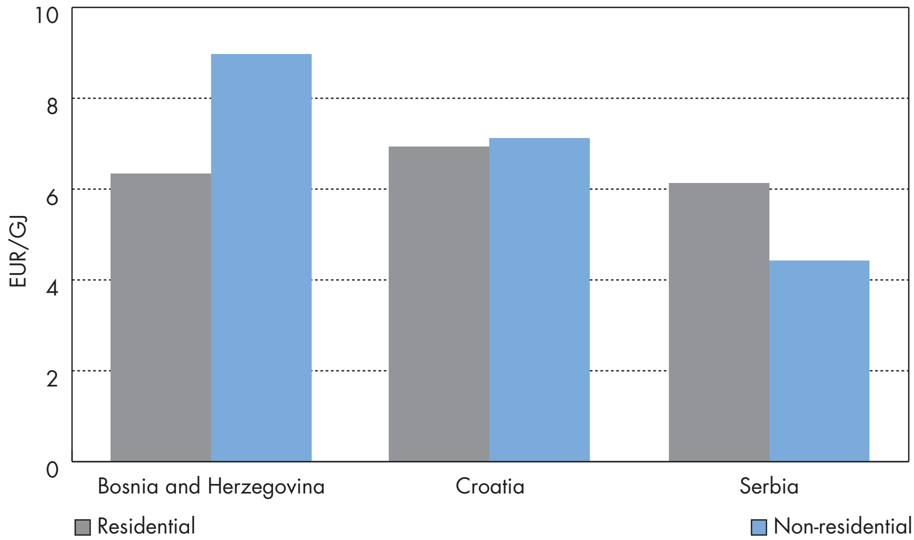
Notes: Prices are calculated for a weighted average consumption and based on (i) official average end-user price, or (ii) revenue from sales to end-users, divided by the quantity sold. Residential and non-residential (industrial) prices may include fixed charges, capacity charges and energy charges.
Source: Energy Regulators Regional Association (ERRA).

Congestion management

Transmission system limitations are frequently encountered when supplying power across borders within a single market, creating a need to manage transmission congestion. Since January 2006, the European Transmission System Operators (ETSO) has been using monthly simulations to help TSOs in the SEE develop expertise in co-ordinating flow-based auctions of transmission capacity. In principle, participants have agreed to implement a multilateral and market-based congestion management solution, which is expected to have distinct advantages over bilateral mechanisms, including improved network security, more effective utilisation of the grid, and greater transparency and convenience for market players.

There are several prerequisites for implementing a congestion management system including close collaboration of TSOs with extensive data exchange, support from the regulators, the establishment of an auctioning office, and unbundling. Participants are preparing an action plan and discussions are taking place during regular meetings of the Athens Forum (ETSO, 2006).

Figure 6..............Natural gas prices across the Western Balkan region, 2005 Q4



Notes: Prices are calculated for a weighted average consumption and based on (i) official average end-user price, or (ii) revenue from sales to end-users, divided by the quantity sold. Residential and non-residential (industrial) prices may include fixed charges, capacity charges and energy charges.
Source: Energy Regulators Regional Association (ERRA).

Spot markets

Stakeholders in the electricity sector are considering the creation of a regional power exchange for spot trading in SEE. One option would be to extend the geographical scope of existing national power exchanges in Romania (OPCOM) and Slovenia (Borzen), which are owned and operated by their respective TSOs. Such a regional power exchange would require setting up a global contractual architecture, defining specific regulation (including for transparency) and securing initial capital requirements. An equity investment from the European Bank for Reconstruction and Development (EBRD) has been envisaged for this purpose (EBRD, 2006).

Establishment of balancing markets

Enhancing reliability of electricity supply has been especially important since the re-synchronisation of the two UCTE zones in 2004. One way to address the situation is by establishing balancing markets to allow for better control of intra-regional flows. The Nordic market (Nordpool) and the arrangements in the Austro-German market demonstrate that a real-time balancing market can function across borders. Such a cross-border market is yet to evolve in SEE.

TSOs can call for reserve power in case of disturbances. However, such measures require activation of reserves larger than the amounts offered by producers/consumers in the balancing market. TSOs typically procure reserves and balancing energy in one of three ways: market mechanisms (*e.g.* bids in the balancing market); periodic tenders (*e.g.* daily, monthly, yearly); or bilateral agreements (negotiated as required).

It is important to note that in many SEE countries, levels of real-time automation and communication remain limited. Although considerable improvements have been made and are still under way, technical limitations continue to impede some countries' efforts to implement fully operational electricity markets. Some typical obstacles are:

- The substantial degree of manual intervention required to change the output of many individual generating units.
- The lack of remote metering capabilities in some interface points of the high-voltage transmission network.
- The lack of modern systems for supervisory control and data acquisition (SCADA).

All non-EU countries of the SEE region are developing arrangements for real-time balancing and reserve power markets.[29] Emergency reserves are another example of a specific balancing service; they are typically procured by TSOs through monthly or annual markets, or through bilateral contracts. Most TSOs in SEE have contractual agreements with neighbouring TSOs to vary transfers across interconnectors in times of system stress (ETSO, 2006). Harmonisation of balancing market regimes would be an important step to increase the size of control areas and facilitate regional trade.

Incentives for investment in generation capacity

Well-functioning competitive markets should provide the right signals for investment, thereby promoting secure and reliable energy supply in the most cost-effective manner. A clear policy and legislative framework for environmental issues is essential to support medium-term investment planning and to promote sustainability.

Investment support mechanisms, or 'capacity schemes', can play a role in SEE by providing incentives for investment in generation capacity. However, an assessment conducted by the CEER in 2006 found that there is no standard or harmonised mechanism in place in SEE. In Kosovo (and in Romania), a capacity support mechanism was in the planning stage; in FYR Macedonia, capacity support was provided via an alternative vehicle (power purchase agreements) that is deemed sufficient; in Bosnia and Herzegovina, Montenegro and Serbia, capacity expansion decisions were still being made centrally. In other cases, it was felt that a liberalised market will, in itself, be sufficient to generate investment incentives. The CEER recommended that SEE stakeholders consider a gradual transition from the existing structures to a market model that includes energy and also provisions for capacity availability. As of early 2008, it was not clear how this transition could be achieved coherently across SEE.

Expanding cross-border transmission capacity

Insufficient (or unavailable) cross-border capacity hampers market integration. Thus, it is important to ensure sufficient capacity and adequate investment incentives in order to remove bottlenecks.

A distinctive feature of energy co-operation in SEE is that investment decisions are taken from a regional perspective. More than a dozen 400 kV interconnections and one 220 kV interconnection (Map 2) are considered of bilateral importance, *i.e.* participants recognise their potential benefits to the system as a whole. Several other projects aim to upgrade sub-stations and transmission lines rated at less than 220 kV. Taken together, these interconnections will provide the backbone of inter-system transmission infrastructure and have a significant impact on decisions related to generation and other system planning issues. A list of priority projects is included in the section on *Co-operation on Investment and Infrastructure* below.

29. Turkey is also negotiating to join UCTE.

Map 2.................Electricity infrastructure of the Western Balkan region

The boundaries and names shown and the designations used on maps included in this publication do not imply official endorsement or acceptance by the IEA.

Crude oil and natural gas

To date, there has been much less scope for developing regional trade within the SEE's oil and natural gas sectors, largely due to the virtual absence of national or regional competitive wholesale markets for these resources. Crude oil is typically imported under contracts (often long term) concluded between a refinery or an integrated oil company and a foreign supplier. In addition, some Western Balkan markets have only one or two refineries or integrated oil companies; others have none at all.

Croatia and Serbia are the only significant consumers of natural gas, and 80% of Croatian consumption is covered by domestic production. Markets in Bosnia and Herzegovina and FYR Macedonia are small; Albania, Montenegro and Kosovo are not gasified. Where gas is imported, Russia's Gazprom is the dominant supplier under long-term contracts with take-or-pay clauses. Gazprom also often enjoys exclusive rights with respect to access to infrastructure and other non-competitive privileges, such as a prohibition of re-sale or re-export.

These factors make it much more difficult to pursue the tasks of market opening and enhancing competition and trade in the oil and gas sectors. The opening of natural gas markets on a national or regional level may not progress hand-in-hand with greater competition. In addition, if the dominant share of imports continues to come from a single supplier under long-term contracts, market opening may fail to establish essential buttresses related to security of supply.

Developing the distribution network is crucial to establishing retail gas markets. The World Bank commissioned the *SEE Regional Gasification Study* to examine the potential and options for increased access to natural gas (gasification projects to new areas) and alternative supplies. The World Bank has also made a preliminary proposal for a Western Balkan gas ring, which would link gas markets in the region and allow for a more diversified regional supply. This gas ring would provide an alternative to Russian gas delivery, which comes from the east and north. It would also improve market access to gas from Croatia (including possible LNG) and potentially from the Caspian basin and/or the Middle East, delivered by the Nabucco Pipeline, the Turkey-Greece Interconnector or the Trans-Adriatic Pipeline (see the chapter on *Oil and Gas Transportation in Southeast Europe*). Initial demand from combined cycle gas turbine (CCGT) power stations would be necessary to anchor development of the Western Balkan gas ring.

Oil products

Oil products are traded between national and international oil companies and a large number of small to medium importers, wholesalers and retailers that are active in various domestic markets. The main external players are Hellenic Petroleum of Greece and Lukoil of Russia. Oil products are transported by railway, trucks and ships (sea and river). Despite refurbishment efforts and new investments, the regional transport infrastructure remains deteriorated: railways and roads are limited in both number and length.

In 2005, oil product imports by countries in the Western Balkan region reached 7.6 Mt, an increase of 80% since 2000 and 13% since 2004 (IEA, 2007b). The main importers are Bosnia and Herzegovina (1.3 Mt), Croatia (1.2 Mt), Albania (1.2 Mt), Serbia and Montenegro (3.6 Mt) and FYR Macedonia (0.3 Mt). Exports[30] within the region are reported at 2.4 Mt in 2005 (1.9 Mt in 2000), mostly from Croatia (1.9 Mt), Serbia (0.3 Mt) and FYR Macedonia (0.3 Mt). Imports from outside the region include LPG and motor fuels, notably EU standard fuels.

Unreliable product quality is a serious problem, stemming directly from weak enforcement of product specifications and control, and from illegal domestic and cross-border trade and retail. Illegal trade means that tax evasion is widespread in the oil products sector.

Fuelwood

Fuelwood consumption is widespread across the region, generating intense domestic and cross-border trade. Data on actual consumption derives mainly from household surveys and estimates; overall, the data are scarce and lack reliability and scope. However, it is widely accepted that much of the harvesting (cutting) and sales are informal or illegal. Albania, Bosnia and Herzegovina and southern Serbia are the main exporters of fuelwood, mainly to northern Serbia and Kosovo. Considering the relatively low value of fuelwood and its transport costs, trade should logically be restricted to short distances (50 to 100 km). In fact, it is traded over longer distances due a wide range in prices across the region.[31]

This long-distance road transport of fuelwood adds another level of complexity to cross-border trade. In order to make trade financially feasible, end prices must be relatively high. Thus, high quality construction or industrial wood is traded in the form of fuelwood. In turn, this causes a decline in the region's wood and furniture industry,[32] which was once internationally competitive. The informal/illegal nature of trade in fuelwood also raises the risk of price manipulation and threatens the sustainability of the resource base. Certain areas show signs of inadequate management of forest stock and significant risk of deforestation. Longer transport also removes wood waste from the market and increases oil product consumption.

30. These official figures do not include informal cross-border flows, which are sizeable at several borders.

31. Selection of average prices: Albania (EUR 20 to 30 per m^3), Bosnia and Herzegovina (EUR 20 to 25 per m^3), southern Montenegro (EUR 35 to 40 per m^3), northern Serbia (EUR 30 to 45 per m^3), southern Serbia (EUR 22 to 35 per m^3) and Kosovo (EUR 35 to 45 per m^3).

32. The wood and furniture industry usually has exceptionally high added value, exceeding the value of raw fuelwood by several times. It is also higher than added value in the metal industry.

Waterways and water resource management

The Danube River and its associated surface waters form the largest hydropower resource and navigation route in SEE. Danube catchment areas cover most of the Western Balkans region. During the 1980s, navigation along the Danube was an important instrument for energy security in former SFR Yugoslavia. Construction (in 1972) of the massive Iron Gate dam and hydropower plants (Dherdap/Portile de Fier) between Serbia and Romania also opened a navigation system in the middle Danube (Croatia and Serbia) for river-to-sea going vessels. During the 1970s and 1980s, throughput of Danube ports in the former SFR Yugoslavia was roughly equal to that of ports along the Republic's Adriatic coast – *i.e.* more than 10 Mt/y plus considerable internal flow. Imports included steam and coking coal, iron ore, scrap metal, copper ore, fertilisers, crude oil and oil products. Agriculture and industrial products were the primary exports. Ports along the Danube provided appropriate economies of scale and the ability to import high quality fuels for industries in the area of coverage.

During the political turmoil in the 1990s, the flow of goods along the Danube dropped to 1/8 of peak levels registered in the 1970s and 1980s. At the same time, imports of fuels and fertilisers dropped to negligible amounts. As a result, industries dependent on hard coal imports were forced to switch to low quality domestic lignite. The drop in fertiliser use led to a decrease in agriculture productivity, reducing the availability of biomass in Serbia and Croatia.

The Western Balkan region (particularly Montenegro, northwest Albania, Bosnia and Herzegovina, south Croatia and southern Serbia) is very well endowed with hydropower resources, reflecting is dramatic geography (high mountains and deep valleys) and its significant, yet variable, levels of precipitation. A number of important hydropower plants (HPPs) were built between in the 1960s and the 1980s in the Adriatic catchments area (*e.g.* Fierza, Trebinje, Perucica, Dubrovnik, Capljina, Jablanica) and Drina/Danube catchments area (*e.g.* Piva, Visegrad, Bajina Basta, Zvornik). Water inflows between the Western Balkans and the Alps generated significant electricity exchange and trade during this period, and provided the commercial rationale for developing the Yugoslavia 400 kV network.

Following political tensions in the early 1970s, SFR Yugoslavia lacked legal and policy instruments to utilise water resources shared by two or more republics. Destruction of the energy infrastructure during the 1990s prompted the development of economic structures that were far more "inward" oriented; as a result, newly established countries in the Western Balkans re-oriented existing HPPs to serve domestic markets. This led to relatively low peak power prices across the region (compared with the rest of Europe) and serious under-utilisation of available capacity.

Sizeable and unpredictable water inflows have created strain and over-utilisation of base load (mostly lignite-fired) power plants. This has led to a deterioration in the physical availability of the plants, which is exacerbated by lack of investment and maintenance. A number of commercial and political disputes over the use of water resources (Montenegro – Bosnia and Herzegovina; Bosnia and Herzegovina – Croatia;

Montenegro – Serbia; etc.) continue to limit the utilisation and eventual upgrade of existing assets, as well as the development of new infrastructure. There is no integrated water management model available for the region, nor is one envisaged within the current scope of regional co-operation.

CO-OPERATION ON INVESTMENT AND INFRASTRUCTURE

The SEE region has inherited a series of large energy facilities that were originally joint investments between various federal entities of the former SFR Yugoslavia including:

- Croatia's TPP investments in Bosnia and Herzegovina, Serbia and Kosovo.
- Power swaps between Serbia and Montenegro.
- A nuclear joint venture in Krško (Slovenia) between Croatia and Slovenia.
- The Yugoslavia 400 kV electricity ring.
- The Adria oil pipeline involving Bosnia and Herzegovina, Croatia and Serbia.
- The Drina River water management programme between Bosnia and Herzegovina, Montenegro and Serbia.
- A gas transmission pipeline between Bosnia and Herzegovina and Serbia.

However, commercial disputes have emerged in many of these joint investment projects. At present, there are ongoing disputes over the Croatian investments in Bosnia and Herzegovina and Serbia's TPPs, and over the ownership of power generation/lignite extraction assets located in Kosovo, as well as over the power swaps between Serbia and Montenegro, the Adria oil pipeline and the water management programme. As of early 2008, none of these issues had been resolved.

Priority generation and infrastructure projects

Co-operation regarding investment priorities in the energy sector is a necessary complement to the creation of a regional energy market. The intention is to avoid a rigid plan and to provide instead a framework that gives signals about the most effective use of regional generation and transmission/transportation assets. These signals should enable the private sector, public authorities and donors to identify priorities and sequencing that will optimise investments. An important objective is to enhance or replace low efficiency and low reliability facilities that are costly to operate, with a particular focus on TPPs in SEE that are characterised by low efficiency (30%) compared to modern plants (over 40%) and combined cycles gas turbines (over 50%) (IEA, 2007a).

The Ministerial Council of the Energy Community, at its meeting in Belgrade on 18 December 2007, discussed a list of priority generation and infrastructure projects in the region. The Ministerial Council adopted the list as an indicative and non-binding tool to promote more regionally oriented investment planning. It is envisaged that this list will be updated on an annual basis.[33]

33. An initial indicative list of 154 projects proposed by contracting parties to the Energy Community and by Moldova (an observer to the Energy Community) was finalised in September 2007. A shorter list of priority projects was prepared for the ministerial meeting in December 2007.

The list of priority projects adopted by the Ministerial Council was put together in 2007 on the basis of submissions from public authorities in the region. These were then evaluated in line with the findings of various studies (an updated *Generation Investment Study*, the *SEE Regional Gasification Study*, an evaluation of investment in transmission prepared by the Southeast Co-operation Initiative (SECI), security of supply statements from participating authorities, and the UCTE *System Adequacy Forecast 2006-15*) as well as the EU guidelines for trans-European energy networks. The list includes only new investments in generation and infrastructure, and not rehabilitation projects.

Six electricity interconnection projects, six electricity generation projects and eight projects for gas transportation and storage were identified (Table 6) as being in an advanced stage (*i.e.* either under implementation or for which financing has been identified). A second priority list included projects at an earlier stage of development, the implementation of which are foreseen for the period after 2010.

In February 2008, a coalition of non-governmental organisations (NGOs) in SEE expressed regret that all the priority electricity generation projects are fossil fuel fired or large hydropower projects, and that no non-hydro renewable energy projects were selected (Bank Watch, 2008). The coalition also requested donors to reconsider eight controversial projects for allegedly not complying with environmental or transparency criteria, and/or with the EU guidelines for trans-European energy networks.

THE ENERGY COMMUNITY TREATY

In March 2002, the European Commission brought forward proposals to create a regional electricity market in SEE. In November of the same year, representatives of 11 parties[34] signed a Memorandum of Understanding (MoU) – the Athens Memorandum – during a ministerial meeting. The European Commission and the Stability Pact[35] acted as sponsors of the MoU; the European Commission also agreed on a common strategy paper with all international donors active in the region. In 2003, a second MoU extended the approach to natural gas. This second MoU committed the parties to adopt the energy legislation of the internal EU market[36] in order to integrate electricity and natural gas markets in the SEE and to open them to competition for non-residential customers by 2008. The overall goals of the regional market are to improve the reliability and security of supply, achieve economies of scale and enhance complementarities between systems. The initiative is expected to promote use of the most cost-effective capacities and reduce overcapacity of the existing base load, thereby reducing generation costs by around 10%.

34. The signatories were Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Greece, Italy, FYR Macedonia, Romania, Turkey, SFR Yugoslavia, and Kosovo (signatory pursuant to UN Resolution 1244).

35. The Stability Pact is a framework for regional co-ordination established in 1999 and replaced by the Regional Co-operation Council in 2008.

36. EU Directives on electricity (2003/54/EC) and on natural gas (2003/55/EC).

Table 6 ....Priority power generation and infrastructure projects in Southeast Europe, 2007*

Name and location	Project value (est. in million EUR)	Notes
Electricity interconnection projects		
400kV transmission interconnection line Tirana (Albania) – Podgorica (Montenegro)	41.8	Key for the electricity supply of Albania: part of the interconnection Montenegro-Greece, completes a missing link in the regional power market
400kV transmission interconnection line Tirana – Elbasan (Albania)	13	Part of the interconnection Montenegro-Greece
Interconnection from FYR Macedonia – Albania – Italy (via submarine cable)	450 (of which Albania's investment 50)	Supporting interconnection between EU and non-EU countries
2 x 400kV transmission lines from Ernestinovo (Northeast Croatia) to Pecs (Hungary)	40 (of which Croatia's investment 21)	Identified in SECI report as project yielding most benefit to SEE transmission grid
2 x 110kV lines from Plat (Croatia) to Herceg Novi (Montenegro)	tbd	First transmission connection Croatia – Montenegro (along Southeast Adriatic Coast)
400 kV transmission interconnection line Croatia to Bosnia and Herzogovina	tbd	Increased transit capacity in the region
Electricity generation projects of regional significance		
Combined Cycle Plant at *Vlore* (Albania) dual fired on distillate oil / natural gas 97 MW capacity	92	Key for Albanian security of supply, reduces dependence on hydropower
Skavica HPP (Albania) up to 350 MW capacity	550	Expected to cover one third of Albania's electricity demand, reducing shortages and pressure for electricity imports
Glavaticevo HPP (Bosnia and Herzegovina) 172 MW capacity	73	Listed as candidate for expansion under the Generation Investment Study (medium and high gas price scenario)
TPP Stanari (Bosnia and Herzegovina) lignite fired 410 MW installed capacity	661	
New unit TPP Gacko 2 (Bosnia and Herzegovina) options for 300 / 600 MW installed capacity	tbd	Construction work started May 2007
Development of new lignite field and TPP Kosovo C up to 2 100 MW installed capacity	3 500 (of which TPP is 2 700)	Designed to export electricity to the region and neighbouring EU members
Gas transmission network and LNG terminals		
Construction of the Trans-Adriatic Pipeline (Albanian section)	1 100 (total project cost)	See section on Oil and Gas Transportation
Pipeline Greece-Albania and new TPP in *Korca region of* Albania with capacity 350 MW	287 (of which 185 for TPP)	Option for gas supply to Albania from Greece, power station would diversify Albanian energy mix
Integrated project for 10 bcm/year LNG Terminal at Fier (Albania), TPP in Fier, trans-Adriatic pipeline and high-voltage line	800	
Gas pipeline Bosanski Brod – Zenica (connection across Bosnia and Herzegovina)	45-57.5 depending on diameter of pipe (16 inch/20 inch)	Connection to the Croatian pipeline network and contribution to gasification of Bosnia and Herzegovina
Gas pipeline Bosiljevo – Ploce (Croatia)	tbd	Will allow link to the Ionian-Adriatic Pipeline (when constructed)
Ionian-Adriatic Pipeline (Albania-Montenegro-Croatia)	230	Link in turn to the Trans-Adriatic Pipeline (when constructed), would contribute to security of supply and gasification
Gas pipeline Dravaszerdahely (Hungary) – Donji Miholjac (Croatia) – Slobodnica (Croatia) – Bosanski Brod (Bosnia and Herzegovina)	tbd	Regional significance would be enhanced as and when planned underground gas storage at Benicanci will be connected
Gas pipeline Lucko (Croatia) – Zabok (Croatia) – Rogatec (Slovenia)	tbd	Offers additional gas import capacity

* Projects are described in more detail in the respective energy policy survey as well as in the chapter on Oil and Gas Transportation in Southeast Europe.
Tbd: To be determined.
Source: Energy Community (www.energy-community.org).

The Athens Process paved the way for the development of the Energy Community Treaty, which made the previous political commitments legally binding.[37] The Treaty entered into force on 1 July 2006, following ratification by all signatories.[38] In November 2006, the parties granted observer status to Moldova, Norway, Turkey and Ukraine; Georgia was granted observer status in December 2007. The Treaty established the Energy Community Secretariat (based in Vienna, Austria) to co-ordinate activities and monitor the implementation of treaty obligations, as well as other related institutions including the Ministerial Council, the Permanent High Level Group and the Regulatory Board.[39] To date, funding of the Energy Community institutions and activities has been covered by EU CARDS funds and a contribution from the Austrian government. Contracting parties are expected to contribute to funding at a later stage.

The Energy Community Treaty provides a legal and economic framework for organising relations between the markets of the Western Balkans, with the aim to:

- Create a stable regulatory and market framework, capable of attracting investment in gas networks, power generation, and transmission and distribution networks.
- Create a single regulatory space for energy trade.
- Enhance security of supply by providing a stable investment climate that supports the development of connections to gas reserves in the Caspian basin, North Africa and the Middle East, and facilitates the exploitation of indigenous energy sources such as natural gas, coal and hydropower.
- Mitigate the environmental impacts of energy production and use through improvements in energy efficiency and the use of renewable energy.
- Develop market competition for electricity and natural gas on a broader geographic scale, thereby exploiting economies and scale.

In order to meet these primary objectives, the Energy Community has identified several key stepping stones. As part of its aim to establish a predictable regulatory environment and attract investment, the Energy Community needs to improve the reliability of energy systems, reduce market barriers and establish a level playing field for market participants. To enhance security of energy supply, the Community needs to transition to more competitive energy prices while also improving transparency and reducing corruption. Finally, it needs to establish a framework for identifying critical investments in the region.

Countries participating in the Energy Community have undertaken to adopt substantial portions of the EU's *acquis communautaire* for electricity, gas, the environment, competition and renewable energy. The foundation of the *acquis communautaire* on energy consists of three pieces of EU legislation, namely:

- EU Directive on common rules for the internal market in electricity (2003/54/EC).

37. EC MEMO/05/397, 25 October 2005.
38. The signatories include: Albania, Bulgaria, Bosnia and Herzegovina, Croatia, FYR Macedonia, Montenegro, Romania, Serbia and Kosovo (signatory pursuant to UN Resolution 1244), as well as the European Community.
39. Any EU member state may participate in the discussions; this right has been exercised by Austria, Greece, Hungary, Italy and Slovenia, as well as by Bulgaria and Romania since they became EU member states in 2007.

- EU Directive on common rules for the internal market in natural gas (2003/55/EC).
- EU Regulation (1228/2003/EC) on conditions for access to the network for cross-border exchanges in electricity.

In relation to market opening, each contracting party to the Treaty resolved to ensure that eligible customers would be able to choose electricity and gas suppliers within specific timeframes (defined in the Treaty as 1 January 2008 for non-residential customers; 1 January 2015 for all customers). In practice, as noted above, the timetable for market opening for non-residential customers was not achieved by January 2008 and remains to be clearly defined.

The Energy Community also sets forth environmental legislation and establishes a corresponding timetable for implementation. At present, the Community is focusing on three EU Directives:

- EU Directive on the assessment of the effects of certain public and private projects on the environment (1985/337/EEC as amended), which was operative upon the entry into force of the Treaty.
- EU Directive on the reduction of the sulphur content of certain liquid fuels (1999/32/EC) by 31 December 2011.
- EU Directive on large combustion plants (2001/80/EC) by 31 December 2017.

In addition to adopting specified portions of the *acquis communautaire,* the Energy Community Treaty foresees the establishment of a specific regulatory framework. The framework would facilitate efficient operation of gas and electricity markets, including the creation of a single mechanism for cross-border transportation and transmission of energy. Parties to the Treaty also commit themselves to mutual assistance in the event of a disruption of electricity or gas supply.

REGIONAL CO-OPERATION AND INTERNATIONAL AND MULTILATERAL ASSISTANCE

Specific areas of co-operation

Energy policy and statistics

Energy authorities across the Western Balkan region face similar issues and energy policy challenges. This provides an opportunity for productive exchange of information, experiences and best practices. Although to a lesser extent than in Central Europe, two co-operative regional initiatives on energy policy were developed:

- The Black Sea Regional Energy Centre (BSREC)[40] initiated several policy-focused regional programmes and events (1995-05; see below).
- The Southeast Europe Energy Policy Working Group (SEEEP-WG), an informal gathering of experts in energy administration, was established in early 2004 at the initiative of the Bulgarian Ministry of Energy and Energy Resources. Its objective was

40. www.bsrec.bg.

to promote exchange on developments, methodologies and tools related to energy policy, strategy and reforms.[41]

Since 2002, the main regional fora on energy have been the Athens Process and then the Energy Community.

After the break up of SFR Yugoslavia (and the various conflicts that ensued), countries across the Western Balkan region had to create or re-establish statistical offices (and their units/departments for energy-related issues), with the aim of providing the reliable data needed by energy authorities, companies and customers. Despite a stated, shared objective to comply with international standards, no formal ongoing exchanges or co-operation has taken place, apart from responding to the common Eurostat/IEA/UNECE Annual Energy Questionnaires.

Regulation

Countries of the Western Balkan region have been more successful in developing common initiatives among energy regulatory bodies. In 2000, a dozen energy regulators, primarily from economies in transition, established the Energy Regulator Regional Association (ERRA),[42] with the support of the US National Association of Regulatory Utility Commissioners (NARUC) and the US Agency for International Development (USAID). ERRA now brings together 27 energy regulators in economies in transition (including all those in the Western Balkan region) and develops a broad scope of co-operative exchange activities. In 2003, a specific regional group for SEE countries was established within ERRA. Since the Athens Process (2002) and the subsequent adoption of the Energy Community Treaty (2005), regional co-operation on regulation takes place primarily within the Regulatory Board of the Energy Community Treaty.

Sustainable energy

A range of energy stakeholders took early steps to address issues related to sustainable energy by establishing, in 1999, the Regional Network for Efficient Use of Energy and Water Resources for Southeastern Europe (RENEUER).[43] This regional initiative focused on energy efficiency and renewable energy; its participants included representatives of central and local authorities, NGOs and companies of Albania, Bosnia and Herzegovina, Bulgaria, Croatia, FYR Macedonia, Romania and (at the time) Serbia and Montenegro. It was supported by the UN Economic Commission for Europe (UNECE) and the Alliance to Save Energy. Its main objective was to foster a favourable investment climate and market conditions for improvements in energy and water efficiency. EnEffect (Center for Energy Efficiency) and the Black Sea Regional Energy Center (BSREC) provided the secretariat for RENEUER.

Regional institutions/ focal points

The Black Sea Regional Energy Centre (BSREC)[44] was established (in Sofia, 1995) as a joint initiative of the European Commission (under its SYNERGY Programme) and the countries of the Black Sea region.[45] FYR Macedonia joined the BSREC in

41. Support during the initial meetings (in 2004) was provided by the IEA and the Czech Ministry of Industry and Trade, acting as a representative of the Visegrad Group.
42. www.erranet.org.
43. www.reneuer.com.
44. www.bsrec.bg.
45. Albania, Armenia, Azerbaijan, Bulgaria, Georgia, Greece, Moldova, Romania, Russia, Turkey and Ukraine.

1999; Serbia and Montenegro (still as a single country) became a member in 2001. The BSREC has acted as a focal point for energy-related activities, aiming to develop co-operation amongst countries in the region and the European Union. A steering committee was established and a permanent team of seven experts appointed. The Centre has managed and contributed to numerous EU and international projects on a wide range of topics: energy policy; regulation/market reforms (based on the EU framework); energy transit (*e.g.* Synergy Balkan Energy Interconnection Task Force projects and Energy Interconnections in Southeast Europe); sustainable energy (energy efficiency and renewable energy sources); and information networks (*e.g.* data banks, the Black Sea Region OPET[46] Associate, RENEUER).

In 2003/04, parties to the Athens Process envisaged the establishment of a Regional Technical Co-ordination Centre to "institutionalise relations among national energy sector authorities and support co-ordination of various regional initiatives and energy projects of common interest" (Stariradev, 2003). This initiative evolved into the Energy Community Secretariat, which is tasked with the lead role in implementing the Energy Community Treaty.

In 2006, member countries decided to transform the Stability Pact into a Regional Co-operation Council, and that one of the six priority areas for regional co-operation would be infrastructure and energy. The work of the Regional Co-operation Council is supported by a Secretariat, based from 2008 in Bosnia and Herzegovina (Sarajevo).

International and multilateral assistance

Donor support

Since the mid-1990s, a large share of international assistance to the Western Balkan region has been focused on the energy sector. Major multilateral donors include the European Commission and international financial institutions (IFIs). Additional bilateral support has come from:

- EU member states (the Czech Republic, Denmark, Finland, France, Germany, Hungary, Italy, Poland, Slovakia, Slovenia, Sweden and the United Kingdom[47]), as well as from Norway and Switzerland.
- Countries and organisations based in North America (USAID; the Canadian International Development Agency – CIDA; the Southeastern Europe Electrical System Technical Support Project – SEETEC, also funded by CIDA).
- Countries in Asia (PR China, Japan, South Korea).
- The Russian Federation.

Assistance has evolved over time and has taken multiple forms, the most common being:

- Technical assistance and training to governments and energy companies (including TSOs, to re-interconnect national and regional high-voltage electricity networks within the region and to the UCTE).

46. Organisations for the Promotion of Energy Technologies.

47. Also a joint UK-Slovenia initiative (2007-08) in the Western Balkans.

- Grants – primarily for equipment, energy imports, and funds.
- Loans – for rehabilitation and new investments.

Other assistance programmes have been directed to parts of the region affected by conflicts, such as Bosnia and Herzegovina and Kosovo. Emergency aid was initially provided in the form of equipment and energy imports (oil products and electricity) to meet humanitarian needs during the winter. Subsequently, assistance was directed toward major rehabilitation projects for energy infrastructure and support for government initiatives on energy reforms.

Several donors, including the World Bank, USAID, the European Commission and SEETEC, and a multi-country technical assistance programme (2001-06) co-ordinated by CIDA, have helped Western Balkan governments develop energy policy and institutional capacities (Albania in 2002; Serbia in 2004; FYR Macedonia in 2005; Bosnia and Herzegovina in 2007; and Montenegro in 2007).

In 2003, the Kreditanstalt für Wiederaufbau (KfW) and the World Bank produced a regional study on electricity supply and demand. The final report provided guidelines for investment with particular focus on rehabilitation. In 2004, the European Commission and the World Bank commissioned two major interconnection studies (UCTE to IPS/UPS and UCTE to Turkey), as well as the *Generation Investment Study* (GIS). The GIS used existing demand data to extrapolate national electricity demand to 2015 and analysed new generation projects (both refurbishment and new capacity). According to the latest forecast (by EKC Consulting, which was previously the TSO for FYR Macedonia, Montenegro and Serbia), total electricity consumption[48] in the Western Balkans is expected to increase by around 28% – from 71.2 TWh in 2005 to 90.9 TWh in 2015.

As a follow up of the GIS, participating countries requested a specific regional project to help authorities develop capacities on energy demand analysis and projections. The resulting project, Southeast Europe Regional Energy Demand Planning (SEE-REDP), uses a detailed methodology, existing data and a robust model (MARKAL/TIMES) to project (15 to 20 years out) national energy demand in four main sectors, under various scenarios. The capacity building has focused on the use and development of the model by the energy ministries, agencies and power companies. SEE-REDP is a four-year project (2004-08) led by the International Resources Group with USAID funding.

A Swedish regional technical assistance project (2007-09) has supported upgrades and capacity building on energy statistics systems. The IEA has focused its co-operation on the collection, harmonisation and dissemination of energy statistics, mainly on annual national energy balances. The IEA has also supported activities related to energy policy development and assessment through specific papers and workshops (see below).

The European Commission has been the largest donor to the Western Balkan region and has played a major economic and political role. It has led the co-ordination functions between energy donors within the Athens Process and the Energy Community Treaty. As the main donor to energy in the Western Balkan region, the

48. Total electricity consumption = production + imports - exports - transmission/distribution losses.

European Commission has been implementing a large technical assistance programme through various mechanisms:

- The European Agency for Reconstruction (EAR)[49] initially (2000-01) provided emergency fuel supplies for populations and supported repairs of damaged energy facilities in FYR Macedonia, Montenegro, Serbia and Kosovo. The scope of EAR support has been expanded to rehabilitation of large power plants (Serbia and Kosovo) and to the energy reform process through institutional and capacity building (*e.g.* within the energy regulators and energy agencies in Serbia and Kosovo). The EAR mandate has been extended until the end of 2008, at which time the European Commission Delegations in the region will assume management of projects. Over the period 1999-2006, EAR spent EUR 880 million on the energy sector in the Western Balkan region, mostly in Serbia (EUR 450 million) and Kosovo (EUR 400 million). It also supported a few projects in FYR Macedonia (EUR 14 million) and Montenegro (EUR 9 million).
- Regional projects supported by the European Commission, including those related to the Athens Process and the Energy Community Treaty, are managed by the EC headquarters in Brussels. The EC Delegations in Albania, Bosnia and Herzegovina and Croatia also manage a variety of national technical assistance programmes. Since 2007, EU pre-accession funding has been channelled through a single, unified instrument designed to deliver support to both candidate and potential candidate countries, the Instrument for Pre-accession Assistance (IPA).

Focal points for information and co-ordination on matters related to infrastructure were established in some countries of the Western Balkan region, including the International Management Group (IMG)[50] in Bosnia and Herzegovina (1993), and the UN Office for the Co-ordination of Humanitarian Affairs (OCHA) in Serbia and Montenegro (1999-2001). The Economic Reconstruction and Development in Southeast Europe (SEERECON),[51] established by the European Commission and the World Bank, provided a joint structure to focus on infrastructure, including energy.

Since the mid-1990s, support for the repair and upgrade of major electricity power plants and electricity transmission and distribution grids has been provided by IFIs such as the World Bank, the EBRD and the European Investment Bank (EIB). A selection of projects is provided in Table 7.

The Energy Charter Treaty

The Energy Charter Treaty is a broad multilateral framework for trade and investment in the energy sector. To date, 51 European and Asian countries have signed the Energy Charter Treaty. From the Western Balkans, Montenegro, Serbia and Kosovo are not covered by the Treaty. All EU member states are individual signatories. The Treaty has also been signed by the European Union itself, bringing the total number of parties to 52. Of these 52, all but five have ratified the Treaty.[52]

49. The EAR is based in Greece (Thessaloniki); it provides project rehabilitation and assistance in various sectors for a cumulative total funding of EUR 2.86 billion since 2000.
50. The IMG is a specialised intergovernmental organisation established in 1993 at the initiative of the United Nations High Commissioner for Refugees (UNHCR) with the effective support of the Humanitarian Aid Office of the European Commission (ECHO). Established in response to the crisis in Bosnia and Herzegovina, its primary goal was to identify and address critical infrastructural problems. www.img-int.org.
51. www.seerecon.org.
52. These countries are Australia, Belarus, Iceland, Norway, and the Russian Federation.

Table 7 ....Major power plant rehabilitation and demand-side projects in the Western Balkans

Unit – country	Fuel – commissioned year	Installed rated capacity in MW (operational)	Donor/Operator – year	Rehabilitation expenses in million Euro (EUR/kW)	Performance
Kolubara A5 – Serbia	Lignite – 1978	95 (90)	EAR – 2001	30 (330)	Completed with delays; low efficiency and availability; cost of lost production not included
Nikola Tesla A3 – Serbia	Lignite – 1982	305 (270)	EAR – 2002	60 (225)	Same issues as Kolubara A5
Kosovo B – Kosovo	Lignite – 1983	678 (360/400)	EAR-UNMIK – 1999-2005	200 (500-555)	Low efficiency and availability; one unit severely damaged in 2002 (additional repair costs: EUR 40 million)
Belgrade District heating – Serbia	Natural gas, coal, fuel oil	2 520 (2 520)	EBRD – 2001	26 (10)	Substitutes peak electricity
Tuzla A3 – Bosnia and Herzegovina	Lignite – 1966	100	World Bank – 1996-2000	43 (430)	Frequent outages; low efficiency; early date of decommissioning
Kakanj A5 – Bosnia and Herzegovina	Lignite – 1960	32	World Bank – 1996-2000	40 (1,250)	
Reduction of network losses / reactive load – Serbia	Energy savings	Peak load reduced, more than 200 MW introduced to network	EPS – 1999/2002	Less than 1 (less than 100)	Peak load network losses reduced by introduction of industrial reactive power devices directly to the power network

Sources: EAR; EBRD; IEA estimates.

The Energy Charter Treaty places obligations on member countries in three key areas: providing fair treatment of investors from other member countries, including protection against discriminatory treatment and other key non-commercial risks; facilitating energy transit across national territory in line with the principle of freedom of transit; and minimising the environmental impact of energy use. The Treaty includes a commitment to the operation of efficient, market-oriented energy markets, but does not cover detailed issues of market structure for member countries, such as unbundling and mandatory third-party access to electricity and gas infrastructure.

For SEE countries (including the Western Balkans), the adoption of the *acquis communautaire* goes further than the Energy Charter Treaty in promoting unbundling, competition and access to infrastructure. However, the Energy Charter Treaty remains complementary to the Energy Community Treaty, particularly in relation to the treatment of foreign investment and by providing coverage along the energy value chain back to the producer countries. In the area of investment protection, the Energy Charter Treaty is distinctive because it gives individual investors the possibility to protect their rights by taking host governments to international arbitration.

The Energy Charter Treaty conducts reviews of the investment climate and market structure in its member countries, including a review of FYR Macedonia (2006). Likewise, the Charter has conducted in-depth reviews of energy efficiency policies and programmes in Croatia (2005) and FYR Macedonia (2007),[53] within the framework of the Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects (PEEREA).

United Nations Development Program (UNDP)

In SEE, the UNDP has pursued activities on capacity building for institutions, with a focus on energy and climate change. The UNDP builds local capacities to develop sustainable patterns in the energy sector, as part of its global initiatives on sustainable development, poverty reduction and human development. As the lead agency in achieving UN Millennium Development Goals (MDGs), the UNDP recognises the unique role of a sustainable energy sector within MDG framework. Thus, it places high priority on enhancing co-ordination between the energy sector strategy and other sector strategies (poverty reduction, environment, etc.) (UNDP, 2004). In this respect, UNDP is addressing unique and delicate development problems in SEE.

UN Economic Commission for Europe environmental performance reviews (2000-07)

Environmental performance reviews (EPRs) for SEE countries in transition were initiated by environment ministers at the second ministerial conference "Environment for Europe" (Lucerne, Switzerland, 1993). The EPRs aim to assess how effectively these countries are managing their environments. They also promote dialogue among UNECE member countries, which ultimately supports harmonisation of environmental conditions and policies.

The UNECE Committee on Environmental Policy is responsible for the EPRs. The actual studies are carried out by international teams of experts from the region, who work closely with national experts from the country reviewed. The teams also benefit from close co-operation with other UN organisations (including the UNDP) and the Organisation for Economic Co-operation and Development (OECD). The second cycle of reviews (since 2003) covered seven countries, including five countries in the Western Balkan region: Albania, Bosnia and Herzegovina, FYR Macedonia, Montenegro and Serbia.[54]

Organisation for Economic Co-operation and Development (OECD)

Since 2000, OECD's regional activities in SEE have focused on supporting the development and implementation of structural reforms. Its main programme is the Investment Compact for Southeast Europe, which aims to boost private sector investment. The Investment Compact promotes structural policy reform as a means of encouraging private sector development and creating a favourable environment for domestic and foreign direct investment. Related policy areas include: investment policies and promotion strategies; support structures for small and medium-sized enterprises; fiscal and tax reforms; competition law and policy; corporate governance; accounting reforms (IAS/IFRS); and regulatory governance.

The OECD is also active in other collaborative initiatives to reinforce public administration (PUMA-Public Management Service), promote trade, improve

53. The reviews are available online at: www.encharter.org.

54. Available online at: www.unece.org/env/epr/welcome.htm and www.unece.org/env/epr/countriesreviewed.htm.

governance and fight corruption (Stability Pact Anti-Corruption Initiative-SPAI).[55] In 2002, it published the *Economic Assessment of Yugoslavia*.

International Energy Agency (IEA)

In 2000, the IEA, in co-operation with the Energy Charter Secretariat, published the Black Sea Energy Survey,[56] the first comprehensive review of energy policies and sectors of the region (including Bulgaria and Romania). The Survey assessed developments of market reforms (particularly energy strategies, institutions and re-structuring) and energy transit.

The IEA's main objective in SEE has been to support the introduction of efficient energy policies, in part by sharing the experiences and expertise of its member countries, notably its new members in Central Europe. The IEA has focused its activities on energy statistics (principally on national energy annual balances), energy policy and regulatory reform (in partnership with national and international organisations), and workshops and conferences.[57]

Discussion

Regional energy trade: opportunities and barriers

At the regional level, energy exchange and trade can play a key role in the stability and economic development of the Western Balkans by supplying secure, diversified and low-cost energy. Moreover, a strong energy market will enhance the region's capacity to attract investments and to develop oil and gas transit infrastructure to Central and Western Europe.

Despite major progress in refurbishing and strengthening the region's energy infrastructure, multiple physical and market barriers limit the current potential for increased electricity trade. The most pressing issues include the relatively low levels of regulated end-use tariffs (notably for electricity for heating), low collection rates and the dominance of vertically integrated companies. Persistent congestion of cross-border capacities makes it difficult for new entrants to access the system, as do the lack of reliable and accessible market data, the lack of domestic and regional/cross-border market regulation and enforcement, and an overall lack of transparency. Some of these issues are being tackled through the development of EU-based regulatory frameworks as envisaged in the Energy Community Treaty. Others will need specific and considered attention by the relevant authorities in each market.

Co-operation on investment and infrastructure

Electricity transmission operators in the Western Balkan region have made impressive progress in improving the energy infrastructure, largely in co-ordination with governments, donors, the UCTE and ETSO. This includes the restoration and enhancement of national grids, re-interconnection of such grids within regional networks, and full re-synchronisation (with the exception of Albania) with the UCTE (2004). Improved security and diversity of supply have increased export options and

55. Priority measures include: adhering to international instruments; promoting good public governance; strengthening legislation and promoting the rule of law; promoting transparency and integrity in business; and promoting an active civil society.

56. Available online at: www.iea.org/Textbase/publications/free_new_Desc.asp?PUBS_ID=1133

57. Proceedings available online at: www.iea.org/Textbase/subjectqueries/keyresult.asp?KEYWORD_ID=4111

facilitated expanded trade within and outside the region. Interconnections among the SEE countries were initially undertaken to improve network security; today, they are the main driver for developing cross-border electricity trade in the region.

Additional investments are needed on national grids (lines and sub-stations) and cross-border points to enhance security of supply and to enable new exchange and trading across the region. Close regional co-operation and co-ordination within the UCTE and Energy Community, in particular with the Community's Regulatory Board, will be crucial in order to facilitate these investments.

The Western Balkan region shows potential for export of surplus generation and trading of electricity from lower to higher price areas. However, this will require improved transmission interconnection capacities. The creation of new electrical corridors between Italy's market (high price and large demand) and Western Balkan countries (*e.g.* Albania, Croatia and Montenegro) is one of the most attractive investment options in the region. The main justification for new capacities is that existing lines across Slovenia (400 kV and 220 kV AC) and the undersea cable between Greece and Italy (400 kV DC) are inadequate to meet the growing needs of electricity trade.

However, this approach could lead to a drain of capacities (particularly peak hydropower) to the Italian market and create instability in the regional Western Balkans market. Supply is already relatively tight in the region due to the closure of capacities due to obsolete equipment/facilities or for safety requirements (*e.g.* the EU-Bulgaria agreement to shut down two nuclear reactors at Kozloduy in December 2006); a further drain on capacities would risk driving prices up. Summer droughts have also reduced hydropower generation over the past few years. In winter months, high use of electricity for space heating in the Western Balkan region has led to increasingly high peak demand levels, adding major stress to the electricity systems.

Investment in infrastructure will also be critical for introducing and expanding the use of natural gas, which is poorly developed in the centre and south of the Western Balkan region. Supply routes extended by transmission and distribution grids should be assessed using least-cost supply analyses.

Energy Community Treaty: a key instrument for reforms

The Athens Process and the subsequent Energy Community Treaty open up the possibility for the Western Balkans to move beyond co-operation and towards integration. This process has entailed a major sustained and co-ordinated effort by donors under the leadership of the European Commission and the governments of the Western Balkan and SEE region. With a focus on developing a regional energy market in SEE that is compatible with the EU internal energy market, these efforts have contributed to implementing reforms and expanding trade. They have also led to the progressive alignment and harmonisation of energy regulation in SEE countries with that of the EU *acquis communautaire*. With donor support, SEE countries are focusing their efforts on liberalising and integrating the retail electricity markets, in compliance with EU Directives.

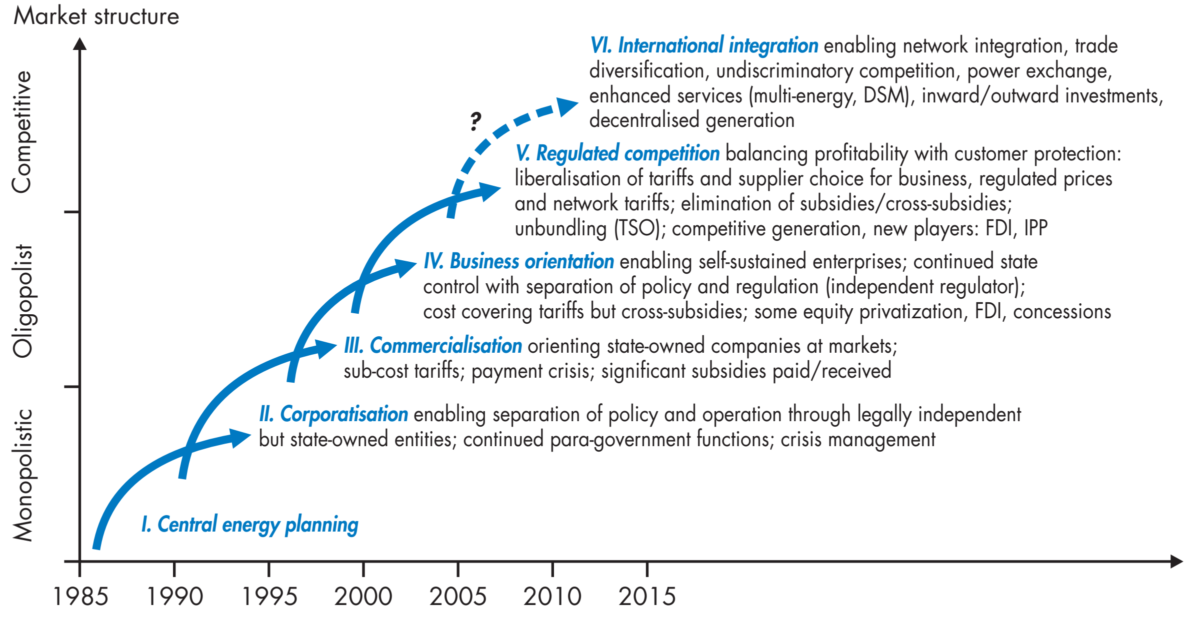
In the initial phase of this process (from 2002), the stated objective to create a regional energy market was very ambitious given the limited energy reforms in most Western

Balkan countries. Establishing a comprehensive institutional and regulatory framework was a key first step to support development of rule of law, cost-reflective energy pricing, customer payment discipline and energy sector re-structuring, particularly unbundling of monopoly activities and market transparency.

These economic and legal prerequisites for effective market opening to competition, trade and regional integration required major work at the policy, regulatory and industry levels. The experience of Central European countries (since the early 1990s) has shown that governments need to give priority to initial reforms (*e.g.* corporatisation of companies, customer metering, etc.) to stabilise and rationalise the energy sector and establish a robust policy and institutional framework. In a next stage, governments need to prepare for the opening of domestic electricity markets to competition, which has been handled effectively in several countries. The anticipated sequence of reforms over 15 years is illustrated in the reform path of the Central European energy systems (Figure 7).

The experience of Central European countries also reveals inherent risks. There is a potential risk for SEE (including Western Balkan) countries that placing priority on market liberalisation and integration – without paying sufficient attention to vital intermediate steps – could be detrimental to reaching the desired objectives, ultimately destabilising the reform process. Reaching the intermediate levels III and IV (Figure 7) already requires thorough reforms and strong political will to follow through on difficult political decisions.

Figure 7...............Dynamics of energy reform in transition economies



FDI: foreign direct investment, IPP: independent power producer.

Development of a regional market for natural gas is at an early stage in the Western Balkans, due to small or weak domestic retail markets and the limited coverage of the existing gas network. The feasibility of a competitive regional market must also be assessed in the context of a dominant single external supplier, Gazprom. The fact that Gazprom is expanding its ownership of transmission and distribution assets in the region raises concerns over the prospect for diversification of supplies and effective competition in the medium term.

The establishment of the Energy Community Secretariat as the co-ordinator and impartial monitor of progress (according to agreed road maps for reform) has brought a new momentum to the Energy Community process and to the reform process overall. The Secretariat has established a credible presence in a short period of time, and has helped integrate multiple dimensions of the reform process into a more structured overall strategy. To sustain and enhance the reform momentum, the Secretariat needs to become a regional organisation with reinforced country 'ownership' of the process. It also needs to assist in further developing policy and regulatory capacities in the region. Its activities should logically extend to regional energy security (*e.g.* oil and gas supply and storage), demand issues (energy efficiency, fuelwood, etc.) and climate change policies.

Noticeable progress has been made in developing a regional energy demand forecast model (SEE-REDP), which is based on a qualitative approach and uses a proven software. The model will help build solid national capacities in this crucial field, and possibly extend to the development of an integrated least-cost investment plan that covers national and regional demand forecasts. In parallel, countries have been creating or upgrading much-needed energy data systems.

Overall, efforts undertaken in almost all Western Balkan countries have established relatively solid foundations for domestic and regional market reform and dynamic growth in regional trade. In many cases, there has been significant progress in adopting new energy policies and establishing new institutional frameworks. With new market-based regulations and independent regulators in place, it has been possible to take steps to re-structure and modernise energy companies. It is essential to maintain and, indeed, strengthen, the existing momentum.

Regional co-operation

At the beginning of the transition period (*i.e.* in the second half of the 1990s), regional energy co-operation between SEE countries (including Western Balkan countries) was limited in scope and intensity. The region had yet to overcome a legacy of political mistrust and unresolved commercial issues. Countries were also focused on national problems, in particular how best to re-establish full energy services and institutions in order to catch up with reforms that were well advanced in neighbouring countries of Central Europe. Starting in 1998 and increasingly after 2001, bilateral and regional relations and co-operation became more active, especially under the Athens Process and with the support of international donors. Relations, which initially focused on electricity interconnections, were extended to a broad range of areas such as re-interconnection of electricity systems, common regulatory frameworks, and new supply and transit lines for gas. These initiatives highlighted the strong synergies between and amongst the region's energy systems and national energy policies.

Nevertheless, there is a need to further enhance regional co-operation on energy policy in terms of both methodology/approach and substance – especially given the common issues that individual countries are facing or have overcome. The situation is similar for energy statistics, both building data systems and facilitating data exchange, notably on trade. Further development of bilateral and regional co-operation on a broader scope of energy policy (*e.g.* security, efficiency, economics and environment) across all aspects of the energy administrations (decision-makers, policy makers, experts, etc.) will contribute to:

- Opening exchange of best practices on energy policy development, implementation and monitoring.
- Building national capacities and ownership of sound and balanced energy policies, which should converge across the region in the medium term.
- Fostering the development of reliable national data on energy and trade.

To date, most co-operative activities at the regional level have focused on supply-side projects. Meanwhile, the combination of high energy intensities and rising energy prices has become a heavy burden for governments, businesses and households. In this respect, it is important that regional co-operation also focus on demand-side issues such as:

- Energy efficiency policies to reduce energy intensity and carbon intensities, which will also serve to reduce import dependency and energy poverty.
- Implementation of renewable and de-centralised energy systems to enhance energy security, environmental performance and local development; mechanisms to attract investments in energy efficiency and renewable energy.
- Climate change policies to reduce greenhouse gas emissions through the development of Kyoto Protocol flexibility procedures; adaptation mechanisms, particularly in the electricity sectors.

International and multilateral assistance

Significant assistance, from multiple donors, has been crucial to reforming energy sectors across the Western Balkan region. The technical and financial support of donors has played a major role in rehabilitating and modernising key national and cross-border electricity infrastructure. The assistance has been effective in adapting to the situation and needs of the countries, evolving from emergency aid to infrastructure rehabilitation and, subsequently, to support for market reform, particularly liberalisation and regional integration of electricity networks. A large fraction of assistance was in the form of grants; most of the remainder came through loans, often under preferential conditions. Nonetheless, there is room to improve donor co-ordination, which should be systematic and sustained even at the country level; some initiatives continue to overlap because of poor information exchange.

The European Commission's leadership has been critical in assessing priorities and co-ordinating actions at the regional level. Since the adoption of the Energy Community Treaty, the Energy Community Secretariat has assumed many of the co-ordination functions on behalf of the European Commission.

Transferring major financial support (through grants and loans) to incumbent power companies has been a key challenge in the electricity sector. Generally, the transfer of financial support has had the effect of reinforcing the monopoly status and influence of these companies – including their influence over energy policy. This has been detrimental to the reform process. International donors must ensure that projects designed to enhance reliable supply do not end up reinforcing an ineffective status quo.

Large rehabilitation projects directed at lignite-fired power plants are a case in point. Often, it is extremely difficult to undertake a comprehensive economic analysis of such projects due to the lack of up-to-date electricity statistics, demand outlooks and least-cost investment plans. Thus, it is not clear whether the rehabilitation of large lignite-fired power plants in Serbia and Kosovo is economically feasible, considering the obsolete technology and the huge financial resources needed to refurbish or replace them. These plants are used at low capacity (below 5 000 hours per year), run at very low efficiency (below 30% in average) and do not meet EU environmental performance limits. Similar power plants in Eastern Germany, which had been better maintained, were decommissioned in the 1990s. The lack of reliable data makes it difficult to undertake least-cost investment analyses on such issues. If such analysis were possible, it might well rank other investments as more attractive compared to plant rehabilitation, such as:

- Demand-side management projects (*e.g.* price signals,[58] metering and payment discipline).[59]
- Projects to reduce network losses.
- Projects to enhance electricity imports.
- Projects to enhance de-centralised supply options (*e.g.* CHP in urban areas).

Donors have a tendency to focus on large, supply-side projects; this creates a risk of obscuring the large energy-saving potential that exists across the Western Balkan region. Combined heat and power (CHP) generation for district heating (DH) could be an effective and economic alternative to electrical space heating and hot water supply, if systems can operate effectively once technical and financial difficulties are solved. The EBRD has supported the rehabilitation of various DH systems (*e.g.* in Belgrade and Sofia).

The lack of reliable and comprehensive energy data is a major barrier for the entire reform agenda (policy making, market functioning, investment and regulation, etc.) and for the investment needed for sector development. Lack of data has limited the development of national economic tools (energy demand forecasts, least-cost investment plans, etc.) to assist decision making in policy, regulatory matters and investment. A good example is a donor-supported initiative (2003/04) to develop a regional level electricity demand forecast, combined with an appraisal of new generation investments.[60] Due to the lack of reliable data, the methodology used (*i.e.* extrapolation of existing data) was open to criticism. As the *SEE Regional Gasification Study* subsequently noted:

58. The Serbian government adjusted electricity prices and introduced a block tariff system between 2001and 2002, which proved to be an effective and inexpensive way to largely rebalance supply and demand.

59. Due to lack of meters and non-payments, commercial losses of Kosovo's electric utility amounted to almost 50% of electricity supplied.

60. The Generation Investment Study (GIS) and the Regional Balkans Infrastructure Study (REBIS).

"Unfortunately, such data is either unavailable, unreliable or incomplete in many of the SEE markets. In some cases, particularly in the former SFR Yugoslavia, fuel consumption in the 1990s was severely affected by war and so historical data does not provide a reliable basis for projecting future consumption."

Furthermore, projections did not account for externality costs of fossil fuel-fired plants, nor the significant potential of demand-side management (energy efficiency of about 20% of total energy demand) and network losses (currently 22% of final electricity consumption).

An initial selection of priority generation investment projects for up to 10 GW of capacity (almost 20% of the current SEE capacity),[61] carried out in 2004/05, was done before effective analytical tools had been developed – notably a new regional demand forecast model (SEE-REDP) and national least-cost investment plans. A second list of priority projects, selected in December 2007 (see above), amounted to a potential installed capacity of 3.7 GW and an estimated investment of EUR 5.6 billion (as opposed to EUR 10 billion for the earlier priority list). Better forecasts and investment ranking will reduce the risk of under- or over-investment.

Donors should give high priority to building capacity in institutions to ensure that administrations have the skills, economic tools and data needed to develop and implement policy. Several donors (World Bank, European Union, etc.) have provided targeted support to help energy ministries develop energy policies and clarify the institutional framework (*e.g.* in Serbia in 2004; in FYR Macedonia in 2005; in Bosnia and Herzegovina in 2006). More support of this type is needed.

In addition, reliable, available and detailed supply and demand energy statistics are of primary importance for policy making, market functioning, investment and regulation. Public data systems should be able to collect, analyse and disseminate data in line with international standards. Most of the data systems of Western Balkan countries and entities (except Croatia) are weak and fragmented. A step forward in this latter respect was the launch, in 2007, of a regional technical assistance project (Sweden Statistics under a SIDA funding) on energy statistics, with the objective of meeting international standards by 2009.

Donors have also supported the creation of key institutions, including independent regulatory bodies and energy agencies, and assisted in the adoption of market-based energy laws to be enforced by these new institutions. These achievements have strengthened the role and authority of regulatory agencies. Nevertheless, some of these new structures remain isolated, lacking a clear policy, legislative framework and action plans. For instance, in Bosnia and Herzegovina, the absence of a policy framework and regulations beyond the electricity sector has created difficulties for the state and entity regulators. In Serbia, the agency responsible for energy efficiency has no strategy on which to base its activities.

61. Total of 51 GW broken downs as follows: fossil fuels (31 GW), hydropower (15 GW) and nuclear energy (4 GW).

KEY FINDINGS

Regional energy trade

- Energy trade can play a key role in the stability and economic development of the Western Balkan region by supplying secure and economical energy with acceptable environmental performance.
- A solid and competitive regional energy market will enhance the Western Balkan region's capacity to attract investment. However, steps must be taken to remove remaining market barriers (*e.g.* low tariffs, dominant suppliers, and lack of data) and non-market barriers (*e.g.* congested cross-border capacities, weak market rules and lack of transparency). Many of these issues are being addressed through the Energy Community Treaty; all will require specific and concerted efforts in individual markets to achieve a market-based energy sector and regulation based on real costs and market transparency.

Co-operation on investment and infrastructure

- The rehabilitation, modernisation and expansion of capacities in national electricity grids, combined with a strong co-operation amongst regional TSOs and with UCTE, have facilitated regional re-interconnection and the re-synchronisation of the region within the UCTE system.
- Interconnection of SEE and UCTE systems has enhanced security of electricity supply and diversified both imports and exports. Ongoing co-ordination of operation and investment will be key to improving efficiency and strengthening the role of SEE electricity systems within Europe as a whole.
- Realisation of the planned cross-border interconnections (in a coherent SEE network or ring) will foster exchange and trade opportunities within and beyond the region. Access and transport tariffs should cover investment and maintenance costs, and should integrate a peak element/variable. New links, in particular to export markets, should consider balance at national and regional levels.
- New national and regional gas infrastructure would need to integrate access to a supply line(s) or LNG, preferably on a regional scale to mutualise investment costs. Investments must be bankable and ensure sufficient medium- to long-term security of gas supply.
- Creating gas storage will bring economic benefit, flexibility and security for the gas systems in the region, as well as to eventual gas transit lines. However, it can only be pursued if justified by the size of the market and eventually developed for several markets.

Energy Community Treaty

- The ambitious objective of establishing a regional energy market (in line with EU requirements) has led to intense co-operation and significantly enhanced frameworks for reform and trade.

- The entry into force of the Energy Community Treaty, with functioning institutions (particularly the Energy Community Secretariat), has effectively strengthened the reform process. Additional benefits derive from upgraded energy policies and market-based regulation, and from effective economic tools (*e.g.* regional forecast models and improved national energy data systems).
- The sequencing of reforms is key to effective and durable market liberalisation and integration (notably, reaching market fundamentals such as cost-reflective prices, limited cross-subsidies, and the establishment of market institutions).
- Addressing issues such as sustainable energy development and energy security will require further regional co-operation, as well as the reinforcement of joint and national institutions to strengthen capacities of policy making and regulatory enforcement.

Regional policy co-operation

- Regional co-operation on energy policy has the potential to enhance policy convergence, build ownership of the reform process and foster trade. Key institutions are now in place to support regional co-operation and integration. The creation of the Energy Community Secretariat as regional/joint focal point has enhanced this process. The scope of co-operation at regional level needs to cover not only the removal of barriers to trade, but also issues of energy efficiency and security, as well as the impact of energy on the environment.

International and multilateral assistance

- Extensive donor assistance directed toward the energy sector of the Western Balkan region has been crucial for the rehabilitation and modernisation of key national and cross-border electricity infrastructure. It has also supported market reforms, particularly liberalisation and regional integration.
- After successfully supporting the region's rehabilitation following the wars of the 1990s, donor priority focused on financing large-scale power plants (mostly lignite fired), rather than capitalising on the region's large potential for energy saving. This was partly due to the lack of reliable energy statistics and the inability to carry out effective least-cost investment analyses and assessments.
- Donor technical assistance to administrations is key to the success of the reform process, including developing strategies and implementing policies in a wide range of areas (*e.g.* particularly statistics and market reforms).
- Co-ordination between donors and national administrations is crucial at all stages of donor assistance; this should be made systematic at the country level in order to enhance donor efficiency and improve coherence of the reform process.

II. OIL AND GAS TRANSPORTATION IN SOUTHEAST EUROPE

INTRODUCTION

The Western Balkan region is strategically located between regions rich in hydrocarbons (Russia, the Caspian basin and the Middle East) and key energy-consuming regions of Western and Central Europe. In this sense, the region is well positioned to play a significant role in the future transportation of oil and gas. In order to consider the Western Balkans in context, this chapter will look at international oil and gas transportation issues across Southeast Europe (SEE) as a whole (*i.e.* the Western Balkans plus Bulgaria, Greece and Romania). The ultimate importance of the SEE region in oil and gas transportation depends on three main factors: the development of routes now on the drawing board; the entry into operation of routes already under construction; and the inroads made by liquefied natural gas (LNG) systems.

If all planned projects were built, existing transit capacity in the region would more than double or even triple over the coming decade. However, many of the proposed oil and gas transportation projects are competing for the same sources of oil and gas, and for the same markets. Thus, it is clear that not all projects currently under discussion or development will go ahead.

The multiplicity of project plans described in this chapter may suggest a level of activity and openness that, in reality, does not exist. In many Western Balkan countries, unregulated monopolies or large commercial operators control the entire oil and gas supply chain and have considerable – and growing – political and economic influence. Over time, the introduction of EU-compatible regulatory frameworks may reduce the power of these monopolies. In the meantime, this situation may slow the rate of progress or lead to contending influence over certain oil and gas transit routes, and result in less diversification and transparency.

Over the last decade, oil and gas companies have shown increased interest in the regional infrastructure of Southeast Europe, often for reasons beyond the economics of infrastructure investment. New transportation routes for oil and particularly for natural gas could bring energy supply diversity to the immediate region as well as to other European countries, enhancing security of supply, competitiveness and market openness. The choice of routes also has political implications for the entire region, and for the development of a common EU energy policy with an external policy component.

Cross-border energy trade and transit projects are developed for a range of reasons, which may differ depending on whether the product to be transported is oil or gas.

The essential prerequisites are supply of and demand for the product in question, but choice of transportation modes and routes are also influenced by the physical characteristics of oil relative to gas.

Oil's high energy density makes it a suitable commodity for shipment by tanker, which is the predominant means for international oil transportation and trade. Cross-border oil pipelines are relatively infrequent and are motivated by specific circumstances – *e.g.* the need to: reach a port from a landlocked country or supply a landlocked country; avoid sea route chokepoints or shorten an excessively long "roundabout" sea route; access more loading ports; or transport oil through a region that does not have an ice-free port.

By contrast, the lower energy density of gas means that large-scale investment in liquefaction and gasification plants is needed before it can be shipped by sea as LNG. Although the importance of LNG trade is growing, most cross-border shipments of natural gas for delivery to Europe are by pipeline.

An alignment of interest and balancing of risks and rewards along a pipeline route is necessary for a project to move ahead. This is not easy to achieve, given that the motives of producers and consumers (and transit countries) do not necessarily coincide. Transit countries should carefully consider the basic motives of all players while considering pipeline projects.

This chapter describes a number of proposed pipeline projects at various stages of development. Not all of these pipeline proposals will make it past the drafting stage they are now in. The IEA does not subscribe to any particular project, but generally views all pipelines that are economically based with private sector backing as having potential to enhance supply security. Pipeline projects that provide access to a variety of supply sources are all the more attractive from the perspective of energy security.

NEIGHBOURING OIL- AND GAS-RICH REGIONS

Russia is the major supplier of oil and gas to the SEE region, and to countries beyond in Central and Western Europe. This chapter focuses on other resource-owning countries in the Caspian basin, the Middle East and North Africa that could become suppliers to European markets.

Caspian basin

The Caspian basin holds large hydrocarbon reserves[62] and has rapidly increased its production. Throughout the 1990s, many of the independent states that emerged from

62. The resource owners of the Caspian region discussed in this chapter include Azerbaijan, Kazakhstan, Turkmenistan and Uzbekistan. Reserves of oil are largely in Azerbaijan and Kazakhstan. The largest reserves of natural gas are in Turkmenistan and Uzbekistan (the latter producing primarily to meet domestic demand), followed by Azerbaijan and Kazakhstan.

the former Soviet Union undertook new infrastructure development for the trade and transit of oil and gas. This was driven by a shared interest for more diverse and direct export routes to support steadily rising oil and gas production. The new infrastructure aimed to complement, rather than replace, major Soviet-built oil and gas export routes running through Central Asia, Russia, Ukraine, Belarus and the Baltics.

Some major new infrastructure projects have been put in place to move Caspian oil resources westwards towards or around the Black Sea. The Baku-Supsa and the Caspian Pipeline Consortium (CPC) pipelines link Azerbaijan and Kazakhstan directly to oil export outlets on the Black Sea through Georgia and Russia, respectively. The Baku Tbilisi Ceyhan (BTC) pipeline delivers oil from Azerbaijan through Georgia to the Turkish East Mediterranean seaport of Ceyhan, which is also an outlet for Iraqi oil.

For natural gas, the South Caucasus or Baku Tbilisi Erzurum (BTE) pipeline runs parallel to the BTC from Baku via Tbilisi before linking to the Turkish gas grid in Erzurum. This line provides an export corridor through Georgia and Turkey for Azeri gas production, currently from the Shah Deniz gas condensate field in the Caspian basin. Gas deliveries to Georgia and to Turkey began in 2007. The associated supply contracts do not have restrictions on re-export. This makes the BTE particularly important as a means to enhance competition in natural gas markets since it can act as a feeder to pipelines linking Turkey and the main European markets (*e.g.* the Nabucco, the Turkey-Greece-Italy Interconnector and the Trans-Adriatic pipelines).

In principle, the BTC pipeline and other routes across the South Caucasus could also provide future export routes for oil production from Kazakhstan and other East Caspian states. In anticipation of increased oil production, major investment is being committed to rationalise and expand the Caspian tanker fleet and port capacity for trans-shipment amongst various export terminals. Over time, East Caspian gas could also flow to Turkey, with the BTE gas export system well placed to manage this trade. At present, trans-Caspian gas transportation options are at an early stage of development.

Export volumes of crude oil transiting the Black Sea from the Caspian basin and Russia are rising. In 2001, they amounted to 1.6 million barrels per day (Mb/d) (81 Mt/y) or 3.5% of world exports. By 2005, this figure had increased to 2.3 Mb/d and is expected to rise further as Kazakhstan, in particular, increases its crude production. Total exports of crude and oil products from Black Sea ports reached 2.90 Mb/d in 2005.

The tonnage of crude oil and oil products transiting the Turkish Straits from the Black Sea, which was around 1.2 Mb/d in 1996, reportedly reached 3.1 Mb/d in 2004 – although this figure fell back in subsequent years as Russia has switched some exports to the Baltic ports. Nonetheless, many sources confirm that traffic passing through the Straits clearly exceeds the maximum capacity. As a result, transit delays for all tankers are rarely less than 2-3 days. Transit delays peaked during the first quarters of each of the last three years, rising to 8 (2005), 21 (2006) and 16 (2007) days.

With some major new upstream pipelines in place, and the prospect of significant increases in export volumes over the next 10 to 15 years, the need for infrastructure investment in oil and gas trade and transport is moving further downstream, with an aim to optimise export flows of Caspian oil and gas and to relieve congestion on the Turkish Straits. Various projects have been proposed or put in place for transporting Caspian volumes to demand centres in an economically viable and environmentally sustainable way.

The sources of supply and motivations behind these various projects differ widely. The rationale and viability of various pipelines depend, to a large degree, on the interests of the Caspian states (including Russia and Iran). These interests can be divergent or complementary. The dynamics of projects involving states on the west shore of the Black Sea and in the Western Balkans also depends on their potential role as transit countries, as well as on the market interest of oil and gas companies. The most viable projects will be those that combine the various motives of participants while minimising cost and maximising benefits.

Middle East and North Africa

Oil and gas producers in the Middle East and North African (MENA) have been far slower to develop transit infrastructure to Europe. This is due, in part, to the fact that many producing states have good access to port facilities and are in the early stages of developing LNG. The Suez Canal and the Sumed pipeline (through Egypt) are two of the longest-standing facilities that enable effective transit of oil and LNG from MENA. Both bypass the lengthy journey around Southern Africa and provide access to Mediterranean and Atlantic buyers. In recent years, LNG sales to European buyers have been supplemented by natural gas pipelines from North Africa to Southern Europe, including the Maghreb-Europe Gas Pipeline from Algeria via Morocco to Spain and the Green Stream pipeline from Libya to Italy. Additional natural gas pipelines from Algeria to Italy and Spain are currently under construction. The removal of destination clauses[63] from supply contracts will make it technically possibly to feed this gas to other European buyers, if new transmission capacities are built.

Egypt's entry into the natural gas export market has created an opportunity for pipeline sales to Europe. In addition to two LNG facilities completed in 2004/05, Egypt is pursuing an Arab gas pipeline scheme. To date, this project extends to Jordan and Syria; it is expected to reach the Turkish border (at Kilis) by the end of 2008. Discussions on Egyptian gas sales have taken place with Turkey, Romania and Bulgaria, potentially utilising the Nabucco infrastructure (see below). However, supply constraints in Egypt are likely to limit the gas volumes available for the pipeline, at least in the near term. In 2004, Iraq signed an agreement to join the scheme, thereby creating a prospect to bring Iraqi gas (from fields near the Syrian border) into the system at a later stage. Such a move would considerably boost volumes.

63. Destination clauses in gas supply contracts restrict the sale of gas to a specific geographical or market area for which it is destined. The European Commission has argued that such clauses are not in line with European competition law within the European Union, as they restrict the re-sale and flow of gas between EU countries.

Iraq already has oil export infrastructure to Turkey through the Kirkuk-Ceyhan pipeline, which is fed by the northern oilfields around Kirkuk. After consistent sabotage that began in 2004, security seems to have improved in late 2007, enabling more regular supplies to Ceyhan. Iran is also linked into the Turkish gas system, through a pipeline (currently 10 bcm per year) commissioned in 2001. Iran recently advanced plans to use some 8 bcm of spare capacity on this pipeline to feed other markets in Europe[64] and in the Mashrek countries. However, in the medium term, spare gas is likely to remain at a premium. The current situation in Iran is characterised by delays in upstream development work and high domestic demand for gas, particularly from the petrochemicals sector, electricity generation and oilfield re-injection.

The rationale for transit pipelines in Middle East countries also depends on geo-strategic interests, pricing and market preferences. In theory, Iran, Iraq and Egypt all show interest in natural gas pipeline routes that transit the Balkans to reach European buyers. However, proposed initiatives to supply European markets currently face stiff competition on three fronts: from LNG facilities; from alternative pipeline sales (*e.g.* the Southern Asian market for Iran); and from domestic consumers and markets within the MENA region. As a result, there is limited opportunity to make large volumes of gas available for export to Europe. However, if there is willingness and investment, reserves are sufficient to make this a medium-term possibility (outlook of 15 years).

OIL

Existing pipelines

Adria

The Adriatic (or Adria) oil pipeline was built in the 1970s to supply all Yugoslav refineries[65] with crude oil from international markets (primarily Africa and the Middle East). It also connects to Hungary's pipeline system. Originally designed to carry up to 34 Mt/y, Adria's current capacity is 20 Mt/y. The pipeline starts at the Croatian port of Omisalj, where tanker-supplied oil is taken inland to the Rijeka and Sisak refineries. The pipeline branches at Sisak, with one branch continuing to Hungary and another extending east to Serbia.

Adria's eastern branch first connects to the Bosanski Brod refinery (currently not in operation) in Bosnia and Herzegovina. It then enters Serbia to supply the Novi Sad and Pancevo refineries, which are fully dependent on its supplies. Adria is jointly owned and operated – by Jadranski Naftovod (JANAF) of Croatia until the Croatian/ Serbian border and then by Transnafta of Serbia. This line was out of commission during the war in the 1990s,[66] but re-opened in December 2000 under an agreement between JANAF and the Serbia's state oil company, Nafta Industrija Srbije (NIS). In

64. This includes a 2007 MoU with Swiss electricity company Elektrizitäts-Gesellschaft Laufenburg AG (EGL) for up to 5.5 bcm of gas per year delivered via Turkey, Albania/Greece, and on to Italy through the Trans-Adriatic Pipeline from 2010. Given the size of its reserve base, Iran is also a potential supplier to the Nabucco project.

65. With the exception of the OKTA refinery (now in FYR Macedonia) which, at the time, was supplied by rail.

66. Barges were used for transport during this period.

2004/05, Adria operated at about one-third of its installed capacity, carrying 4 Mt/y to Croatian refineries and 3 Mt/y to Serbia. This low volume reflects reduced refinery activity; facilities in both countries need to be upgraded and modernised to supply oil products that meet current market standards.

Thessaloniki-Skopje

The Thessaloniki-Skopje oil pipeline runs approximately 200 km, linking the Mediterranean port of Thessaloniki (Greece) to the OKTA refinery near Skopje (FYR Macedonia). Built in 2001 (at a cost of EUR 85 million), the pipeline is owned and operated by Hellenic Petroleum, which also owns a 54% share of the OKTA refinery (since 1999). The pipeline's capacity of 2.5 Mt/y matches the nameplate capacity of the OKTA refinery. However, throughput in recent years has been less than one-third capacity (0.8 Mt/y); the refinery has been operating at a low load factor because of lower sales on domestic and export markets.

The Thessaloniki-Skopje pipeline has limited potential to play a greater role in regional trade and transit, primarily because of the ownership structure and the lack of additional outlets: it is dedicated to servicing the OKTA refinery (Energy Charter Secretariat, 2006). Hellenic Petroleum recently began construction of a product line (0.3 Mt/y) from the OKTA refinery to Kosovo. The company also intends to build a product line from OKTA to southern Serbia.

Crude oil ports and storage facilities

Crude oil ports and storage facilities in the region vary in capacity, depending on their tanker capacity limits and the refineries they supply (Table 8). Bulgaria, Romania and Serbia can also use port capacities on the Danube River to import oil products. However, past international sanctions against Serbia and bombing of infrastructure in 1999 significantly reduced the fleet and capacity of these facilities.

Table 8 ....Oil ports in the Western Balkans, 2005

Country	Port	Capacity (Mt/y)	Tankers (Dwt)	Refinery link
Bulgaria	Bourgas (Rosenets) Oil port	18.0	75 000*	Lukoil Neftochim (7-7.5 mt/y with planned increase to 10 mt/y by 2012)
Romania	Constanta** Oil terminal	Actual 31.0	165 000	Supplies oil to domestic inland refineries
Croatia	Omisalj	Design: 125.0 Maximum***: 30.0 Actual: 5.7-7.0	350 000	Supplies oil to the Rijeka and Sisak refineries

* International investors discussing project plans for oil pipelines originating near Bourgas (*e.g.* the AMBO and Bourgas-Alexandroupolis pipelines) foresee the construction of specialised crude oil terminals such as the single point mooring buoy (SPMB). This would allow tankers to unload their cargoes in deeper water and facilitate access by larger (150 000 t) deadweight tankers. Annual capacity could increase to 35 Mt, reducing transportation costs but requiring the construction of additional, large-scale tank farms on the shore.

** In 2007, the Constanta Oil Terminal invested EUR 100 million to increase storage capacity by 35%; future plans to build larger tanks will expand total storage capacity from 1.7 to 2.3 Mt of crude oil (http://investing.businessweek.com/research/stocks/snapshot/snapshot.asp?capId=12763475).This will reinforce the port's capacity to cover needs for both domestic refineries and the proposed Pan European Oil Pipeline (PEOP) project, which is planned to originate from Constanta.

*** As of 2007, the port could handle up to 30 Mt per year of crude oil, if both the Rijeka refinery and the Adria pipeline operate at full available capacity. To attain the port's full potential for crude oil capacity, it would be necessary to either undertake major upgrades on the Adria pipeline and the refineries or to construct new pipelines (www.jadroagent.hr/omisalj.htm).

Sources: Company reports.

Oil products

Croatia is the major intra-regional exporter of refined oil products. In 2004, it supplied about 20% (2 Mt) of product output to other countries in the Western Balkans, notably to Bosnia and Herzegovina, as well as to other SEE markets. At present, refineries in the Western Balkan region operate at only 50% of their effective capacity (or 40% of their nameplate capacity), due to the lack of modern equipment and installations, as well as low demand and import competition. Table 9 lists the design capacity and actual throughput of refineries in the Western Balkans.

Table 9 ....Refineries in the Western Balkans, 2005

Location	Nameplate capacity, Mt/y	Actual capacity, Mt/y	Throughput, Mt/y	Type	Origin of crude oil
Ballsh, Albania	1.0	0.6	0.3	Obsolete	Domestic
Fier, Albania	0.5	0.4	0.1	Obsolete	Domestic
Bosanski Brod, Bosnia and Herzegovina	5.0	1.5	Idle	HS*	Russia (negotiations)
Rijeka, Croatia	5.0	5.0	3.3	FCC**	Med. Basin, Russia
Sisak, Croatia	3.0	3.0	1.8	FCC	Domestic, Med. Basin, Russia
OKTA, FYR Macedonia	2.5	2.5	0.9	HS	Med. Basin, Russia
Novi Sad, Serbia	3.0	1.8	1.0	HS	Domestic, Russia
Pancevo, Serbia	4.8	2.4	3.0	FCC	Domestic, Russia
Total	**24.8**	**17.2**	**10.4**		

* HS: hydro-skimming. ** FCC: fluid catalytic cracking.
Sources: Author's estimates based on company and press reports, conference proceedings, and IEA and ECS studies.

Various factors constrain intra-regional trade in refined oil products and limit the development of the market. Low utilisation of pre-war infrastructure (transportation, transhipment and storage), which has been damaged and poorly maintained, leads to inefficient market decisions and practices. For example, even though several locations can be supplied by rail, most shipments use trucks, leading to higher pollution and increased road damage.

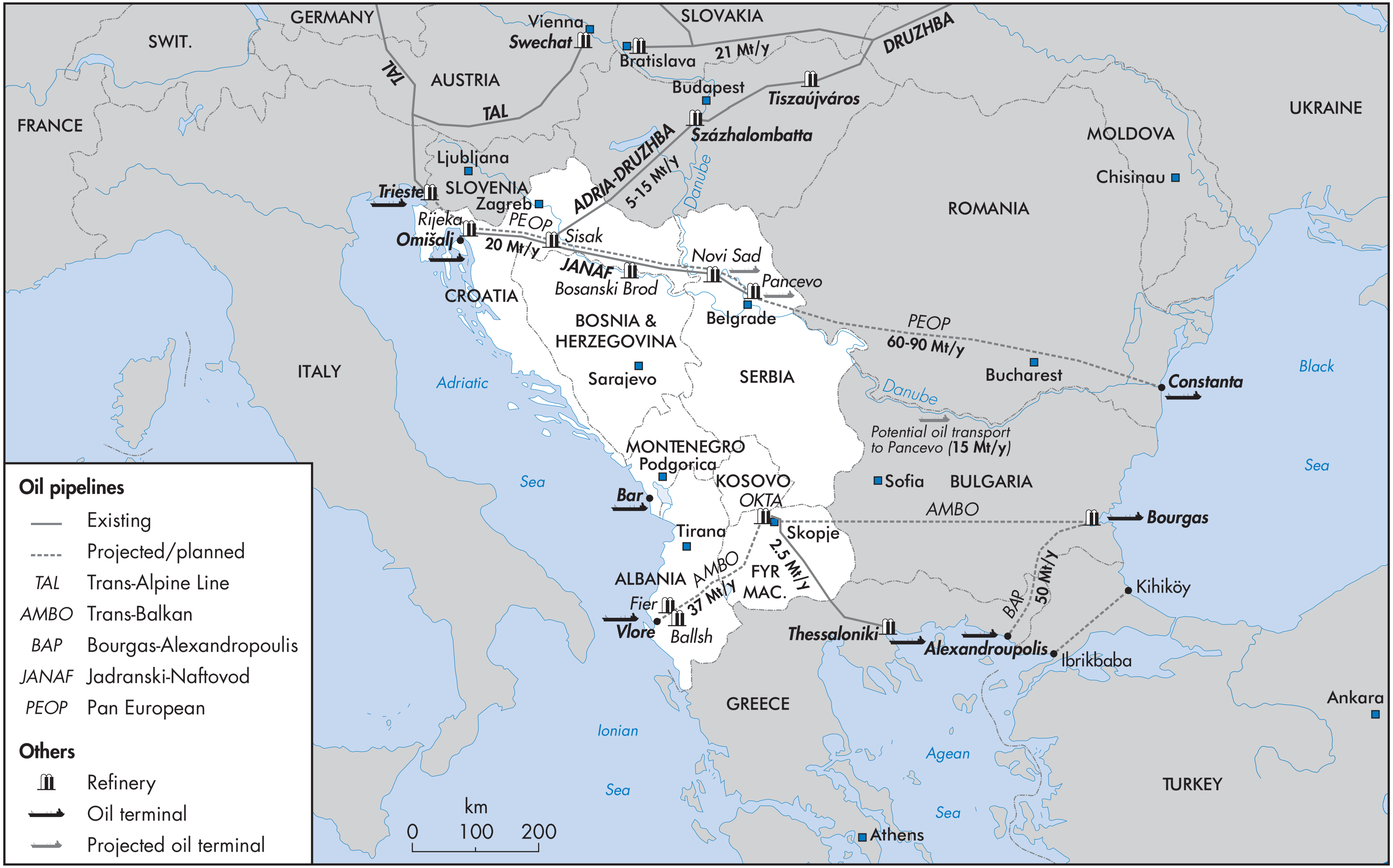
Some countries limit transit of oil products for reasons of protectionism and/or politics. Serbia currently limits the flows of Croatian oil products to Kosovo. In 2001-03, Croatia limited the flows of oil products between Slovenia and Bosnia. FYR Macedonia imposes high transit fees on non-domestic oil products as a means of protecting national oil companies.

The region still faces issues related to oil product compliance to technical and environmental requirements (sulphur content, etc.) and persistent smuggling (notably of low quality fuels) undermines market efficiency and tax collection.

Finally, the region must address issues related to the adoption of EU regulations, particularly those for oil products (*e.g.* progressively harmonising national legislation and practices for fuel specifications to EURO IV and V standards) and stockholding obligations (*i.e.* establishing reserves equivalent to 90 days of consumption).[67]

67. For more details, see the Oil sections in the respective energy policy surveys.

Map 3.................Oil pipelines and pipeline projects in the Western Balkan region



The boundaries and names shown and the designations used on maps included in this publication do not imply official endorsement or acceptance by the IEA.

Note: Routes of planned pipelines are based on publicly available information, which in many cases is approximate.

Planned/potential oil pipelines

Several oil pipeline projects that cross at least part of Southeast Europe are at various stages of development (Map 3):

- The Bourgas-Alexandroupolis Pipeline, connecting ports in Bulgaria (Bourgas) and Greece (Alexandroupolis).
- The Trans-Balkan Oil Pipeline project (AMBO pipeline) between Bulgaria (Bourgas) and Albania (Vlore) via FYR Macedonia.
- The Pan-European Oil Pipeline (PEOP) from Romania (Constanta) on the Black Sea to Croatia (Omisalj) and/or Italy (Trieste) via Serbia.
- The Druzhba-Adria Pipeline Integration Project via Hungary and Croatia.

All of these major projects share two common features. First, they are all designed to carry crude oil from Russia and/or the Caspian basin to international markets. Second, they are all at least partially justified as means of relieving transport congestion in the Turkish Straits. However, other planned pipelines and projects share these features without transiting Southeast Europe. When considering the viability and commercial prospects of the planned pipelines in Southeast Europe, the competitive position and possible impact of these other routes must be taken into account.

The Baku-Tbilisi-Ceyhan (BTC) pipeline is already in operation and ramping up export volumes delivered directly to the Mediterranean at Ceyhan. The Samsun-Ceyhan pipeline (or Trans-Anatolian Pipeline), a north-south overland route across Turkey from the Black Sea to the Mediterranean, could deliver Russian and other Caspian oil to the same point. This project is supported by Italy's ENI and Turkey's Çalık Enerji.

To the north of the Black Sea, the Odesa-Brody oil pipeline was conceived as a way to bring Caspian oil to Central European markets. It was completed in 2001 along with an oil sea terminal on the Ukrainian Black Sea coast (capacity 9 to 12 Mt/y) at a total cost of EUR 580 million. A proposal to extend the pipeline to Poland (745 km of new pipes to the Plock refinery and possibly to the port of Gdansk at an estimated cost of at least EUR 400 million) may yet see this pipeline operating according to the original vision. However, the line has not attracted firm commitments from international oil companies in the Caspian basin or by oil refiners in Europe. In the absence of such commitments it has been used by Russian oil companies, in particular BP-TNK and pipeline operator Transneft, in reverse mode for exports southwards through Ukraine (Odessa).

Bourgas-Alexandroupolis Pipeline

Discussions on the Bourgas-Alexandroupolis (B-A) oil pipeline project date back to 1993, when Bulgaria, Greece and Russia signed the first intergovernmental MoU. Throughout the 1990s progress was slow, even though a 1999 study by ILF of Germany concluded the B-A would be much shorter and cost about 60% of the AMBO pipeline. The B-A pipeline would run entirely within the European Union. Initially, it would transport 300 000 barrels per day (b/d), gradually increasing to full design capacity of 700 000 b/d and potentially up to 1 Mb/d. The estimated total cost has increased considerably from EUR 550 million to EUR 1 billion. The project is expected to be funded by a mix of equity and commercial loans.

In September 2006, Bulgarian, Greek and Russian heads of state announced they had overcome a deadlock on control of the project's ownership. In March 2007, the countries signed a tri-party intergovernmental agreement (IGA), which was subsequently ratified by their respective parliaments. The IGA foresees the establishment of an international project company (IPC) that will own the pipeline.

Despite ratification of the tri-party IGA, several contentious issues persisted in 2007. The Russian party put forward three additional conditions of some significance. The first was that the project company should own and operate all of the infrastructure and rights-of-way for the pipeline (including the Bourgas terminal). Second, the project company partners should provide guarantees for crude oil volumes proportionate to their project shares. Finally, non-Russian partners (especially those from Bulgaria) should sell their IPC shares – to the Russian companies or to upstream operators in Kazakhstan – prior to the formal project start-up.

An agreement on the establishment of an IPC was signed in January 2008. A Russian enterprise Bourgas-Alexandroupolis Pipeline Consortium (BAPC), which includes Transneft, Rosneft and GazpromNeft, will have a 51% share in the project company; Bulgarian and Greek entities will each hold 24.5%. Bulgarian shares are expected to be held by the state-owned Bulgargaz and Technoexportstroy (12.25% each). The Greek state will hold 1% of the shares, leaving 23.5% to the Helpe S.A.-Thraki S.A. consortium, which includes Hellenic Petroleum S.A., Latsis Group, and Prometheus Gas Group. At present, ownership of the Prometheus Gas Group is split 50/50 by the Kopelouzos Group (Greece) and Gazpromexport (Russia). Thus, Russian participation in the Bourgas-Alexandroupolis project company would actually exceed the nominal 51%.

Article 5 of the IGA gives Russia's Transneft sole responsibility for key operational functions and decisions such as contracting, lifting programmes, scheduling, dispatch, and nominations on the entire route (from the oilfields to Alexandroupolis). The Article declares that the exercise of these functions and decisions is subject to Russian legislation, rather than to laws and rules of Bulgaria, Greece or the European Union. The start-up date of the project is mid-2008. The structure of the project, with Russia having a 51+% stake in the IPC and Transneft's positioning as *de facto* monopoly oil supplier under Russian laws and rules, suggests that operational issues will be firmly under Russian control.

Trans-Balkan Oil Pipeline (AMBO Pipeline)

First proposed in 1994, the Trans-Balkan oil pipeline was to run between the port of Bourgas (Bulgaria) on the Black Sea and the port of Vlore (Albania) on the Adriatic Sea, travelling through Skopje (FYR Macedonia). Its feasibility was first investigated in 1996 by the US oil giant Halliburton. The project's current promoter, the US-registered Albanian-Bulgarian-Macedonian Oil Co. (AMBO), received a grant (in 1999) from the US Trade and Development Agency to expand the feasibility study.

The second study estimated the 912-km pipeline would have a capacity of 37 Mt/y (750 000 barrels per day) and would cost about EUR 950 million. Three-quarters of the costs (EUR 720 million) were to be funded, at least partially, by international donor loans. The study indicated that construction could begin in 2005 and the pipeline could be completed by 2008. However, no investment decision has yet been taken and the AMBO project has yet to resolve the question of sources of oil supply and to secure solid industry backing.

In an attempt to raise institutional support for the project, the governments of Albania, Bulgaria and FYR Macedonia signed (in 2004) a political declaration and an MoU with AMBO's president. On 31 January 2007, the same governments signed a tri-party IGA, which was to be followed by an environmental impact assessment. The earliest possible commissioning date for the pipeline has shifted to 2011-12.

Pan-European Oil Pipeline (PEOP)

The Pan-European Oil Pipeline (PEOP)[68] plans to take oil from the Romanian coast of the Black Sea to refineries in Serbia and Croatia, and on to Trieste (Italy) via connections with the existing Trans-Alpine pipeline (TAL) and the Italian pipeline network. Excess oil would be shipped by tanker from Italy (Genoa) on the Mediterranean Sea to European markets (Bank Watch, 2007). The pipeline is slated to connect two Romanian facilities, starting at Constanta and follow the existing corridor to Pitesti. The route would continue via a new corridor through Serbia (Pancevo) and Croatia (Sisak), then on to Italy (Trieste) via Slovenia or the Istria peninsula (Nacional, 2007).

An IFC-funded feasibility study (conducted in 2005) estimated that a 40-inch pipeline covering this 1 300 km route could be operational in 2011 at a cost of EUR 1.8 to 2.6 billion. It would eventually be able to transport 40 to 90 Mt/y of oil, depending on the chosen configuration; the likely throughput would be in the order of 60 Mt/y. Russia would be the most likely source for the oil, but the line could also transport non-Russian Caspian oil if the latter were separated from Russian (Urals) crude qualities.[69] The study indicated that financing would be 70% debt by export credit agencies and the EBRD. The remaining 30% would come from private commercial banks. The study found that the project was feasible if supported by preferential tax rates.

Romania has done its share of work to complete financial and marketing studies for this line. However, other countries have not yet defined in detail the pipeline route. For example, no final decision has been made on the possible reverse use of the JANAF pipeline, which currently carries oil from Croatia to Serbia. JANAF has a design capacity of up to 34 Mt/y, but available capacity to all destinations is about 20 Mt/y. Throughput from Croatia to Serbia is about 4.5 Mt/y, much lower than both available and design capacity on this branch of JANAF. Whether this pipeline will remain in use, and in which direction, is largely Serbia's decision.

If PEOP supplied sufficient oil to refineries in the region, there would be no need for JANAF to continue operating the Croatia-Serbia pipeline; its infrastructure could instead be used, in the reverse direction, by PEOP. Regardless of Serbia's decision, Croatia would like to retain the route from Omisalj to Sisak. Options on PEOP's delivery points in Italy (*i.e.* Trieste and eventually Genoa) are not yet clear, nor are details regarding transit through Slovenia or the extent of Austria's eventual participation.

68. The PEOP was formerly known as the Constanta-Pancevo-Omisalj-Trieste (CPOT) Pipeline and is sometimes also referred to as the Southeast European Line (SEEL).

69. Caspian oil is lighter and sweeter (lower in sulphur) than Russian (Urals) crude.

The governments of the participating countries (Romania, Serbia, Croatia, Slovenia and Italy) generally support the project, albeit with some reservations. They stepped up their efforts by signing, together with the European Energy Commissioner, a ministerial declaration (April 2007 in Zagreb, Croatia). The document proposes that the operators create a project development company and consider extending the PEOP route to Genoa. Following the Zagreb meeting, the participating countries established an intergovernmental working group with the objective of developing the framework understandings (*i.e.* intergovernmental and host government agreements) in support of the project.

During the November 2007 visit of the president of Kazakhstan to Romania, there were indications of interest from Kazakhstan's KazMunaiGaz (KMG) in the PEOP project, which would complement its own expansion strategy in the Western Balkans and the European Union. In August 2007, KMG agreed to purchase, from Rompetrol Holding SA, a 75% stake in the Rompetrol Group NV (TRG). The purchase includes two refineries in Romania and 630 gas stations in seven countries. Using PEOP for crude oil shipments to the Romanian refineries (and other destinations) could enhance KMG's regional position. Despite this progress, the project's initial schedule has started to slip from 2011 to 2013.

Druzhba-Adria Pipeline Integration Project

The Druzhba-Adria oil pipeline project sought to bring additional quantities of Russian oil to European and international markets through the Croatian port of Omisalj. It was based on the idea of using available capacity in the Druzhba pipeline (which transits Russia, Belarus, Ukraine and Slovakia) and the JANAF pipeline (Croatia). The project was originally promoted by Yukos in 1999. Following the dismantling of Yukos it was taken over by TNK-BP, with Transneft acting as co-ordinator on the Russian side.

The Druzhba-Adria pipeline depends heavily on ensuring the flow of oil to Omisalj. This requires reconfiguration of the Hungarian pipeline system to remove bottlenecks at two crossing points on the Hungarian-Croatian border; namely, the eastern crossing point (capacity 10.5 Mt/y) and the northern crossing point (capacity 4.5 Mt/y).

The idea of integrating the Druzhba and the Adria pipeline systems requires three additional undertakings, which could be carried out in phases. First, it will be necessary to reverse the flow on two lines between Százhalombatta (Hungary) and Omisalj (Croatia) to carry 0.5 Mt/y from Druzhba-2 (via Ukraine) and 4.5 Mt/y from Druzhba-1 (via Slovakia). This requires only minor upgrades at a cost of about EUR 15 million. The second phase would focus on increasing transit from Druzhba-2 to 5.5 Mt/y (transit from Druzhba-1 would remain at 4.5 Mt/y). This entails construction of a new pumping station at Nagyfuged and upgrades of the Kara and Csurgo pumping stations. By the end of Phase 2, annual transit volumes could be increased to 10 Mt/y. The third phase would further increase annual transit from Druzhba-2 to 10.5 Mt/y (annual transit from Druzhba-1 would remain at 4.5 Mt/y) through construction of a new pumping station at Tizsaujvaros and further upgrades of the Kara and Csurgo pumping stations. Final total transit capacity of the line would be 15 Mt/y for a total estimated cost of EUR 400 million.

Phase 1 of the project could be implemented quite quickly. In late 2002, senior officials of Croatia, Russia, Belarus, Ukraine, Slovakia, and Hungary signed (in Zagreb) a

10-year renewable agreement in support of the project. The agreement envisaged a start-up date of 2004. However, in late 2005, Croatia's Commission for Assessment of the Druzhba-Adria Project rejected the environmental study of the project as incomplete, recommending to the Ministry of Environmental Protection to refuse its authorisation. In addition, the Croatian Commission pointed to unresolved issues related to transit tariffs, oil supply and participation – and publicly indicated that the project had collapsed.

In late 2006, the project was again discussed at a meeting between the Croatian and Russian governments. The project continues to face considerable opposition related to environmental concerns, notably the risk of pollution of the Croatian coasts. In the meantime, Russia's oil export and transit strategy has evolved, giving priority to northern (St Petersburg sea terminal) and southern routes (Bourgas-Alexandropoulis).

Table 10 ....Characteristics of main oil transportation projects in Southeast Europe

Project name	Route and countries crossed	Length (km)	Capacity (Mt/y)	Construction cost (estimated: EUR m)	Earliest completion date
Bourgas-Alexandroupolis Pipeline	Bulgaria (Bourgas) – Greece (Alexandroupolis)	280	35-50	1 000	2010
AMBO	Bulgaria (Bourgas) – FYR Macedonia – Albania (Vlore)	890	37	1 200	2011-2
Pan-European Oil Pipeline (PEOP)	Romania (Constanta) – Serbia – Croatia – Slovenia – Italy (Trieste)	1 300 (total, some use of existing lines)	60-90	1 800-2 600	2013
Druzhba-Adria Pipeline Integration Project	Russia - Belarus – Ukraine – Slovakia – Hungary – Croatia (Omisalj)	3 000 (total) of which 200 (new)	5-15	400	uncertain

Note: Unless otherwise indicated, estimates are based on 100% utilisation rates.
Sources: Company and press report, conference proceedings.

NATURAL GAS

The small size of the gas markets in the Western Balkans makes it difficult to envisage any new bulk transmission lines for these markets alone. However, the Western Balkans are strategically located between the resource-rich regions of Russia, the Caspian basin and the Middle East and key energy consumers in Western and Central Europe. A number of current pipeline proposals cross Southeast Europe in order to supply the main European markets; this opens up the possibility for spur lines to supply small but growing gas markets along the route.

Russia is the dominant supplier of natural gas to Southeast Europe, and diversification of gas supply is an important policy issue for both this region and for the European Union as whole. Although markets in the Western Balkans are small (and there is no gas infrastructure at all in Montenegro and Kosovo), they are expected to follow EU gasification trends in electricity and heat generation, as well as in end-use sectors. IEA projections for the region reflect those of the European Union, with an increase in natural gas consumption and in the share of natural gas in the energy mix.[70]

Existing markets and infrastructure

Total natural gas consumption in Southeast Europe in 2004 was 29.5 bcm, an increase of some 37% as compared to 1995 or 10% as compared by 2001. Natural gas accounts for 19% of TPES in the region. Only Romania and Croatia have a relatively high gas share in their respective energy mixes (Table 11).

Table 11 .... Natural gas consumption and production in Southeast Europe (SEE), 2005 (Mcm)

	Consumption (Mcm)	Contribution to TPES* (%)	Domestic production (Mcm)	Imports** (Mcm)
Albania	17	0.6%	17	0
Bosnia and Herzegovina	461	7.4%	0	461
Bulgaria	3 525	14.0%	535	3 065
Croatia	2 910	26.7%	2 284	1 134
Greece	2 842	7.6%	16	2 820
FYR Macedonia	77	2.3%	0	77
Romania	17 285	36.4%	12 120	5 259
Serbia and Montenegro	2 389	11.6%	282	2 107
TOTAL SEE	**29 506**	**-**	**15 254**	**14 923**

* Total primary energy supply.
** From Russia only.
Note: There is no gas infrastructure in Kosovo and Montenegro.
Sources: IEA statistics.

Economic growth and development will lead to an increase in natural gas consumption and necessitate extension of the region's natural gas distribution networks. The switch to natural gas for electricity and heat generation, at both existing and new units, will be a key factor in the region's outlook for natural gas demand. Recent forecasts (World Bank, 2007) indicate that SEE gas demand may increase by an average of 2.5% per year, rising from almost 30 bcm in 2004 to 44 bcm in 2025. Additional imports are expected to cover most of the increase (25 bcm in 2025).

Gas production in SEE is quite limited, and is located mainly in Romania (12 bcm in 2005) and Croatia (2 bcm). Overall, the region meets about 54% of its current gas demand through domestic production. The remainder is covered mainly by imports from Russia, as well as small amount of LNG imports from Greece. Several countries (Bosnia and Herzegovina, Bulgaria, Serbia, etc.) obtain 80 to 100% of their gas supply from Russia (Table 11).

70. According to the 2006 *World Energy Outlook* (WEO), the reference scenario at 2030 shows the share of natural gas in EU to increase from 24% in 2004 to 30% in 2030 and the share of imports increasing from 54% in 2004 to 80% in 2030. The *Natural Gas Market Review (2007)* shows European consumption at 645 bcm per year by 2015.

Romania, Bulgaria and FYR Macedonia receive Russian natural gas via Moldova and Ukraine using the Trans-Balkan route, which handles the vast majority of natural gas imports in SEE. The pipeline has a capacity of up to 28 bcm per year at Isaccea on the Romanian-Ukrainian border. In Romania, gas is transited to Bulgaria (190 km) via three parallel pipelines. The first pipeline (commissioned in 1974) is 40-inches and has a maximum capacity 8 bcm per year; two more lines (commissioned in 1989 and 2002) are 48-inches and have maximum capacities 10 bcm per year. All three pipelines follow the same route, thus, total capacity at the Romanian-Bulgarian border is also 28 bcm per year. Romania has the most dense natural gas distribution network in the region, reflecting the country's significant natural gas production. However, domestic production in Romania is in decline.

In Bulgaria, the Trans-Balkan pipeline branches out to Turkey, Greece and FYR Macedonia; there are also plans to build a spur to Serbia (up to 1.5 bcm per year). The southern branch of the Trans-Balkan route supplies FYR Macedonia and Greece; current capacities at these borders (respectively, 0.5 bcm and 2.5 bcm per year) may be expanded in the future (to 0.8 bcm and 4.5 bcm per year). The Trans-Balkan's eastern branch supplies Turkey, with a capacity at the Bulgarian-Turkish border of 18 bcm per year.

Bosnia and Herzegovina and Serbia are supplied with gas from Russia via Ukraine and Hungary (respective capacities: 1.5 bcm and 6 bcm per year). Croatia is supplied by its own system, which has relatively small capacity connections with Hungary, Slovenia and Italy (total: 3 bcm per year). Domestic production is still the dominant source of natural gas in Croatia, although imports are increasing in volume.

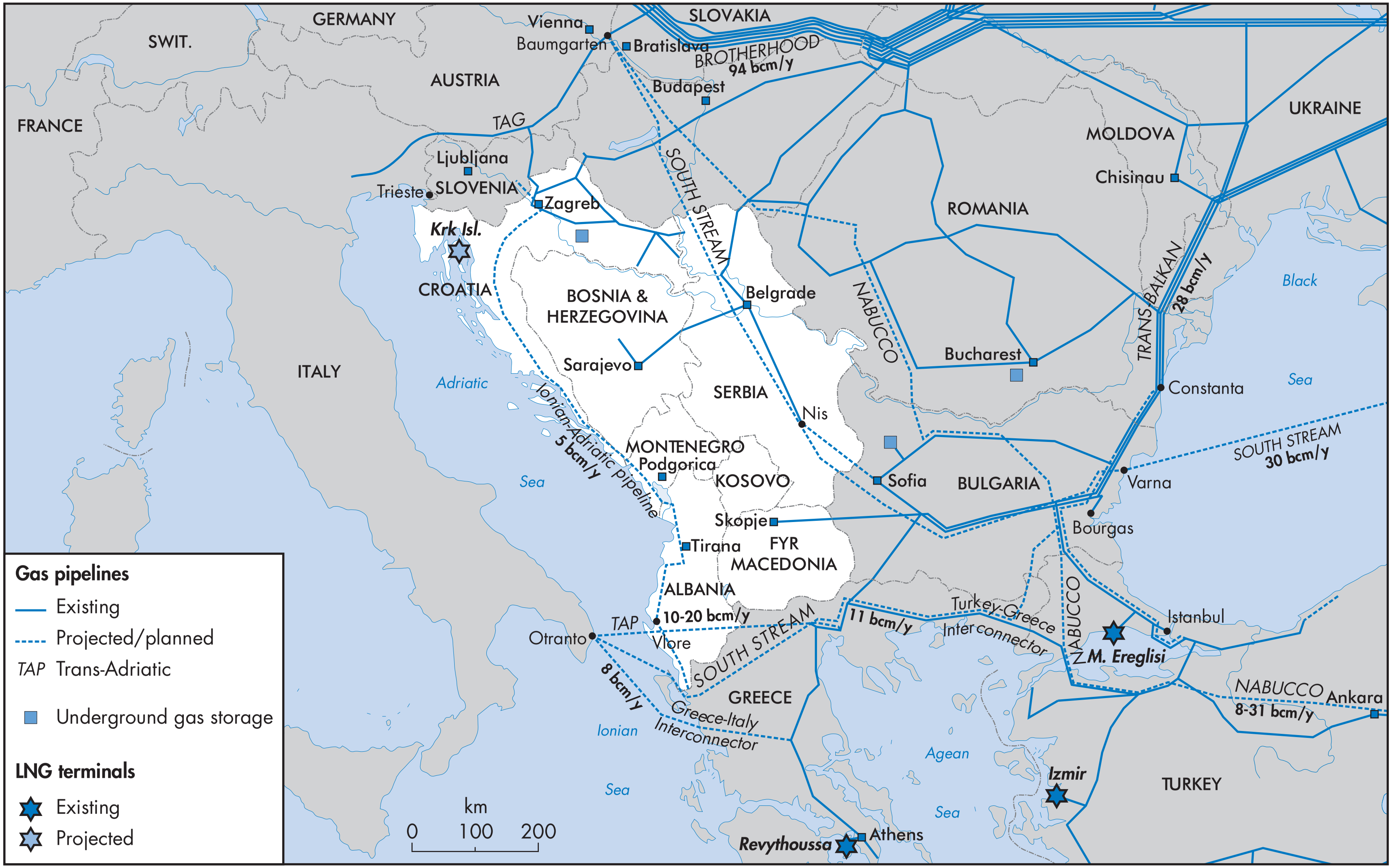
Planned/potential gas pipelines

As with oil pipeline projects, the outcome of almost all regional natural gas pipeline projects depends largely on factors beyond the geographical reach of Southeast Europe, both with regard to upstream supply and downstream demand. As a result, in many cases there is considerable uncertainty regarding project participants (both buyers and sellers), timing and availability of funding. As of early 2008, the most advanced of the large regional gas transportation projects under development were the Turkey-Greece-Italy Interconnector, Nabucco, South Stream and the Trans-Adriatic Pipeline. These projects, along with the Ionian-Adriatic Pipeline, are indicated on Map 4.

Turkey-Greece-Italy Interconnector (TGII)

The Turkey-Greece-Italy Interconnector (TGII) natural gas project aims to link Turkey to Greece and then Italy, thereby bringing new sources of natural gas to those markets. Its feasibility study was co-financed by EU-Trans-European Networks (TEN) and DEPA, the Greek state-owned gas company. In 2003, Turkey and Greece signed an IGA for the first stage of the project, followed in 2005 by an agreement between Greece and Italy. A tri-lateral IGA was signed by Turkey, Greece and Italy in July 2007 that defined the overall commercial and legal framework for gas trade and transit for the TGII. Volumes of gas supplied along the TGII are expected to rise to 11 bcm per year in 2012, with 8 bcm supplied to Italy and the remainder to Greece.

Map 4.................Natural gas pipelines and main pipeline projects in the Western Balkan region



The boundaries and names shown and the designations used on maps included in this publication do not imply official endorsement or acceptance by the IEA.
Note: Routes of planned pipelines are based on publicly available information, which in many cases is approximate.

The first stage of the pipeline, the Turkey-Greece Interconnector, was commissioned in November 2007 following an official inauguration by the prime ministers of Greece and Turkey. This interconnector is a 36-inch pipeline (296 km, including 211 km in Turkey) that links Turkey (Karacabey) to the Greek grid (Komotini). The initial transportation capacity is 3.5 bcm per year. The project cost about EUR 200 million and was funded by Turkey's BOTAS, DEPA and EU structural funds (29% of total construction costs).

The second stage of the pipeline, the Greece-Italy Interconnector, is a much more ambitious 805 km pipeline to connect Greece (Komotini) and Italy (Otranto). The onshore section within Greek territory is around 600 km in length and is to be constructed by the Greek TSO (DESFA). In addition, there is an offshore section of around 205 km that will cross the Adriatic Sea. Edison, Italy's second-largest power company, and DEPA are 50/50 partners in the offshore section of the TGII, also known as the "Poseidon" pipeline.

The Greece-Italy Interconnector is expected to be operational in 2012 (Energy Charter Secretariat, 2006). Initial transportation capacity in the offshore Poseidon pipeline is scheduled to be around 8 bcm per year and will be reserved to Edison (80%) and DEPA (20%) for 25 years. With the approval of the European Commission, the Greek and Italian governments (along with the relevant regulatory authorities) agreed to grant the two operators third-party access exemption on the full capacity of the Poseidon pipeline for the same duration. In exchange, 10% of volumes are to be allocated to the emerging Italian trading hub. Additional transportation capacity will be available to third parties through an open season procedure.

Nabucco Pipeline

The Nabucco Gas Pipeline aims to transport gas from Turkey to Central and Western Europe via Bulgaria, Romania, Hungary and Austria. Companies from the respective countries – namely BOTAS (Turkey), Bulgargaz (Bulgaria), Transgaz (Romania), MOL (Hungary) and OMV Gas (Austria) – signed the Co-operation Agreement for the project in 2002. In 2003, the five companies launched a feasibility study for the pipeline, with 50% funding from the EU's TEN programme. The project is listed as a priority by the European Commission and the energy ministries of the five partner countries have signed a joint ministerial statement in its support. Detailed planning work began in January 2008 with the appointment of an engineering company.

The Nabucco gas pipeline is an important project for Europe in terms of diversifying sources of gas supply and improving energy security, and in bringing to market additional natural gas resources that are currently difficult to access. Nabucco is also one of the significant supply projects developed by downstream players. To assure proper project management and facilitate project funding, the Nabucco commercial partners established (in 2004) the Nabucco Company Pipeline Study GmbH. In February 2008, RWE (Germany) became the sixth partner and an equal shareholder in the project. Further shareholders are possible from both upstream and downstream.

The intention was to complete construction by 2011, with first deliveries in the same year. However, in 2006 and 2007 delays in implementing the project tested the strength of political support in some participating countries, particularly Hungary and Bulgaria, but also Turkey. In September 2007, the EU co-ordinator for natural gas transportation projects in the region confirmed that the countries involved in the project remained committed, stating that all four EU countries and gas companies were "glued" to the project (Platts Energy in East Europe, 2007).

A first construction phase would allow for delivery of up to 8 bcm per year by a target date of 2013, but the main and feeder pipeline system (comprising 3 300 km) could ultimately transport 25.5 to 31 bcm per year of natural gas from the eastern borders of Turkey to the Baumgarten Hub Point (Austria), with transmission through Bulgaria, Romania and Hungary. The gas is expected to be sourced from Azerbaijan, the Caspian basin and the Middle East, although uncertainty remains regarding specific volumes available for the project. Flows of some Russian gas through this line have not been ruled out.

In September 2007, Austria and Azerbaijan signed an MoU to open discussions on possible gas supply. Also in 2007, Iran signed a non-binding MoU with OMV of Austria and BOTAS of Turkey for 20 bcm per year of Iranian gas and to transit 10 bcm per year of Turkmen gas via Iran. There has also been some discussion of supplies from Egypt via Turkey, although any volumes from this source are likely to be limited or based on swap agreements. In May 2008, the Nabucco consortium raised its estimate of the total project cost of the pipeline to EUR 7.9 billion.

The Nabucco project would give Bulgaria and Romania direct access to alternative sources of natural gas. It would also provide this option to FYR Macedonia (via the existing connection to Bulgaria), Serbia and Bosnia and Herzegovina (via the existing connection to Hungary), and Croatia (via existing links to Slovenia and Austria). However, in some cases, access to existing pipelines may be limited because of long-term agreements with Gazprom (Russia), the current dominant supplier.

South Stream

In 2007, the South Stream project became the centrepiece of Gazprom's export strategy in this region, superseding or incorporating various other gas transportation initiatives that had been under discussion. The project was launched in June 2007 with the signature of an MoU between Gazprom and ENI (Italy). Italy is the second-largest market for Russian gas in Europe, with annual supplies amounting to about 22 bcm (of a market size of 80 bcm per year). The ENI-Gazprom deal is considered part of a broader partnership agreement signed in November 2006, whereby Gazprom is to supply 3 bcm per year of gas directly to Italian consumers by 2010. By virtue of the same agreement, ENI has been granted access to upstream projects in Russia.

The precise route and specifications of the project have yet to be finalised, but the initial proposal is for the construction of a large diameter pipeline (30 bcm per year) from Beregovoe[71] on Russia's Black Sea coast across the Black Sea to Bulgaria, where it would branch south towards Greece and southern Italy and also west towards the Austrian and northern Italian markets. The 900-km marine section of the South Stream line would need to be laid in depths exceeding 2 000 m. It would be owned

71. Beregovoe is a site on the Blue Stream line at which a large compressor station is located.

and operated exclusively by a 50/50 joint venture between Gazprom and ENI. Other partners would be invited to participate in onshore sections of the pipeline system. The estimated cost of the entire project is EUR 10 to 12 billion (Vesti, 2007).

In January 2008, ENI and Gazprom created a jointly owned (50/50) project company, South Stream AG, which has been tasked with conducting feasibility work to be completed by the end of 2008. Also in January 2008, agreements were concluded with Bulgaria and Serbia that included support for the pipeline. In the case of Bulgaria, the agreement stipulated the creation of a joint venture to build and operate the onshore section of the South Stream pipeline running through Bulgaria, on a 50/50 basis between Gazprom and Bulgargaz. This agreement is seen as part of a close relationship between Bulgaria and Russia in the energy sector that includes Bulgarian support for the Bourgas-Alexandroupolis oil pipeline (see above) and also Russian investment in the construction of two 1 000 MW units at the Belene NPP.

In January 2008, Russia and Serbia concluded an IGA on oil and gas co-operation that committed the Russian side to routing the South Stream pipeline via Serbia, through a joint venture between Gazprom and Srbijagas, and to refurbish and expand Serbian underground gas storage at Banatski Dvor. The sides also reached agreement on the sale to Gazpromneft of a 51% stake in Naftna Industrija Srbije (NIS), the state oil company. The possibility to privatise NIS had been under discussion since 2005, but the Serbian authorities decided in January 2008 to sell a controlling stake to Gazpromneft without holding an international tender.[72]

Russian officials have stressed that South Stream is not directed against any other project, notwithstanding its geographical proximity to the Nabucco project and its target of the Italian market alongside TGII (RFERL, 2007). For its part, the European Commission has indicated that it has no objection to South Stream, but considers Nabucco a priority project because it would diversify not only transport routes, but also sources of supply.

Trans-Adriatic Pipeline (TAP)

The Trans-Adriatic Pipeline (TAP) is a project being promoted by the Swiss Elektrizitäts-Gesellschaft Laufenburg AG (EGL). TAP seeks to use existing pipelines, as well as projects already underway, to establish a link between the Balkans and south Italy, where EGL operates large natural gas-fired power plants. EGL is considering several alternatives for routing and feeding natural gas into the system. The preferred option is to use the TGII and build a spur line across Albania as a means of accessing future potential natural gas storage facilities (all in Albania). In addition to enhancing diversification of European natural gas supply, the TAP project would provide low transportation fees into the EU gas market and facilitate rapid connections to existing gas networks. The project would also support re-gasification and development of Albania, and create opportunities for third-party access.

Basic engineering work for the TAP project was completed in 2007. The pipeline's right-of-way and permits are expected to be secured in 2008, with complete detailed engineering and procurement following on. EGL signed an agreement in February

72. See the sections on Energy Security and on Crude Oil and Oil Products in the *Energy Policy Survey of Serbia*.

2008 with Norway's StatoilHydro to establish a 50/50 joint venture to develop, build and operate the TAP. A final investment decision is anticipated in the second half of 2009, with the earliest date for completion being 2011.

The project has a number of unresolved questions, the most important being a lack of clarity on the supply side. To date, there are no firm commitments from natural gas suppliers, despite an MoU signed in mid-2007 between EGL and Iran to supply 5.5 bcm of natural gas through the existing Iran-Turkey link for a 25-year period. Some of the possible natural gas sources (*e.g.* Russia's Blue Stream) are subject to restrictions on re-export from Turkey; other Caspian sources are uncertain for the time being or may be committed to other projects. That said, StatoilHydro's 25.5% stake in the Azeri Shah Deniz field and its commitment to TAP have improved the project's credentials as an outlet for Caspian supply. The TAP depends on the completion of other projects to feed natural gas into the pipeline, either from the north (Bulgaria) or from the east (TGII).

Ionian-Adriatic Gas Pipeline

In September 2007, government ministers from Albania, Montenegro and Croatia signed a declaration of support for an Ionian-Adriatic Gas Pipeline, which would run north from the TAP in Albania (Vlore) and supply gas to northern Albania, Montenegro, Croatia (and possibly to Bosnia and Herzegovina) facilitating the gasification of these markets. The project is supported by EGL and by Croatia's Plinacro.

White Stream

The White Stream project is an initiative to bring Caspian gas across the Black Sea from Georgia to Romania (either directly, or via Ukraine through Crimea). The project, which was formerly known as the Georgia-Ukraine-European Union (GUEU) pipeline, would by-pass both Russia and Turkey. It foresees an initial capacity of 8 bcm per year rising to 32 bcm. It has generated some interest and political support, notably from Ukraine, but lacks clarity on the sources of natural gas and commercial sponsors.

Blue Stream II

The existing Blue Stream pipeline runs across the Black Sea from Russia to Turkey and began operation in 2003. The design capacity of this pipeline is 16 bcm, although this capacity has not been used in full. In late 2005, the Russian side raised the idea of running a second line (Blue Stream II) along the same sub-sea corridor to Turkey, with two possible onward routes. The first route would run through Bulgaria, Romania, Hungary and Austria in parallel to the Nabucco project line. In July 2006, Gazprom and MOL (Hungary) set up a joint project company aimed at defining the gas delivery route. However, in mid-2007 this option was overtaken by the South Stream project, which would supply essentially the same markets but by-pass Turkey. The second option, which remains formally on the table, is a southern extension of Blue Stream towards Israel and other markets in the Eastern Mediterranean.

Western Balkans Natural Gas Pipeline

The Western Balkans Natural Gas Pipeline project was put forward by DEPA (Greece) and BOTAS (Turkey) in 2003, when the two companies signed an MoU with the natural gas companies and/or authorities of FYR Macedonia, Albania, Serbia-Montenegro, Bosnia and Herzegovina, Croatia and Slovenia. The natural gas pipeline would connect Greece to Slovenia, running across the Western Balkans. However, since 2003, there has been little progress on the project due to a lack of clarity on the sources of natural gas, on gas demand in the Western Balkans and a lack of commercial interest given other more competitive options for gas transportation including TGII, Nabucco and the Trans-Adriatic Pipeline (combined with the proposal for an Ionian-Adriatic Pipeline for Western Balkan markets).

LNG terminal and trunk line in Croatia

This project envisages building an LNG terminal on the Croatian Adriatic coast, as well as a pipeline to the mainland and then onward to neighbouring countries. The ADRIA LNG Study Co. (an umbrella for several companies including: E.ON [31.1%], OMV [25.6%], TOTAL [25.6%], RWE [16.7%] and Geoplin [1%]) has proposed an LNG reception terminal on the Croatian island of Krk, with connecting pipelines to countries in the region. This would provide an important diversification option for Croatia and for neighbouring markets. The initial target capacity of the terminal is 10 bcm per year, with the earliest completion date of 2011-12 and an estimated cost of EUR 0.7 to 1 billion. The target markets – mainly Hungary, Slovenia and Austria – are outside the Western Balkans.

As there is no network on the Croatian coast, a new pipeline will be needed to evacuate the LNG towards Hungary. Plinacro, the Croatian gas transmission company, plans to increase transmission and connection capacities with Slovenia, and to build connections with other neighbouring countries, in particular Hungary and Serbia. It will also extend its southern network to connect with Montenegro.

Black Sea CNG/ Constanta-Trieste

Another option is to supply compressed natural gas (CNG) by combining a maritime route on the Black Sea with a natural gas pipeline between Romania (Constanta) and Italy (Trieste). The CNG line could run in parallel to the PEOP oil project, with CNG being shipped (using a special fleet) between several upload and unload ports on the eastern and western shores of the Black Sea (Oxford Institute for Energy Studies, 2007). CNG could allow flexibility in terms of adjusting to seasonal load factors and various locations over time as markets develop.

For small to medium volumes of natural gas transported over short distances, CNG is more economical than LNG and gas pipeline options.[73] A key feature of CNG is that it requires limited inland infrastructure: a fairly standard compressor station at the loading port and an equally standard decompression facility at the unloading point. If similar pressure is available, the unloading point can connect directly to the existing gas transport system. Although a relatively new technology, CNG shuttle carriers are already available from naval engineering companies in Canada, Norway and the United States. Lead times for building specialised carriers would be 3 to 5 years.

CNG shuttles on the Black Sea could carry about 20 Mcm of natural gas per trip, for an annual capacity of about 1 bcm per ship. Assuming an infrastructure of three delivery ports and three receiving ports (possible configurations shown in Table 12), with two ships per route and one-third of utilisation reserve for shifting loads from one route to another, the maximum transport capacity would be in the order of 5.5 bcm per year.

The economics and efficient operation of the CNG concept still need to be assessed by a commercial operator and an investor, as does its link with an inland transit route (*e.g.* from Romania [Constanta] to Italy [Trieste]). The scale of the up-front investment

73. Private investors are developing a CNG project between Egypt and Greece.

costs for the CNG fleet and a pipeline will be a challenging obstacle, as will the need to secure both natural gas suppliers and customers. This project calls for sequential development of infrastructure, as well as better use of existing pipelines and UGS facilities.

Table 12 ....Possible CNG ports in the Black Sea

Possible CNG loading ports	Possible CNG unloading ports
• Beregovoe (Russia) where existing infrastructure delivers gas to Blue Stream. Possible suppliers: Gazprom, Itera, LukOil and independents. • Supsa (Georgia) where natural gas could be delivered through the existing corridor from Azerbaijan. An adequate pipeline could be developed from the Baku-Tbilisi-Erzurum (BTE) in Tbilisi to Supsa. The projected development of underground gas storage (UGS) facilities near Tbilisi could facilitate this project. • Trabzon (Turkey) where natural gas could be delivered from the BTE.	• Constanta (Romania) which could be supported by several existing and potential UGS facilities near Bucharest. • Bourgas and Varna (Bulgaria) to deliver natural gas to existing or expanded systems of natural gas pipelines. • Odessa (Ukraine) which could deliver natural gas to existing transmission networks. • Kiyikoy (Turkey) which could support consumption in the Istanbul area and eventually deliver natural gas to Greece.

Table 13 ....Natural gas pipeline and supply projects in Southeast Europe

Project name	Route and countries crossed	Length (km)	Capacity (bcm/y)	Construction cost (estimated: EUR m)	Earliest completion date
TGII stage 2	Greece – Italy (Otranto)	600 (onshore) 205 (offshore)	11 to Greece 8 to Italy	600 (onshore) 300 (offshore)	2012
Nabucco	Turkey – Bulgaria – Romania – Hungary – Austria	3,300	Initial 8 up to 31	7 900	2013
South Stream	Russia – Bulgaria then northern branch (Serbia – Croatia / Hungary – Austria) and possible southern branch (Greece-Italy)	900 (offshore)	30	10-12 000	2013
Trans-Adriatic Pipeline	Greece – Albania – Italy	505 (onshore) 115 (offshore)	10 initial up to 20	1 500	2011
Ionian-Adriatic Pipeline	Albania – Montenegro (possible Bosnia and Herzegovina) – Croatia	400	5	230	2011-12
Blue Stream II	Russia – Turkey – Southeast Europe	400 (offshore)	10-15	n/a	uncertain
White Stream	Georgia – Ukraine – Romania (also option for direct Georgia – Romania)	1 355 (1 235 for direct route to Romania)	Initial 8 (stage 1)	3 800 (stage 1)	uncertain
Western Balkans Natural Gas Pipeline	Greece – FYR Macedonia – Albania – (Serbia) Montenegro – Bosnia and Herzegovina – Croatia – Slovenia	n/a	n/a	n/a	uncertain
Croatia LNG	LNG Terminal	-	10	700-1 000	2011-12
Black Sea CNG	Multiple possibilties	-	1 per ship	n/a	uncertain

Sources: Company and press reports, conference proceedings.

Underground natural gas storage

Underground natural gas storage (UGS) has a crucial role in the gas chain. It is essential to meet large demand peaks (seasonal, weekly, daily, etc.) by providing extra gas delivery capacity. It avoids the need for – or minimises the size of – new supply pipelines and associated infrastructure (compressor stations, etc.), thereby reducing capital outlays and operating costs of main supply pipelines while also assuring higher load factor. This generally results in more constant pipeline load factors and lower transportation costs. It also provides a gas stock buffer for emergency and safety use, thereby improving reliability and assuring uninterrupted gas supply to end-users. From a strategic perspective, UGS addresses security concerns related to possible supply interruptions, especially where import dependency and concentration are high.

As an added value, many UGS sites provide a good opportunity to establish gas trading hubs: the stock of available gas of known quality facilitates trade between producers, users, pipeline operators and natural gas traders. However, market liberalisation and a reasonable degree of competition are usually prerequisites for tapping into the synergies provided by natural gas hubs.

As of 2000, UGS capacities in Southeast Europe accounted for 16% of demand in Bulgaria, 7% in Romania and 18% in Croatia. Serbia operated a UGS facility until 1995, which it plans to refurbish and expand with the support of Gazprom (see above on South Stream). Based on Central European experience, the capacity of UGS in depleted fields and aquifers should be around 25% of annual natural gas demand (allowing for seasonal modulation). Where source, infrastructure or import dependency is high, more UGS capacity is needed to provide a buffer against possible supply interruptions; UGS capacity is also important to support transit flows, which were some 16 bcm in 2007 (mainly south through Romania and Bulgaria to Turkey).

Applying the rule of 25% coverage, countries of the Western Balkans need to double UGS capacity – *i.e.* increase capacity by 2.5 to 3.0 bcm – as compared to that available in 2000. Capacity also needs to be diversified by type, which requires the addition of more flexible, high send-out capable storage. This can be done on a large scale in areas with substantial salt deposits. Bulgaria already extended its storage capacity (which is accessible to third parties) and plans to commission a new UGS site. Work towards increasing capacity is underway in Serbia and Croatia, but net additions remained limited as of mid-2007.

Discussion

The development of major new oil and natural gas routes in Southeast Europe will have strategic implications for the region and beyond. Transit projects have important effects on energy security and market development as well as other economic, social, environmental and political impacts. Cross-border pipeline projects, even when commercially driven and efficiently operated, need to be compatible or in synergy with national energy policy goals. Transit country governments should undertake independent, global cost/benefit analyses on potential gains as well as the potential negative impacts of proposed projects.

In order to realise potential benefits, transit countries in Southeast Europe need to attract private investors by establishing and maintaining an effective, non-discriminatory and transparent regulatory framework for investment in and operation of cross-border energy projects. This should be achieved in a manner that is consistent with the principles of the Energy Community Treaty and the Energy Charter Treaty.

Progress in these areas varies across the Western Balkan countries. Some are lagging behind in terms of developing a legal framework for investment and transit (*e.g.* Serbia and Montenegro have not yet acceded to the Energy Charter Treaty). The most advanced countries have established attractive conditions for investment, often through co-ordinated and sustained market reform undertaken in preparation for EU membership. The private sector is best suited to judge the commercial viability of any given project – and to take the necessary risks. However, governments also play a key role in fostering projects that will improve energy security.

In a pan-European perspective on energy security and trade, the European Commission has worked together with several European Union and Western Balkan governments to develop regional frameworks for energy investment and market opening. Public authorities across the region have co-operated in defining priority projects for supply and transit of both oil and natural gas. Activity in many countries of the Southeast Europe is also shaped by the political and economic influence of unregulated monopolies or large commercial operators that exercise control over the oil and gas supply chain. This may slow progress overall or generate competing influence over certain oil and gas transit routes, ultimately limiting both diversification and transparency.

In the case of oil transportation projects, and even with ambitious projections of increasing oil inflow to the Black Sea region, volumes will not be sufficient to support all the transportation projects currently on the table. Those include not only the three Bosphorus bypass projects discussed above, but also the Samsun-Ceyhan Trans-Anatolian Pipeline and the Odesa-Brody-Plotsk Pipeline. Medium-term export potential is likely to justify, at peak production based on commercial companies' production schedules, the utilisation of two to three major overland export oil transit routes (including the BTC) in the Black Sea region. Negotiating the export routes for additional volumes of Caspian oil will be complex given the diverse interests of the states and companies involved. Nonetheless, there are already multiple export routes in place for Caspian oil, and diversity and flexibility will help to mitigate the monopoly power of any single state or commercial actor.[74]

The situation is different in the case of natural gas. The Eurasian gas transport system, largely inherited from the Soviet era, was created to supply Soviet (mainly Russian) gas to Western Europe, with transit through Eastern Europe. Since the break-up of the

74. These include: the pipeline from Kazakhstan (Atyrau) north into Russia (Samara); the Caspian Pipeline Consortium pipeline from Kazakhstan (Tengiz) to the Russian Black Sea coast (Novorossisk); the Baku-Tbilisi-Ceyhan pipeline from Azerbaijan to Turkey; pipelines from Azerbaijan (Baku) to Russia (Novorossisk); export routes from Azerbaijan (Baku) to Georgia (Supsa by pipeline, Batumi by rail); barge deliveries to Iran (Neka); and the pipeline eastwards from Kazakhstan (Atasu) to China (Alashankou).

Soviet Union, Russia has sought to maintain and reinforce its control over gas export pipeline systems. Russia has pursued a policy of building new, direct major pipelines, such as Blue Stream (operational to Turkey since 2003) and has proposed new projects, including a Blue Stream II and the Nord Stream pipeline (planned to Germany with the outlook of also reaching the United Kingdom). Russia has also put forward the South Stream project, which would cross the Black Sea to Bulgaria and could supply Southeast Europe en route to markets in Italy and Central Europe.

The BTE pipeline is already supplying natural gas from Azerbaijan to Turkey, and volumes of Caspian gas delivered to Turkey are set to increase. The development of alternative natural gas transit routes (even with modest initial capacities) from new sources in the Caspian basin and the Middle East will be critical to the development of emerging gas markets in the Western Balkans, Bulgaria and Greece. It will also support the diversification of sources of supply to the main European markets. The European Union has highlighted the strategic importance of these new natural gas interconnections and provided support for project development. However, these projects depend on reliable conditions for energy transit and need to prove their added value, security and economic viability compared to existing routes and potential future competing routes. They will also compete against supply sources in the form of LNG, or against other energy sources.

The establishment and development of a reliable and cost-effective, east-west natural gas corridor through Southeast Europe will require major upstream and transportation investment. Planned transmission capacity through 2010 is coherent with upstream development and final market requirements. Implementation has advanced with respect to the first stage of the TGII, with natural gas deliveries commencing to Greece in late 2007 and to Italy planned for 2012. By contrast, the Nabucco project has advanced more slowly than initially anticipated; high costs and delays are related to difficult topography, challenges in sourcing gas, limited gas demand on the SEE transit markets and the need to ensure secure and reliable transit arrangements with countries along the supply route. However, Nabucco would ultimately tap into sources of gas that are currently unavailable to Europe and would enhance diversity of gas supply to the region and to Europe at large – benefits that would not be realised in the case of the South Stream project.

A study (World Bank, 2004) estimated that natural gas from the Caspian basin can be competitive in Europe. In some cases, the value of diversification of sources of supply may justify the payment of a premium price; this is already the case in the Czech Republic with regards to Norwegian natural gas imports, and in Poland, where an LNG terminal is being discussed. In effect, the public interest in terms of security of gas supplies may justify targeted financial and fiscal support for commercial investment. Such support should avoid distorting "gas-to-gas" and "gas-to-other fuel" price competition, and should be effectively regulated.

Development of natural gas supply routes requires significant investment and financial capacities of commercial operators. In practice, this means the involvement of major natural gas importing companies, as well as sufficient demand. Over time, the integration of existing fragmented national markets in the Western Balkans (which are so far mostly supplied by public monopolies) and the growth of a regional gas market will help to improve the economics of future natural gas import and transit projects.

In the absence of effective regulation to promote competitive markets, the strong influence of Gazprom and affiliated companies in Southeast Europe has the effect of limiting or delaying the development of alternative natural gas supplies (for European markets) from the Caspian basin and the Middle East. Gazprom has a very strong resource base in Russia and a variety of commercial tools to slow alternative gas supply development, including its influence in the Caspian basin, its control over existing transportation routes, its sponsorship of major new projects such as South Stream and its growing presence in downstream transportation and distribution markets. Gazprom has gained presence or influence in most of the countries of the region, particularly in Bulgaria and Serbia because of historically close economic and political relations. Russian interest in ensuring that East Caspian gas continues to flow through Russian-controlled pipes was underlined by the announcement (in June 2007) of a new Caspian Coastal Pipeline designed to enhance throughput capacity of Turkmen gas to Russia.

The South Stream project would supply the same markets (Italy, Austria, Southeast Europe) with gas from the same supplier (Russia) as the existing regional natural gas infrastructure. While gas demand is set to rise in all of these markets, the option of supplying them through South Stream is more expensive than through the use or expansion of existing overland routes for Russian export – some of which have spare capacity in any case. This raises questions about the strategic motivation for the South Stream project. Looking at the possible gains to Russia/Gazprom from the South Stream project that might justify the additional cost, two considerations come to the fore. First, the new pipeline project would bypass existing (Ukraine) and potential (Turkey) transit countries for Russian gas, thereby improving Russian leverage in bilateral negotiations with these countries: reducing the "transit risk" affecting Russian exports has been an explicit aim on the Russian side. Second, South Stream complicates the task of making a commercial case for alternative pipelines – notably the Nabucco pipeline – that would link the main European markets directly to Caspian and/or Middle Eastern suppliers through Turkey.

The announcement and development of the South Stream pipeline demonstrates Russia's ability to push forward complex international projects by making bilateral deals with selected consumer and transit countries, both inside and outside the European Union. Where natural gas companies of the European Union and the Western Balkans are heavily dependent on Gazprom and barriers to finding alternative sources of supply exist, it may appear to be rational to reinforce links with the dominant supplier as the best available guarantor of reliable deliveries. This outcome may not, however, be optimal from a broader national, regional or European perspective, since it precludes the enhanced market performance and supply security that can be offered by diversified suppliers of natural gas.

It is possible to achieve the objectives and sustainable results of enhanced energy security through diversified oil and natural gas supplies and infrastructure (transit and interconnection pipelines, storage and LNG). However, it will require the right mix of key players and supporting actors, and a sustained effort to build strong institutional and regulatory frameworks. European operators must work together with partners in the Western Balkans; their combined efforts must be backed by proactive, integrated and co-ordinated EU policy. The European Commission has a crucial role in this process through the development and enforcement of an external component in the common energy policy for the European Union. This component should be based on security of supply, economic competitiveness and environmental protection.

KEY FINDINGS

- Developing new oil and gas transportation routes that link Europe to new supply sources will help to diversify supply, and enhance market performance, efficiency and transparency in the Western Balkans.
- At present, supply diversification is hampered by insufficient market reforms, lack of regional co-operation, inadequate financial support and lack of transparency.
- Governments, with technical and financial assistance from donors, have a crucial role in establishing an efficient and balanced framework for energy investment and trade.
- The number of cross-border oil and gas projects currently planned for the SEE and Black Sea regions exceeds that which can be supported by projected supply from neighbouring resource-rich regions. It also surpasses medium-term projections of downstream market needs.
- Commercial oil and gas operators are best suited to study, implement and operate large projects for energy transportation. For the most part, non-commercially driven projects (*i.e.* those undertaken by public entities) are costly and risk being under-utilised. The possible exception is that of local interconnection projects implemented to promote market integration and regional trading.
- Growing influence and market power from vertically integrated and unregulated monopolies and oligopolies (particularly those in the Russian energy sector), together with slow political and economic reforms, may limit and/or negatively affect the commercial development of potential oil and gas diversification routes.
- Public authorities should act to strengthen and harmonise regulatory institutions and frameworks for investment and cross-border energy flows in line with the principles of the Energy Community Treaty and the Energy Charter Treaty. It is important to ensure that weak regulatory frameworks do not leave the key functions (*e.g.* control of supply, transit and storage infrastructure) open to abuse by a dominant supplier.
- An integrated, resilient and competitive EU gas market, the strategy of its operators and an effective European Union external integrated energy policy are crucial in creating a supportive environment for new diversification routes, provided such routes are economically viable.

III. ENERGY AND POVERTY

INTRODUCTION

A survey of energy policy in the Western Balkans would not be complete without a focus on the links between energy and poverty. This is particularly pertinent because of the wars and conflicts that this region experienced over the 1990s. Those conflicts damaged or destroyed some of the region's energy infrastructure and hampered activity in most economic sectors. The effect is ongoing: because investment flows are limited, the energy infrastructure remains fragile and continues to be a barrier to economic recovery.

Thus, it could be said that the region and the individuals within it are affected by a state of "energy poverty" (see Understanding Energy Poverty). Levels or degrees of energy poverty are very difficult to measure and quantify – especially in a region such as the Western Balkans where institutions responsible for collecting basic energy statistics are in the early stages of development. Accurate and comprehensive data on energy poverty can only be acquired through household surveys, which require a great deal of effort, time and resources.

To date, only a few studies have been undertaken across the region. Their results are not encouraging: they estimate more than 16% of the population in the Western Balkans is exposed to energy poverty. Given the difficulty of measuring energy poverty directly, a simplifying assumption is often made that segments of the population living below the national poverty line are also exposed to energy poverty. Closer examination of the Western Balkan region shows that people living above the national poverty line can also be exposed to energy poverty. In several parts of the region, up to 40% of households are not able to ensure sufficient space heating and also suffer from indoor air pollution caused by inefficient heating and cooking stoves.

Countries with a high incidence of energy poverty face difficult policy choices and challenges. Reducing energy poverty is critical to putting the region on a sustainable energy path. However, efforts to develop effective policies and frameworks to alleviate the situation are seriously hampered by a lack of reliable energy statistics.

ENERGY POVERTY: A REGIONAL CHALLENGE

Understanding energy poverty

The United Nations Development Programme (UNDP, 2004) defines poverty as follows:

"Poverty represents the absence of some basic capabilities to function: a person lacking the opportunity to achieve some minimally acceptable levels of functioning is considered poor. The functions relevant to this analysis can vary from such physical ones as being well nourished, being adequately clothed and sheltered and avoiding preventable morbidity to more complex social achievements, such as partaking in the life of the community. The capability approach reconciles the notions of absolute and relative poverty, since relative deprivation in incomes and commodities can lead to an absolute deprivation in minimum capabilities."

A recent study (UNDP, 2004) delineates five aspects of poverty: environmental, geographic, seasonal, physical and financial. The link between poverty and energy poverty is particularly evident in terms of seasonal impacts in cold climates (Table 14). Winter temperatures affect heating demand and energy prices; if poverty results in inadequate provision of heat for a healthy lifestyle, it ultimately affects the health and productivity of the poorest segments of the population.

Table 14 .... The multi-dimensional nature of poverty

Aspect	Natural assets	Social capital	Human capital	Physical capital	Financial assets
Trends	Productivity	Ownership rights	Demographic trends	Utilisation rates	Discounted revenues
Seasons	Winter Temperatures	Restricted interaction	Excess mortality	Utilisation per season	Seasonal patterns
Shocks	Availability	Deprivation	Strikes	Age of physical assets	Number of wage earners in household
Location	Weather	Share of middle class	Access to health and education	External services	Employment opportunities
Density	Density of resources	Population density	Education levels	Living space per person	Liquidity

Source: Adapted from UNDP, 2004, Based on Barnett 2001.

Energy poverty reflects a lack of energy-related capital: it may be mostly easily explained by describing the opposite condition – *i.e.* that of having adequate energy. In the short term, households should be able to afford energy services within a given structure of energy-related assets. In the longer term, households should be able to maintain healthy living standards and be able to afford all necessary energy services. Energy poverty fails to meet these criteria and can generally be regarded as having three dimensions:

- A general shortage of energy and shortage of peak supply during certain periods.
- Inadequate provision of energy in rural areas due to lack of infrastructure (low quality electricity network, voltage problems, poor demand-side management, etc.).
- The detrimental impact of energy-based pollution on human health.

Overall, energy poverty affects both individuals and economies. Energy poverty in economic sectors reduces activity and employment opportunities, making it difficult for people to earn sufficient income. Energy poverty in the home creates financial strain and reduces standards of living in general. These impacts are particularly noticeable in rural areas where employment opportunities are already limited and incomes are generally low – excessive expenditures on energy (*e.g.* self-generators) consume a larger portion of limited commercial or household budgets. Similarly, the purchase and use of less expensive but inefficient equipment and appliances can create energy-based pollution, which has detrimental effects on human health. In turn, reduced health has direct and indirect costs – *e.g.* the cost of treatment or medication or lost earnings due to reduced productivity.

The energy-poverty link in the Western Balkan region

The general dimensions of energy poverty listed above take on a more specific character in the Western Balkan region. This chapter focuses on three main aspects of energy poverty within the region: insufficient access to energy services; lack of reliable electricity supply; and the inefficient use of energy. Indirect impacts of energy poverty are discussed more broadly including the negative impacts on human health and the environment.

Inadequate access to energy services

Various studies, including those of the UNDP, estimate more than 16% of people in the Western Balkan region are – to a greater or lesser extent – exposed to energy poverty in that they do not have access to sufficient energy services to ensure a healthy lifestyle for themselves and their families.

Lack of reliable electricity supply

Lack of reliable electricity supply is an obstacle to economic development and investment in the region. Seasonal and weather-related peaks in electricity demand lead to black-outs or electricity rationing, or force vertically integrated utilities to maintain considerable reserve capacity, which reduces potential exports and revenues. This lack of reliability in electricity supplies has obvious deleterious effects on industry, reducing the attractiveness of the investment environment and the livelihood of individuals.

Inefficient use of energy

Inefficient energy use – by the population in general and the poor in particular – erratically increases load on the energy infrastructure. This happens most often in response to cold weather and supply shortages in traditional heating fuel, in most cases fuelwood.

Broader impacts of energy poverty

Energy poverty has significant impacts beyond the energy sector in the Western Balkan region. People pay for energy in many different ways. If energy services are subsidised, consumers may pay through higher taxes or, even more indirectly, through costs related to inadequate environmental protection, lower quality of service, or unreliable energy supply. In many cases, poor families face difficult choices in allocating inadequate financial resources to basic family needs. Lack of knowledge and access to information can lead to sub-optimal choices. In many cases, such families buy low quality appliances or fuels that are inefficient, which increases the per unit cost of useful energy consumed. In some cases, governments make special arrangements to provide the poor with sufficient energy services. Thus, these households are not considered to be exposed to energy poverty. However, it may be that their other expenditures (for food, clothing, education, etc.) are insufficient to ensure a healthy lifestyle.

Poor households in the Western Balkan region spend a considerable portion of their income on heating fuel and energy services. This is partly due to inefficient use of energy. Furthermore, the use of inefficient wood stoves has a negative impact on the health of households burning fuelwood. Unsustainable and often illegal wood cutting leads to environmental damage (*e.g.* deforestation), which can also affect the productivity of agricultural land and, thus, the incomes of farmers who are amongst the poorer segments of the population. In addition, many of the poorer segments of urban populations live close to industrial sections of the city and are, therefore, more exposed to the health and environmental impacts of lignite-fired power plants.

Inadequate access to energy services: measuring energy poverty

Energy end-use is an important indicator of actual poverty at both household and national levels. A number of technical surveys and studies on housing and energy efficiency of housing are available for various cities and countries in the Western Balkan region. For the most part, these derive from national statistical offices, which conduct regular household consumption surveys that provide useful physical and financial data. These offices also publish data on forestry, housing and transport.

However, these surveys often fail to provide sufficiently detailed information on the breakdown of household expenditures, including energy expenditures. Moreover, standard poverty surveys assess general consumption in monetary terms (*e.g.* actual energy expenditure) without assessing adequacy. Thus, they provide information about money spent, but offer no hint as to whether the product or service purchased (*e.g.* space or water heating) is adequate or inadequate to meet the basic needs of a given household.

The persistent lack of data on energy poverty in the Western Balkans limits the ability of governments to develop effective energy policy and to integrate such policy with poverty reduction strategies at the national level. To date, no statistical institution in the region has been able to conduct the regular surveys needed to collect the required data. Donor funding has not been sufficient or focused enough to build up these capabilities at the national level, nor to undertake regional comparisons and benchmarking exercises. Developing capacity and acquiring data will be essential to support effective policy and monitor progress.

Despite this lack of data, countries throughout the Western Balkan region have developed national *Poverty Reduction Strategy Papers (PRSPs)*, which provide in-depth analyses of the poverty situation and related public policies. The papers are usually based on Living Standards Measurement Surveys (LSMS), which compile detailed information on household expenses and on the poverty situation.

In 2003/04, the UNDP conducted a set of complex surveys on energy, environment and poverty in Serbia and Montenegro. To date, no other comprehensive survey has been undertaken to collect the data necessary to assess energy poverty in other parts of the Western Balkan region. Such surveys are critical in establishing a baseline of energy poverty and in tracking progress in efforts to alleviate it.

The World Bank assesses poverty using a methodology that measures Unmet Basic Needs (UBN), which includes inadequate electricity supply. A household is classified "poor" if two or more basic needs are unmet. The World Bank's *Poverty Assessment for Albania* (2003) indicates considerable non-income related poverty (Table 15).

Table 15 ....Unmet Basic Needs (UBN) in Albania (%)

	Tirana	Urban	Rural	Total
1. Inadequate water and sanitation (*)	0.5	2.6	28.6	**17.5**
2. Inadequate housing (**)	8.5	6.3	16.5	**12.5**
3. Inadequate energy supply (***)	1.7	9.0	18.1	**13.5**
4. Crowding (more than 3 persons/room)	10.3	15.6	18.6	**16.7**
5. Education (household head with primary or less)	34.7	47.0	74.8	**61.2**
Poor (two or more UBN)	11.5	16.6	47.2	**33.8**
Extreme poor (three or more UBN)	2.3	3.2	18.3	**11.9**
Not poor (one or no UBN)	**88.5**	**83.4**	**52.9**	**66.2**

* Inadequate water and sanitation: running water and piped WC are both unavailable for water and sanitation.
** Subjective assessment (house inadequate for living or under construction).
*** Inadequate energy supply: power shut off for 6 hours or more per day.
Source: World Bank, 2003.

This World Bank study revealed significant differences in access to electricity amongst the population of Albania. Across the country, electricity is often shut off for six hours or more per day. However, these shutdowns create a much larger disruption in rural areas, where they affect 18.1% of the population than in urban areas (9.0%) or in the capital city of Tirana (1.7%). In Albania, the lack of electricity – in volume, quality and security of supply – is an important obstacle for economic and human development, especially in rural areas.

Using the UBN methodology, the World Bank estimates that more than one-third of Albania's population is poor. A weakness of this type of assessment, however, is that it does not consider inadequate housing or crowding in detail. It also fails to reflect an important distinction between summer and winter periods, the latter of which is characterised by reduced living space due to an inability to heat all rooms in a given dwelling.

In 2003, the European Bank for Reconstruction and Development (EBRD) sponsored an energy affordability study covering Western Balkan countries (among others), which provides further insight into the relations between energy and poverty. Being the first of its kind in the region, the study is of vital importance. However, it has several limitations.

In the EBRD study, the concept of "affordability" applies only to network energy, notably electricity. Thus, it does not consider either the issue of inadequate energy services or the impact of extensive use of fuelwood in the region. Another weakness is that the study does not assess how eventual nominal increases in electricity prices will affect the prices of alternative fuels. The electricity price acts as an effective price cap for other prices. Electricity is the immediate replacement for fuels such as fuelwood and natural gas; thus, increases in electricity prices imply a corresponding increase in the alternatives.

The EBRD study highlights the relatively low electricity consumption of poor households in the region. It suggests that some countries should consider establishing "lifeline" tariffs, which offer a lower tariff for electricity volumes up to a certain level of basic need per month (hence, the term "lifeline"). In countries that use subsidised DH services to supply a considerable portion of the population (*e.g.* Serbia), lifeline tariffs tend to improve living standards. This is largely due to the fact that households connected to DH systems tend to consume less electricity during the winter than houses not connected to the system. However, the scope of this approach is limited in that district heating is available only in densely populated areas – *i.e.* areas in which the incidence of poverty is lowest.

Poverty and unreliable electricity supply

Energy consumption patterns in the Western Balkan region reflect the unreliable nature of electricity supply. Many consumers effectively "double up" systems, most often by using two or more modes of heating (*e.g.* electricity and fuelwood). In winter cold periods, when fuelwood supply is unable to match increased demand, consumers turn to electric heaters to as a supplement, which leads to added loads on the electricity network. In turn, this increased electricity consumption pushes up prices and/or strains the system, leading to black-outs or rationing. Both of these eventualities, higher prices or reduced access to electricity, feed into the vicious cycle of energy poverty.

Box 1 .... The importance of fuelwood in the Western Balkan region

Use of fuelwood is widespread throughout the Western Balkan region. In fact, some surveys show that consumption is much higher than reflected in official statistics. For instance, in Serbia, some surveys estimate that typical fuelwood consumption over the last several years has reached 12 Mcm in winter; official statistics report only about 2 Mcm. Fuelwood consumption in Kosovo is estimated at more than 2 Mcm – more than five times higher than official statistics. Similar situations are found in Albania, Bosnia and Herzegovina, FYR Macedonia and Montenegro; the difference between estimates and official statistics is less dramatic in Croatia.

Most households use fuelwood from their own forests including orchards and short-harvesting forests maintained specifically for this purpose. Fuelwood can also be bought on the open market. Since fuelwood does not have direct production costs, its market price is determined by the most readily available substitute. This is electricity in most of the Western Balkan region, and natural gas in parts of Croatia.

During very cold periods, when higher demand puts pressure on the supply of fuelwood, its marginal cost rises above the price of electricity, which remains relatively flat. Poorer consumers in rural areas then supplement their fuelwood heating (the main source of heating) with electricity; in urban areas, electricity is used to supplement unreliable DH services.

These practices explain the excessive peaks in electricity demand during cold periods. In turn, the peaks force electric utilities of the Western Balkan region to maintain considerable reserve capacity in both generation and distribution networks. The net result is a combination of low average utilisation rates and higher unit costs. These consumption patterns affect the affordability of electricity supply at the national level. However, the impact is particularly severe for settlements and geographical areas that are already exposed disproportionately to poverty. The pattern also has a negative impact on national revenues in that it decreases the export potential of peak power of hydroelectric plants.

The specific challenges vary across the Western Balkan region:

Albania: Fuelwood consumption is very high, particularly in rural and mountainous areas. In 2005, reported consumption was equivalent to 230 ktoe (or almost 11% of TFC). However, several estimations (based on energy consumption surveys) indicate that actual consumption may be 300 to 350 ktoe.

Bosnia and Herzegovina: More than 60% of the population, including almost all poor families in rural and suburban areas, uses fuelwood as their main source of fuel for space heating. Fuelwood officially accounts for 6% of TFC (estimates based on demand surveys indicate around 15%).

Croatia: Fuelwood accounts for only 5% of TFC and 20% of household heating needs. This could increase if natural gas prices are set to marginal costs.

FYR Macedonia: Increasing electricity prices have led to increased energy poverty, which is reflected in a rapid increase (44%) in the use of biomass (mostly fuelwood) between 1991 and 2005, reaching 12% of TFC.

Montenegro: Official sources report fuelwood consumption of 150 000 to 220 000 m^3 per year (5% of TFC); actual use is estimated at 1.2 Mcm (18% of TFC according to household surveys).

Serbia: An estimated 12 Mcm of wood is used per year (or 1.5 Mtoe); the estimated sustainable use of forestry stock is only about 6 Mcm (or 0.75 Mtoe). Household surveys and forestry reports suggest that fuelwood is used for approximately two-thirds of space heating needs. According to supply data, fuelwood accounts for 5% of TFC; estimates based on demand surveys indicate 18%.

Kosovo: Fuelwood is widely used by households and industries. Annual wood stock is about 32 Mcm with an annual growth of 600 000 m^3; about 400 000 m^3 is used as fuel each year (or 20% of TFC).

Note: Data sources are indicated in the individual policy surveys.

The lack of reliable electricity supply is a key problem for economic development and investment throughout the Western Balkan region, but the effect is particularly pronounced in Albania and Kosovo. Frequent black-outs or electricity rationing limit investment and negatively affect the investment climate by stunting economic growth and development. Larger countries (*e.g.* Bosnia and Herzegovina, and Serbia) with large electricity baseload capacities are less affected; however, even in these countries erratic electricity consumption patterns (particularly during winter months) raise red flags to investors. More efficient use of energy across the region will be critical to reducing loads on the fragile electricity networks.

In most of the Western Balkan region, the energy infrastructure shows low utilisation rates, meaning that more assets or capital are engaged per unit of output. Only FYR Macedonia is able to arrange for relatively high utilisation rates of its energy infrastructure.

Security and quality of DH services is of particular importance in the Western Balkan region. In most cities, DH services are linked to the electricity network, which provides power for circulation pumps and DH systems. Some DH systems are connected to local grids but have no backup supply. Thus, there is a risk of service disruptions during black-outs.

A 2004 UNDP survey in Serbia revealed that half of DH consumers owned electric heating devices, and that 17% of consumers used such devices to supplement DH services. This is most likely to occur if cold weather hits during the autumn or spring when DH services are not available; consumers are likely to rely on electric heating.

Throughout the region, consumers often feel compelled to maintain more than one sort of heating system in order to reduce the risk of supply interruptions. When limited household resources are spread across a larger number of heating devices, consumers may actually spend more for maintenance, fuel stocks and replacement. However, they are less likely to select more specialised and efficient devices. In addition, they prolong the service life of appliances and heating devices to avoid replacement costs. This behaviour is evident across the population of the Western Balkan region as a whole, not only amongst the poor. However, because of lower household incomes, the cost of this doubling up of capacity has a more dramatic impact on poorer households.

This phenomenon of doubling up extends to consumer efforts to ensure the security and quality of food and water supplies at affordable and predictable prices, which can also affect energy use. In Serbia, for example, more than half of households use large deep freezers to cope with fluctuations in food prices. This increases the base load in Serbia's electricity system and affects overall energy efficiency in that industrial deep freeze storage is much more economic.

Discussion

Energy poverty in the Western Balkan region is closely linked to the fragility of electricity networks; poor reliability prompts consumers to take measures that ultimately have a negative effect on the system itself. Energy market reforms also play a role: most countries are in the early stages of electricity liberalisation and newly established electricity system regulators are ill-equipped to adequately address problems of system reliability. Furthermore, there is little co-operation between the regulators and organisations working to protect consumers in the region. Regulators established within the last few years have not yet had enough time to develop appropriate regulatory practices regarding security, reliability and quality of supply to domestic end-users.

Inefficient use of energy

The Western Balkan region is characterised by high energy intensity, which can be attributed to three primary factors: the energy-intensive nature of the industrial sector; the use of inefficient technology in the energy sector, in industry and at the household level; and poor building insulation in residential and commercial sectors. Governments in the region are at varying stages in formulating their energy efficiency strategies. It is evident that all have much to gain – estimates of potential energy savings range from 25 to 35% of national energy consumption – and that all have a long way to go.

Most available technical studies and surveys confirm the low energy efficiency of housing stock in the region, estimating that residential consumption for heating is two to three times higher than in Western Europe. In addition, the heat supply to the housing stock is of low efficiency. Light heating stoves that burn fuelwood are the most common heating device (used in 50 to 85% of households);[75] the fuel efficiency of these stoves is estimated at only about 20%.

District heating is available in some urban areas, but existing DH systems supply low-grade heat produced from fossil fuels in heat-only boilers. The disadvantage of heat-only boilers is that they extract heat from the main steam cycle: in effect, the energy from the combustion of natural gas or other fuels is used only to produce hot water without producing high value energy such as steam or electricity. Thus, these systems are less efficient than co-generation or combined heat and power (CHP) systems. In the Western Balkans, this low efficiency is often aggravated by the low utilisation rates due to short heating seasons.

Discussion

Given the widespread nature of poverty and energy poverty in the Western Balkan region, one would expect improving energy efficiency (particularly for poor households and public buildings) to be a major focus of national poverty reduction strategies.

75. This is not true of Croatia, where 90% of the population use individual heating systems based mainly on natural gas and LPG. Electricity and fuelwood (accounting for 5% of TFC) are used to a much lesser extent in Croatia than in other parts of the Western Balkan region.

Unfortunately, this is not the case: there has been little to no co-ordination between energy policies and poverty reduction policies. Programmes to improve energy efficiency are not part of any poverty reduction strategy in the region. Monetary, fiscal and social welfare mechanisms are implemented to provide short-term alleviation of poverty and depend often largely on international assistance.

Taking action on energy poverty

Most governments in the Western Balkan region have developed national *Poverty Reduction Strategy Papers* (PRSPs). However, there is still a lack of information on inter-relations between energy and poverty. Analysis of energy poverty requires more in-depth information at the household or apartment level in order to assess whether energy needs are adequately met. This type of assessment is critical to providing administrations with the data and information they need to develop effective energy policies or take wise investment decisions.

Institutions or intra-governmental committees dealing with poverty reduction have been established across the Western Balkan region. Many governments have also established energy efficiency agencies or similar institutions. Most are also advancing in their efforts to formulate energy statistics systems to collect and disseminate energy data; several statistical institutions now have the capacity and capability to conduct relatively complex household surveys.

Box 2.................. Energy poverty recognised by the Energy Community

In October 2007, Southeast European (SEE) countries, including the Western Balkans, signed an MoU that recognises the social effects associated with energy market reforms as envisaged by the Energy Community Treaty. These include:

- The impact of increasing energy prices on vulnerable groups.
- The impact of mine closures and of the re-structuring/privatisation of energy companies, including overall reduction of employment.
- The related impact on cities and municipalities that depend on local energy supply companies.

The MoU signifies the political intent of the signatories to take due account of the social dimension within the context of the Energy Community Treaty. It also invites the European Commission to develop strategies to deal with the wider social dimension covering the issues of affordability, energy poverty, DH reform, rural distribution, isolated systems and societal impacts of reforms.

At the regional level, there is growing co-operation amongst statistical offices, Chambers of Commerce, energy regulators and energy ministries. The Energy Community Secretariat facilitates regional co-operation on an ongoing basis. A benchmarking system has been set up to measure progress in the areas of market reforms and regulation. A regular forum on poverty reduction strategies provides an opportunity for stakeholders from across the region to gather and exchange experiences, ideas and lessons learned. The Fourth Poverty Reduction Strategy Forum (held in June 2007 in Athens, Greece) was dedicated to the inter-relation between energy and poverty.

Some governments in the region conduct Standard Poverty Surveys. Adapting these surveys to include a more comprehensive focus on energy aspects of poverty would be a significant step forward in raising the standards of living and putting this region on a more equal footing with its European neighbours. The most pressing need is to prioritise the collection of data on the affordability of fuelwood, the most widespread mode of heating in the Western Balkan region.

Governments in the region are using various tools to address the issue of electricity poverty in particular. Albania, Serbia and Kosovo have adopted block electricity tariffs with lower first-tier pricing in order to provide households a minimum of electricity supply at affordable prices. The block electricity tariff is more effective than the general subsidy created by a single low-level tariff structure, which often has social and/or political aims. The following examples provide an opportunity to compare various approaches.

Since 1992, FYR Macedonia has raised electricity prices by some 500% (150% in real terms). However, prices still do not reflect all costs. The government aims to address this by eliminating overall energy subsidies that result from low electricity prices, and establishing a more targeted social assistance scheme. Electricity prices are similarly too low in Bosnia and Herzegovina and in Serbia, and distort the entire energy market. There is a clear need to analyse the costs and benefits of this indirect support system and, if justified, to establish a transparent, direct subsidy scheme. Montenegro plans to eliminate electricity cross-subsidies over the next five years, primarily through a gradual increase in residential tariffs and the introduction of targeted subsidies for the poor. Meanwhile, in Croatia, household surveys indicate that electricity prices do not significantly impact household budgets, reflecting the relatively low use of electricity for space and water heating.[76]

Albania has already established a direct and targeted cash subsidy for identified vulnerable households. The Ministry of Social Affairs identified around 190 000 households that have received, in total, an allocation of EUR 5 million against paid electricity bills[77] for the first tier tariff (below 220 kWh/month). This type of social programme could be coupled with future programmes that support energy efficiency. For example, installation of thermal insulation in buildings and efficient wood stoves in households could serve to sustainably reduce energy consumption and energy bills, while also improving living standards.

76. Most of household energy needs in central and northern parts of Croatia are covered by domestic natural gas that is priced below its marginal costs.

77. Consumers receive an allocation upon presenting proof of bill payment.

ENERGY POVERTY ACROSS THE WESTERN BALKAN REGION

Analysis of energy poverty across the Western Balkan region reveals both unique problems and issues that are similar across all countries. As noted above, one of the most widespread concerns is the complex connection between the extensive use of fuelwood and the excessive use of electricity. More efficient use of energy would go a long way to reducing the heavy share of energy products in the basket of basic household needs. Providing poor families with information and effective advice, as well as appropriate energy efficient devices, could support other types of social assistance programmes across the region.

Albania

Key issues

- ***Intensive and inefficient use of electricity and fuelwood***
- ***High energy bills***
- ***Energy efficiency of housing and appliances***
- ***Reliability of electricity supply***

Albania has the lowest per capita income in the Western Balkan region. Poverty is widespread, affecting about 18.5% of the population (in 2005). The incidence of poverty is almost twice as high in rural areas compared to urban areas. Still, the overall situation is improving: the level of poverty was 25.4% in 2002. Much of this improvement derives from rapid economic growth in recent years.

Over the past decade, Albania experienced a massive population migration from rural to urban areas, particularly to the capital of Tirana. Emigration abroad, particularly to Greece and Italy, has been a second significant trend, for both long-term and temporary migrants. These working migrants provide a steady stream of remittances, which now make up the largest source of foreign exchange (estimated at more than 14% of GDP). These remittances also reduce significantly the level of poverty in their home country. Almost 50% of Albanian households have access to migration networks, which act as an important social safety net.

Inadequate energy supply and inefficient use of energy are key contributing factors to poverty in Albania. The World Bank's *Albania Poverty Assessment* (2003) states that:

"While the coverage of the (electricity) network is virtually universal, delivery of the service is highly unreliable, and the situation is worse in rural communities. In 2003, households had no electricity in average for five hours per day (urban areas: 3.5 hours and rural areas: six hours) compared to 8.5 hours in average the previous years. Since then, the situation had improved until 2007 and degraded again."

Fuelwood is extensively consumed, particularly in rural and mountainous areas, and accounts for more than 10% of TPES. Despite being the most important source of energy for low-income households, it is typically consumed inefficiently – *i.e.* in low-efficiency stoves in poorly insulated houses. Overall, inefficient consumption of energy (particularly electricity and fuelwood) by vulnerable households absorbs more than 20% of their revenues – at the expense of other basic needs.

Albania has repeatedly incorporated the need to address energy issues in various strategies, assessments and reports that focus on socio-economic development and poverty reduction. For example, effort has been made to expand the market share of LPG as an alternative to electricity and fuelwood for space heating and cooking. LPG has the advantage of being more reliable in terms of supply, as well as more flexible and cleaner to use. However, it is still relatively expensive and not widely available in the country.

Albania has a comprehensive poverty reduction framework, which was elaborated by the *National Strategy for Growth and Poverty Reduction* (2001). The *National Strategy for Socio–Economic Development* (2003) and its *Action Plan* (2005-08) combine the main policies of the government for reducing poverty. In 2005, a Department of Strategy and Donor Co-ordination (DSDC) was established in the Office of the Council of Ministers to co-ordinate a national integrated planning system through various ministries and the inter-ministerial Strategic Planning Committee (which reports to the Council of Ministers).

Albania's *Energy Strategy of 2003* and its update in 2007 aim to improve conventional energy supply by implementing a broad reform agenda that includes three key elements: re-structuring and privatisation of parts of the energy sector; introduction of block electricity tariffs; and direct subsidy schemes for vulnerable households.

In 2002, Albania's electricity tariff system set a lower residential tariff for the first 300 kWh consumed per month (the consumption level was subsequently lowered to 220 kWh per month in 2004). Above this limit, the tariff doubled. This two-tiered tariff system targeted essential electricity use (lighting, cooking and, electric appliances) by the population and sought to limit excessive electricity consumption (particularly for space heating). Since 2004, the Ministry of Social Affairs has provided a cash subsidy to about 190 000 households to cover the first-tier tariff of electricity bills. In the same year, the government exempted the agricultural sector from having to pay the excise tax on oil products, which accounts for 45% of the total price. This has stimulated a 15% increase in mechanisation and a 15 to 20% increase in land cultivation.

Discussion

The Albanian government has prioritised the availability of electricity for basic household needs and other fuels (*e.g.* LPG) for space and water heating, and for cooking. The direct electricity subsidy scheme is considered to adequately target vulnerable households.

However, low energy efficiency, poor economics of fuelwood use, and a lack of rigorous forest management practices are leading to unsustainable dependence on this renewable resource by a large portion of the Albanian population. The Albanian *Energy Strategy* recognises the importance of regular electricity supply for the country's economic development and the livelihood of its population; to date, there is not enough focus on establishing a comprehensive policy for effective and efficient use of fuelwood resources. Unfortunately, it appears that the government considers Albania's forests to be sufficiently large to withstand the current high and non-sustainable exploitation rates for local and export markets.

Bosnia and Herzegovina

Key issues

- ***Energy efficiency within poor households***
- ***Extensive and inefficient use of fuelwood***
- ***Environmental impacts of energy facilities***
- ***Fuel poverty***

Poverty is considered a major problem in Bosnia and Herzegovina: 18% of the population earns less than EUR 100 per month. Other estimates indicate that an additional 30% of the population is living close to the poverty line. As in most countries, the poor in Bosnia and Herzegovina are concentrated in rural and mixed (suburban) areas, and experience higher unemployment rates. Overall unemployment has increased from about 40% in 2003 to about 46% (or 540 000 people) at the beginning of 2007. Further increases in the unemployment rate are expected as a result of re-structuring and labour productivity improvement in coal mines. Poverty is unevenly spread across the country: some 25% of the population of Republika Srpska are affected, whereas only 16% are affected in the Federation of Bosnia and Herzegovina.

In Bosnia and Herzegovina, inefficient consumption of energy absorbs more than 20% of the incomes in poor households. More than 60% of the population uses fuelwood as their main source of fuel for space heating, including almost all poor families in rural and suburban areas. Fuelwood is used in low-efficiency stoves, leading to high indoor and outdoor pollution as well as higher than necessary expenses for space heating, which contributes to the overall poverty cycle. Electricity is also used extensively for space and water heating.

Electricity exports are a major source of revenue for the electrical utilities in the Federation of Bosnia and Herzegovina and the Republic of Srpska. Fuelwood is also exported to neighbouring countries, but mostly illegally. Another consequence of inefficient use of fuelwood is that it becomes relatively expensive during the heating season, thereby limiting its stable supply to the domestic wood-processing industry, once a major source of revenue and employment in Bosnia and Herzegovina.

The UN Food and Agriculture Organisation's 2004 country report for Bosnia and Herzegovina indicates uncontrolled wood harvesting as the main cause for the decrease in the quality of forests. It also estimates a higher loss (about 10% more) of the forest stock compared to official country data.

Energy production also affects indirectly the poorest segments of the population in that some energy facilities create negative environmental impacts over large agriculture and forest areas (*e.g.* catchment areas on the Ugljevik, Tuzla, Kakanj and Neretva Rivers). This reduces agriculture and forest productivity, leading to yet more poverty. To date, there are no strategies in place to address these environmental impacts, either by the government or the energy facilities themselves.

A number of surveys, assessments and studies assess the poverty situation in the country; the *Poverty Reduction Strategy Paper (PRSP*) is the main national guideline for taking action against it. The country's key analytical tool for poverty analysis is the Living Standards Measurement Survey (LSMS), completed in 2001.

Discussion

The *PRSP* for Bosnia and Herzegovina is a critical planning tool for development in the country. Its analysis of the relations between the energy sector and poverty take into account how this link affects GDP, employment and competitiveness. However, the *PRSP* does not consider the inter-relation between poverty and energy consumption patterns of the poorer segments of the population – even though it recognises that inefficient energy use by poor families is a major contributor to poverty, specifically among the rural and suburban poor.

A workable and practical heating strategy for poor families in Bosnia and Herzegovina does not exist. The urgency of this issue may be dampened by the fact that the country has a large forest resource in comparison to the size of the population. However, low-cost, easy options to improve energy efficiency are available and could provide significant opportunities to improve – in a sustainable manner – the poverty profile in Bosnia and Herzegovina.

Croatia

Key issues

- ***Energy bills of poor and elderly households***
- ***Energy efficiency***
- ***Employment***

Croatia has the highest revenue per capita in the Western Balkan region. Social indicators for the country are broadly in line with those of upper middle–income countries of Europe. However, total employment lags behind GDP growth, with long-term unemployment remaining a key problem. There are significant regional disparities in income: households in the Continental Eastern and Adriatic South regions face a higher risk of poverty and have lower employment opportunities than households in the capital of Zagreb and other parts of the country.

Poverty is less widespread in Croatia than in the rest of the Western Balkan region; however, it is relatively persistent and has changed little in recent years. On average, poverty still affects about 11% of the population, with another 10% at risk of poverty.

In rural areas, the poverty rate soars to more than 18%. Small (one to two members) and large (six or more members) households are at a higher risk of being affected by poverty than intermediate households. The elderly in Croatia are twice as likely to be affected by poverty.

Household budget surveys in Croatia indicate that electricity prices do not have a significant impact on household budgets, reflecting the relatively low use of electricity for space and water heating. Even though it is well known that small and large households, as well as the elderly, are more at risk of poverty, there is no appropriate national programme to support energy efficiency improvements in these households. Such a programme could, in turn, provide growth and employment in the domestic service sector.

Discussion

Although Croatia has managed to moderate the incidence of poverty, it is still a problem in eastern and central regions of the country, particularly in rural areas. Proactive national energy policy to diversify energy sources and enhance energy security could have positive effects. However, it remains to be seen if the envisaged extension of the natural gas distribution network will be achieved in time to mitigate the decline in domestic production and rising production costs.

Long-term unemployment remains a problem in Croatia. However, the country has extensive experience in the development of small- and medium-sized enterprises, and strong job creation in that sector. These strengths could be reinforced through strong policy to support renewable energy and energy efficiency (notably insulation of buildings and upgrading or replacement of equipment such as stoves, boilers and appliances).

FYR Macedonia

Key issues

- ***Poverty***
- ***Fuel poverty***
- ***Energy efficiency***
- ***Extensive and inefficient use of fuelwood***
- ***Indoor pollution***

Poverty in FYR Macedonia is largely the result of declining GDP during the 1990s and the subsequent rise in the inequality of income distribution. About 20% of the population lives below the official poverty line of EUR 60 per month. The World Bank's *PRSP* for FYR Macedonia defines the poor as households with less than 60% of the median household income. Poverty is most widespread in rural areas and in larger households having more unemployed or less-educated members. Although 87% of FYR Macedonia is rural, and 40% of the population lives in rural settlements, about 65% of rural settlements are experiencing a decline in population.

The poor in FYR Macedonia are less able to relocate (find alternative employment, move homes, etc.) and are, therefore, disproportionately affected by pollution-related health problems. The costs associated with these health problems further strain their disposable income. Official records show a significant incidence of latent bronchial obstructions among adults living in the vicinity of FYR Macedonia's largest thermal power plant (Bitola). Children of primary school age living near the industrial zone of the city of Bitola show higher rates bronchitis (due to exposure to air pollution) than do their counterparts from a relatively clean part of the city, Nova Bitola. Compared to other settlements, higher mortality rates due to acute pharyngitis, tonsillitis and tracheitis are registered in the polluted industrial areas of Veles, Probistip, Tetovo and Kratovo.

The government of FYR Macedonia adopted the *interim PRSP* in November 2000. The *PRSP* reported an increase in poverty levels, from 18% in 1996 to 20% in 1998. FYR Macedonia's *Report on the Millennium Development Goals* (published in June 2005), indicates a further increase – to 30% – in 2003. The *Report* also pointed to the high incidence of long-term unemployment, which accounts for 85% of the total unemployment rate of more than 40%. The *interim PRSP* identifies three main objectives: acceleration of economic growth; job creation; and improvements in the social safety net.

Despite the relation between energy and poverty, FYR Macedonia's *interim PRSP* does not include any energy-related measures. Since its publication, transformation of the energy sector has led to skyrocketing energy prices in the country: since 1991, prices have increased more than 500% in absolute terms and about 150% in inflation-adjusted terms. This led to an expansion of energy poverty among the population during the 1990s, which is reflected in a significant rise (44% between 1991 and 2005) in the use of biomass (mostly fuelwood) as the most affordable and easily accessible means of obtaining heat. As of early 2008, about 70% of FYR Macedonia's population relies on biomass for heating. This percentage is even higher in rural areas.

Discussion

Lack of reliable and good quality energy supply is a critical determinant of poverty in FYR Macedonia. Unfortunately, interlinkages between energy, employment and poverty are not incorporated into the *interim PRSP*.

The government aims to replace overall energy subsidies (which are delivered indiscriminately through low electricity prices) by a more targeted social assistance scheme. A comprehensive and workable policy to enhance the efficiency of energy use is needed as a critical tool to reduce poverty. Given the long-term nature of poverty and unemployment in FYR Macedonia, there is a clear need for vigorous policy changes, backed by co-ordinated institutional and legal frameworks.

Montenegro

Key issues

- ***Reduced heated living space***
- ***Energy efficiency***
- ***Extensive and inefficient use of fuelwood***

Poverty affects about 12% of Montenegro's total population (including refugees and displaced persons). The country's level of income inequality is one of the highest in the Western Balkan region. Most of the poor are located in northern Montenegro; there is a much lower incidence of poverty along the coast.

Montenegro's *PRSP*, adopted in 2003, effectively considers links between energy and poverty. It envisages the risk of a further increase in poverty due to the planned increase in real electricity tariffs, and prescribes close monitoring through regular household expenditure surveys. The *PRSP* recognises the causal link between higher electricity prices, increased use of fuelwood and subsequent increases in the price of fuelwood. It also recognises that as energy prices rise, more of a household's disposable income is directed to meet heating needs and less is available for other essentials.

Montenegro's energy strategy documents highlight the need for direct and targeted subsidies to limit the impact of electricity price increases on poorer segments of the population. The country's draft *Energy Strategy* is well co-ordinated with the *PRSP*. Montenegro also conducts regular household expenditure surveys and plans to calculate fuelwood use (in official energy statistics) based on these surveys.

Discussion

Compared to other countries in the Western Balkan region, energy poverty is exceptionally well integrated in Montenegro's policy documents for both poverty and energy poverty. The government has a clear understanding of the links between energy and poverty; the problem is relatively well documented in statistics that derive from regular household expenditure surveys. The *PRSP* prescribes even more detailed bi-annual energy poverty surveys, which will include questions on heating devices and household heating strategies.

At present, the practice of reducing heated living space in the winter is not properly reflected in the available research and policy documents. Nor is there specific focus on improving the efficiency of fuelwood use, despite the significant role this could play both in lifting households out of poverty and in reducing electricity network loads and losses, which would enhance the quality of electricity supply. Clearly this would also lead to a more sustainable use of forest resources. These opportunities could be addressed within a comprehensive national heating strategy.

Serbia

Key issues

- ***High domestic energy demand and high waste***
- ***Intensive and inefficient use of fuelwood***

The *PRSP*, adopted by the government in October 2003, states that poverty affects approximately 11% of households in Serbia, meaning that about 800 000 people live below the poverty line of less than EUR 71 per month. The rate of poverty is highest in isolated rural areas and in cities in which large industries have been closed. The groups most at risk include the elderly, unemployed, refugees and displaced persons, the disabled and the Roma population.

Energy poverty is widespread in Serbia: at least 38% of households (UNDP, 2004) cannot afford sufficient heating for even limited parts of their living space. Households normally heat less than 10 m^2 of living space per person during the winter season; often even this limited space is not heated to a sufficiently high temperature to maintain a minimum standard of living. On top of this, indoor air pollution is widespread due to extensive use of fuelwood.

Almost 75% of households spend more than 15% of their disposable income on energy, despite direct subsidies or cross-subsidies on services (*e.g.* electricity, district heating, lignite or fuelwood) provided by public companies. Most households maintain more than one heating system in order to cope with the lack of reliability of heat supply. For example, 50% of households connected to DH systems own electric heating devices and 17% regularly use both. The low efficiency of common fuelwood stoves is a key factor contributing to energy poverty, as is poor thermal insulation of the housing stock.

The *PRSP* includes comprehensive measures to facilitate poverty reduction through improved provision of energy. The Poverty Reduction Strategy Office, within the Vice Prime Minister's Office, has the responsibility for poverty reduction.

Discussion

Serbia's *PRSP* contains provisions on the role of energy efficiency improvements; however, its energy policies do not focus on poverty reduction.

A possible temporary solution to this problem is to provide impoverished households with direct and targeted support by allotting a fixed amount of electricity to meet basic needs during difficult/cold periods. Such a direct system of subsidies could strengthen the price cap on fuelwood in the open market and improve the welfare of the poor. A more effective, economic and sustainable option is to improve the thermal insulation of buildings and the performance of the appliances (particularly stoves and boilers). This approach would reduce both energy waste and energy poverty.

Kosovo

Key issues

- ***Complexity in design and implementation of support programmes***
- ***Extensive and inefficient use of fuelwood***
- ***Energy efficiency***

Approximately 37% of the population of Kosovo lives in poverty, defined as having an income below EUR 40 per month. Almost half of these individuals (15% of the population) live in extreme poverty – *i.e.* have an income of about EUR 30 per month.

The groups most at risk in terms of income poverty include children, the elderly, single-mothers, the disabled, the unemployed and temporary workers, residents of secondary cities and non-Serb ethnic minorities (such as Roma). Kosovo has the highest infant mortality rate in SEE; inadequate nutrition is a persistent problem. In older populations, tuberculosis, disability and mental health problems are major issues. Some 6% of Kosovo's adult population is illiterate; only about 50% have completed primary school.

Energy poverty is closely linked to general poverty in Kosovo and is a crucial issue for specific low-income and minority groups. On average, only 40% of residential houses are properly heated. Currently, the average family directs about 4.2% of total expenditures toward electricity. This is lower than most SEE countries,[78] largely because electricity tariffs for low-income households do not cover costs and non-payment is frequent. The largest energy expenditure is for solid fuels, mostly fuelwood.

Discussion

Energy poverty is a crucial issue for a large part of the Kosovar population using electricity or fuelwood. Non-payments and illegal electricity connections (theft), as well as illegal wood cutting and fuelwood imports, are widespread and difficult to control for social reasons.

Enhancing the reliability of electricity supply in Kosovo is a critical task facing the government and KEK, the state electricity company. One way to reduce the load on the electricity system is through the introduction of alternative fuels (*e.g.* LPG or dried coal) for residential heating and cooking. LPG could reduce electricity demand and the use of fuelwood. It would also help to limit non-payments because consumers have to buy canisters as they use them. In the early stages of introducing alternative fuels, it will be necessary to undertake information campaigns to ensure the safe and efficient use of LPG stoves. Another priority is to develop an energy poverty programme targeting the most vulnerable households to provide basic insulation and efficient heating equipment (*e.g.* boilers).

However, if approved by the Kosovo Energy Regulatory Office (ERO), a new tariff system proposed by KEK (in February 2007) – which sought to abolish the so-called "lifeline" tariff – would likely increase demand for fuelwood. To date the lifeline tariff remains in place.

78. Bosnia and Herzegovina – 5.4%; Bulgaria – 7.3%; Croatia – 3.9%; FYR Macedonia – 5.3%; Romania – 4.6%; Serbia – 5.5%.

KEY FINDINGS AND RECOMMENDATIONS

In taking action on energy poverty, public authorities in the Western Balkans are encouraged to:

- Reinforce the frameworks for poverty reduction strategies to better integrate cross-cutting aspects (*e.g.* energy poverty, energy efficiency and environmental impacts of energy facilities).
- Improve policy co-ordination and integration amongst relevant sectors (economic, social, employment and energy policies and regulation) at the national level and within regional poverty reduction programmes.
- Include energy poverty in regular statistical surveys and develop indicators for policy monitoring.
- Facilitate the development of regular national energy poverty surveys in order to support appropriate analyses and regional comparisons as well as complex energy affordability analyses.
- Prioritise energy efficiency within direct and targeted social programmes for vulnerable households (notably through thermal insulation and efficient solid fuel stoves).
- Avoid the use of a single electricity tariff structure to address social issues.
- Support the dissemination of efficient stoves to poorer households as well as the thermal insulation of their buildings, with information campaigns on their efficient use.
- Develop effective regulatory measures to ensure consistent quality of supply and to improve operator response to network failures or insufficiencies in network energy supply.
- Establish regulatory best practices; introduce actual/technical performance indicators to benchmark both operator and regulatory performance.

More specifically, the relevant public authorities may consider the following recommendations useful:

Albania

- Continue to provide direct and targeted electricity subsidies to vulnerable households; complement this measure through energy efficiency improvements (*e.g.* replace inefficient equipment and install better insulation in buildings and households).
- Support the expansion of alternative fuels, particularly fuel switching to LPG.
- Co-ordinate improvements in electricity supply and distribution with improvements in the use of fuelwood in rural areas.

Bosnia and Herzegovina

- Develop an action plan for heating for poor households, with a priority to improve energy efficiency overall and the use of fuelwood in particular.
- Take steps to address the environmental impacts of energy facilities, with a priority of reducing impacts on of the poorer segments of the population living in the most affected areas.

Croatia

- Improve co-ordination amongst energy policy, regulation and regional poverty reduction programmes, notably by prioritising energy efficiency measures or direct support to poor and elderly households.

FYR Macedonia

- Implement the plan to eliminate existing energy subsidies (provided through low electricity prices) and develop more targeted social assistance schemes and energy efficiency measures.
- Focus attention and resources on reducing the health-related impacts on the poorer segments of the population living near major energy facilities (*e.g.* the Bitola lignite power plant).

Montenegro

- Continue to link energy and poverty through the *PRSP*; pursue plans to collect even more detailed information (*e.g.* on heating devices and household heating strategies) in bi-annual surveys focusing on energy poverty.
- Guard against the risk of raising poverty levels due to the planned increase in real electricity tariffs; to this end, carry through with objectives to closely monitor government initiatives and continue conducting regular surveys on household expenditures.
- Develop direct and targeted subsidies to limit the impact of electricity price increases on poorer segments of the population.

Serbia

- Enforce a direct and transparent assistance scheme for the most vulnerable households.
- Reduce environmental impacts of energy facilities (particularly lignite); improve preventive health care for populations in affected areas.

Kosovo

- Prioritise energy efficiency through direct and targeted programmes for vulnerable households (*e.g.* thermal insulation and efficient wood stoves); avoid use of electricity tariffs to address social issues.
- Ensure supply of other fuels (*e.g.* LPG and dried coal) to replace electricity and/or wood for heating.

PART II. ENERGY POLICY SURVEYS

IV. ALBANIA

V. BOSNIA AND HERZEGOVINA

VI. CROATIA

VII. FORMER YUGOSLAV REPUBLIC OF MACEDONIA

VIII. MONTENEGRO

IX. SERBIA

X. KOSOVO

Map 5..................Albania's energy infrastructure

The boundaries and names shown and the designations used on maps included in this publication do not imply official endorsement or acceptance by the IEA.

IV. ALBANIA

ALBANIA'S ENERGY HIGHLIGHTS

Table 16 .... Energy snapshot of Albania, 2005

	Albania	Western Balkan region	OECD Europe
Total primary energy supply (Mtoe)	2.4	38.7	1 875
Total final energy consumption (Mtoe)	2.1	25.4	1 340
Energy consumption (toe) per capita	0.77	1.62	3.50
Electricity consumption (kWh) per capita	1 176	2 970	6 145
Energy intensity of GDP*	0.16	0.25	0.15
Carbon intensity (kg CO_2/GDP*)	0.31	0.69	0.33
Net imports as % of TPES (Dependence)	51%	**	44%

* In terms of purchasing power parity; in toe per thousand USD (in year 2000 US dollars).

** Not calculated to avoid double counting due to intra-regional trade.

Sources: IEA statistics (with additional data from administrations in Montenegro and Kosovo used for calculation of averages for the Western Balkan region).

The institutional and regulatory framework for energy in Albania reflects policy progress achieved over the last decade. Albania has adopted oil and electricity laws and regulations, and established an independent electricity regulator with broad powers. It has also made advances towards cost-reflective electricity prices and an EU-model tax system. The re-structuring of the state-owned energy companies has enhanced their technical, economic and corporate performance.

Albania's electricity network has been progressively linked with the neighbouring countries (two lines to Greece, one each to Montenegro and Kosovo) and will be reinforced by the construction of new lines (400 kV) to Montenegro, Kosovo and, possibly, Italy.

Improving energy efficiency is a policy priority of the Albanian government. The *National Energy Sector Strategy* estimates economic energy saving potential at 22% of TPES by 2015. The 2007 update of the *Strategy* identified energy efficiency measures (*e.g.* building insulation and appliance performance) as critical to overcoming the current electricity crisis, along with increasing the availability of heating alternatives (*e.g.* LPG and solar thermal) in industrial and residential sectors.

In 2005, CO_2 emissions registered a 26% decline compared to 1990 levels. Emission components reflect changes in the country's energy use and energy mix. The largest share of emissions derives from use of oil and from transport. Low levels of CO_2 emissions reflect the predominant use of hydro for power generation. Albania ratified the Kyoto Protocol in 2004 (as a Non-Annex 1 Country), and can apply for clean development mechanism (CDM) projects.

ALBANIA'S ENERGY CHALLENGES

Despite refurbishment efforts and investments, Albania's energy infrastructure is still in a fragile state and typified by complex, structural problems on both supply and demand sides.

Albania's oil market is liberalised but still affected by product smuggling, fuel quality issues and only partial collection of tax revenues. As a result, the administration lacks the financial resources to regulate the sector and ensure accountability, notably to monitor effective competition conditions.

The persistence of insufficient metering, unpaid bills and illegal connections has dramatically increased electricity consumption and peak demand in Albania, thereby weakening the system and leading to underinvestment in much-needed new generation and network capacities. As a result, chronic load shedding, black-outs and electricity rationing are common across the country. Cost-reflective tariffs and improved payment discipline are crucial to maintaining the infrastructure, attracting investment and preparing to open the market to competition.

The government and the regulator have launched, in parallel, three important initiatives: reform of the electricity prices and payment structure; privatisation of the electricity distribution company KESH; and establishment of rules and design for market opening. Modernisation of the energy infrastructure (in particular oil refineries and the electricity system) and improvement of corporate governance in energy companies will require significant – and sustained – efforts and investments by the government together with donors and strategic investors.

Albania's energy imports (97% of which are oil products) skyrocketed to 50% of TPES in 2005, compared to 11% in 1990. Albania's *Energy Strategy* projects a dramatic rise in import dependence; however, oil import sources and routes are relatively diversified within the Mediterranean basin. The *Strategy* also identifies the need to improve energy efficiency, enhance the use of renewable energy resources, and support expansion of other fuels (particularly LPG). The Albanian government has an ambitious target of increasing the share of renewable energy from about 30% in 2005 to 40% in 2020, focusing on hydropower, biomass and solar thermal.

INTRODUCTION

The Republic of Albania was re-established as a democratic country in 1991 after decades of control by an isolationist communist regime. The first, free general election took place in 1992.

The country's 28 880 km^2 area is largely mountainous, however plains dominate the 360-km coastlines along the Adriatic Sea (north) and the Ionian Sea (south). Albania's population has remained stable since 1990 at about 3.2 million (2006), of which

750 000 live in the capital city of Tirana. Since 1990, more than one million people have emigrated, mostly to Western Europe.[79]

Since entering its transition process in 1992, Albania has experienced rapid economic growth (over 9% in 1993 and 1994, 4.5% in 2006) and structural transformation. However, in 1996/97, the collapse of various financial pyramid schemes led to a major economic and political crisis. GDP per capita remains lower than other countries in the region[80]. Unemployment is reported at 13% (2005) of the working population; inflation is below 4%.

The industrial sector's share in GDP shrank considerably – from 40% in 1985 to 13% in 2005 – due to bankruptcy of most state-owned plants (which were large and outdated) and dramatic production declines in heavy industry (*e.g.* metal minerals, steel, cement and building materials). The service sector's share also declined, from 37% to 30%. By contrast, agriculture's contribution to GDP increased from 20% to 50%. The energy sector now accounts for about 3% of GDP. Food processing, machinery and mineral extraction represent the largest shares of both industry and exports. The trade deficit has increased, raising the country's debt to 57% of GDP. The unofficial or grey economy is estimated at 20 to 25% of total GDP.

ENERGY DEMAND AND SUPPLY

Sources and methodology

Energy data collection and compilation in Albania is based on the *Ordinance for Energy Balance* (2001) and the *Energy Efficiency and Energy Statistics Law* (2005), both of which are in line with international standards. The national statistical office (INSTAT) and local energy offices share responsibility for ensuring primary data collection within the energy and end-use sectors. The methods of data collection include specific questionnaires for industrial and service units (with annual consumption of more than 1 GWh of electricity, 150 toe of oil or 200 t of coal) or surveys for household, agriculture and transport sectors.

The National Resource Agency (NRA) and the Ministry of the Economy, Trade and Energy (METE) share the tasks of data compilation, preparation of energy balances and indicators (according to Eurostat/IEA/UNECE format), and analysis and dissemination of information.

79. EU 15 and Switzerland.

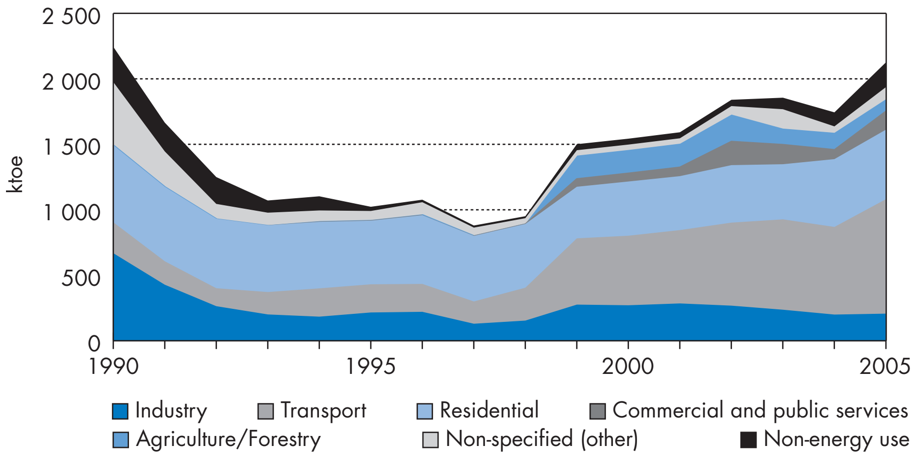
80. GDP per capita, in terms of purchasing power parity, was 4 700 USD in 2005.

Demand

In 2005, Albania's total final energy consumption (TFC) was 2.1 Mtoe, which almost matches the 1990 level (2.2 Mtoe) and is well above the levels of 1992 (1.2 Mtoe) and 1998 (0.9 Mtoe). This 15-year period is characterised by dramatic change in the country's energy mix, as well as in the sectoral breakdown of consumption and end uses. The share of oil products in TFC increased from only 45% in 1992 to 74% in 2005, at which time electricity (15%) and fuelwood (10%) accounted for the rest.[81] The fuels that had the highest rates of consumption in 1990 – *i.e.* coal, natural gas and heavy fuel oil – have been replaced by electricity, diesel and fuelwood. Consumption of coal and natural gas is now practically negligible.

Industry's share of TFC dropped from 21% to below 10% over the same period (1990-2005), whereas the share of transport increased from 11% to more than 40% (Figure 8). Other main sectors include households (24%), services (7%) and agriculture (4%). Changes in end-use include extensive use of electricity for space and water heating, increased reliance on diesel to supplement electricity through self-generation (*e.g.* switching on generators during electricity cuts, load shedding or rationing) and a relative switch to LPG for heating.

Figure 8...............Albania's total final consumption by sector, 1990-2005



Source: IEA statistics.

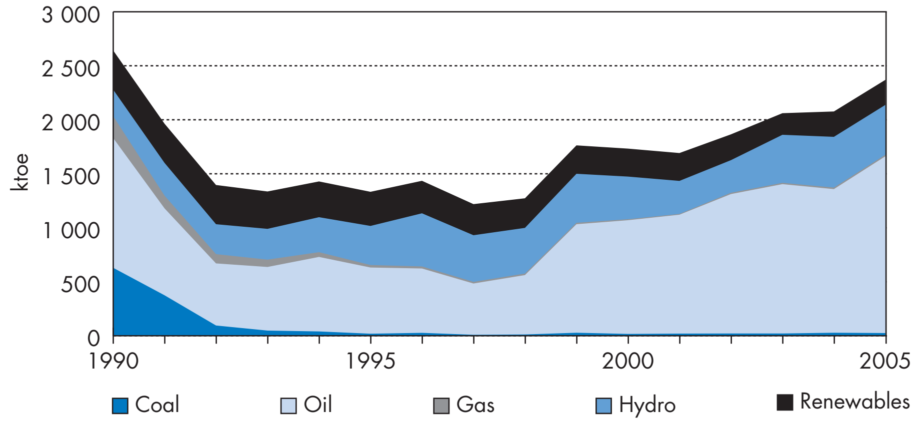
Supply

In 2005, Albania's total primary energy supply (TPES) reached 2.4 Mtoe, or almost 90% of its 1990 level, although the TPES structure changed dramatically during this period (Figure 9). Domestic production, mostly crude oil and hydropower, now accounts for roughly 50% of TPES compared to 90% in 1990. Oil products, electricity and fuelwood collectively account for 98% of TPES, having replaced coal and natural gas as the country's dominant fuels.

81. The share of electricity and fuelwood may be underestimated due to unpaid or non-reported electricity and widespread consumption of illegally cut fuelwood.

Albania trades electricity, either importing or exporting, depending on rainfall and overall hydrology. Fuelwood is also exported, but not officially reported. Albania imports more than 70% of its oil product needs.

Figure 9...............Albania's total primary energy supply by fuel, 1990-2005



Note: TPES excludes electricity trade.
Source: IEA statistics.

Energy intensity

Albania's energy intensity decreased consistently over the past decade and stood at 0.50 toe per thousand USD of GDP (in year 2000 USD) in 2005. In real terms, this is almost three times the average for OECD Europe. Measured at purchasing power parity (PPP), energy intensity in 2005 was 0.16 toe per thousand USD of GDP (PPP year 2000), in the range of the average for OECD Europe. In the same year, electricity consumption was 1 176 kWh per capita and 0.17 kWh per thousand USD of GDP, compared to averages of 6 145 kWh and 0.27 kWh for OECD Europe.

Three main factors influence energy intensity in Albania. Most notable is the low share of services and industries in the economy. Significant financial inflows from emigrants and IFIs have the effect of increasing GDP without increasing energy consumption. Finally, despite rapid penetration of electrical appliances in households, the equipment rate remains low.

ENERGY POLICY AND INSTITUTIONS

Institutions and overall strategy

Institutions

Several organisations (both governmental and non-governmental) participate in Albania's energy institutional framework.

The Parliament determines and passes primary energy legislation. It also appoints (and relieves) members of Electricity Regulatory Authority (ERE), from which it receives reports.

The Ministry of Economy, Trade and Energy (METE) is responsible for the energy sector. As such, it prepares national energy policy and implementation action plans, calculates demand forecasts and drafts the legal framework. METE oversees energy market reforms and energy security. The Ministry also monitors the activities of public energy companies – including KESH (*Korporata Elektroenergjetike Shqiptare*, the Albanian Power Company), Albpetrol (Albanian Petroleum Company), ARMO (Albanian Refinery and Marketing of Oil Company) and SERVCOM (State Oil Service Company) – and prepares these companies for final privatisation. METE also appoints the members of the supervisory councils, which are the company decision-making bodies.

METE is composed of three directorates: the Energy Policy Directorate deals with electricity; the Hydrocarbons and Mines Directorate covers all areas of mining, including coal; and the Competition Directorate oversees aspects of market reform. METE's staff includes four specialists. The Ministry has authority over the following agencies: the National Resource Agency; the Institute for Product Quality of Oil and Gas; the Institute for Pressurised Vessels and Electricity Appliances; and the Energy Efficiency Centre Albania-EU.

The National Resource Agency (NRA) was established in 2006/07 through the merger of three previously existing bodies: the National Energy Agency (NEA), the National Petroleum Agency (NPA), and the Oil and Gas Institute. The NRA's main mandate is to advise the government on energy issues. In this respect, it carries out the following tasks:

- Preparing the energy strategy and evaluating its implementation.
- Drafting primary and secondary regulation related to the energy sector.
- Gathering, assembling and analysing data to maintain a database, which it uses to prepare analysis and development scenarios of the energy sector and energy efficiency.
- Preparing annual energy balances, according to Eurostat/IEA/UNECE formats.
- Proposing action plans for energy efficiency and to promote renewable energy.
- Regulating exploration and production of hydrocarbons (upstream), including licensing; carrying out research on the exploitation of hydrocarbons.
- Preparing development plans for the oil and natural gas sector.

After the merger, NRA's four departments employ six staff from the former National Energy Agency.

The Electricity Regulatory Authority (ERE) was established in 1996 through the government appointment of a Board of Commissioners comprising five members. The Board, which takes ERE decisions, is supported by a staff of 26. The ERE is an independent institution and acquires its budget through licensing fees. Its responsibilities are most closely associated with energy markets, and its mandate includes the following tasks:

- Licensing companies for all electricity activities.
- Setting the wholesale and retail tariffs for electricity and transport; defining the terms and conditions of electricity service.
- Balancing the interests of power sector stakeholders (*e.g.* licensees, consumers and the state).
- Settling disputes amongst licensees, and between licensees and consumers.
- Promoting competition and approving market rules, grid codes and other codes that govern licensee activities.

The Competition Authority was created in 2004 and is responsible for competition issues, notably abuse of a dominant position on the energy markets. However, as in many countries, it is often difficult for competition authorities to assess abuse of dominant position, due to the lack of information and knowledge and in the face of dominant incumbent companies. As of 2007, the Competition Authority had not launched any inquiry in the energy sector.

The Ministry of Environment, Water and Forest Management (MEWFM) is responsible for the design and enforcement of state policy for environmental protection, including rational use of natural resources and nuclear/radioactive safety.

In addition to the above organisations, various local and regional authorities play a role in regulating energy services (notably, public lighting) and participate in decision making on new energy facilities and infrastructure.

The Energy Efficiency Centre Albania-EU is a non-profit organisation, established in 1995 by decree. It is based on an agreement between the Albanian government and the European Commission that grew out of EC Synergy and Thermie[82] projects. The Centre's primary objective is to promote energy efficiency and the use of renewable energy sources. It also has a mandate to disseminate information and raise awareness on sustainable energy.

Energy policy and strategy

Key issues

- ***Administration understaffing (especially Directorate of Energy Policy under METE)***
- ***Obstacles to effectively and durably implement the Energy Sector Strategy and oversee regulation***

Over the past decade, the government of Albania has prepared three key documents. The first two were developed with the assistance of the former National Energy Agency (NEA); the third with the assistance of the National Resource Agency (NRA), into which the NEA was merged in 2006.

82. The European Commission's Synergy project is an energy policy co-operation programme; the Thermie project is an R&D energy programme.

The *1998 Draft Strategy* aimed to set a long-term vision for the energy system, outlining sector reforms as well as the necessary policies and measures at various levels (*e.g.* economic, legal, organisational, institutional and educational). Albania received assistance from the EU's Phare Programme in preparing this document.

Box 3...................Albania's *Energy Sector Strategy 2003-2015*

The *Energy Sector Strategy,* which was approved by the government, centres on a main goal to promote steady and sustainable economic development in Albania. It explicitly recognises the need to pursue growth in a more energy-efficient and environmentally conscious manner. The energy sector can play a key role in achieving this aim by enhancing energy security, which also suggests diversifying energy products, sources and locations of facilities. It can also contribute by improving efficiency in energy supply and demand, including greater use of natural gas and de-centralised generation (particularly co-generation). Finally, the energy sector should seek to increase the use of renewable energy sources.

The Energy Sector Strategy identifies seven specific objectives:

- Establish an efficient energy sector from the financial and technical aspects.
- Establish an effective institutional and regulatory framework.
- Increase security and reliability of energy supply (particularly electricity) at national and regional levels through diversification of the energy system and construction of new generation capacities and interconnection lines.
- Increase energy efficiency in energy generation and use.
- Optimise the supply system with energy resources, including renewables, based on the least-cost planning principle and minimal impact on the environment.
- Considerably increase investments in the energy sector, with the involvement of international financial institutions and private capital.
- Open the domestic electricity market to competition.

The 2007 update of the *Energy Sector Strategy* focuses on three areas: energy supply and demand, and the energy balance to 2015; re-structuring the energy sector on market economy principles; and preparing a framework and corresponding master plans to enhance energy efficiency.

Discussion

Institutions

Albania has made remarkable progress in developing sound energy policies, particularly considering that it began from a difficult and complex situation, and continued through a period of instability marked by increases in both energy import prices and import dependence.

A core institutional organisation – comprising METE and its supporting agencies, the ERE and the NRA – is now in place, and has progressively developed in scope and strength. In addition, the ERE has progressively adopted its role of enforcing electricity regulation (particularly price setting) and the NRA has fulfilled its role in providing policy support (*e.g.* statistics, forecasts) and advice in relation to design and implementation of energy policy.

METE has significantly advanced in separating its policy and regulatory functions, and now acts effectively as the interface between the Parliament and the energy sector. However, it still retains ownership control and management of various state-owned energy companies (including KESH). METE still lacks the administrative capacity to fulfil all of its policy and regulatory functions, particularly in the Directorate of Energy Policy. This puts the ministry in the position of being both policy maker and asset owner, thereby creating a monopoly situation and a potential conflict of interest. The government is aware of this issue and aims to divest its corporate function by privatising the companies, starting with electricity distribution assets. Most Western Balkan governments have transferred the shareholder functions in state companies to a specific body, often the ministry of economy or finance.

Albania had strong rationale for consolidating various energy agencies to create the NRA, including the ambition to develop a multi-competent energy and environmental body that could contribute to the process of designing and monitoring energy policy. Nonetheless, the merger process and reduced resources may harm the NRA's capacity to provide policy support – just when there is increased need to monitor developments and reform in order to fine-tune policy and tools.

Energy policy and strategy

Over the last decade, the Albanian government made it a priority to develop and update comprehensive energy strategies, incorporating effective tools (*e.g.* forecasts, least-cost plans, and indicators). Within a medium-term vision of the energy system, the strategies provide clear reform objectives and guidelines, which are largely compatible with EU standards. This continuous effort has given the administration increased autonomy to design, implement and monitor reforms that are more focused and sustained. Key reforms include the re-structuring of state energy companies, the adoption of a market-based regulatory framework, and the development of policies to diversify the energy mix and enhance energy efficiency.

Albania's efforts started to produce tangible results over the years 2004/06, notably in increased electricity payments and bill collection, as well as in the enhanced management performance of KESH. This progress was partly the result of a diversification in energy heating sources and a subsidy scheme directed at households. Since the summer of 2007, Albania faced a particularly challenging situation: the combination of severe drought, high electricity demand and increased electricity import prices resulted in increased electricity cuts. Such interruptions in electricity supply have a negative impact on the productivity of households and businesses. In addition, consumers turn to self-generators in such circumstances; this adds considerable costs to their operations and reduces their capacity – and willingness – to pay their regular electricity bills. Extensive use of self-generators also increases fuel imports and degrades air quality.

The government of Albania faces complex and urgent short-term issues that result from structural problems (*e.g.* ageing infrastructure and outdated technology, lack of alternative fuels to replace electricity heating, management performance and public governance). These short-term issues appear to be less of a priority for the reform process. Security of supply is of particular importance for three reasons: up to one-fifth of electricity demand is unmet due to load shedding and/or rationing of electricity; a growing trend toward increased electricity and oil imports; and ongoing use of infrastructure that is largely obsolete and has high outage rates.

Overall, the 2003 and 2007 energy strategies identify key issues and priorities. However, the translation into operational change has been difficult and delayed, largely because Albania lacks the administrative resources and institutional strength to design and enforce such plans (*e.g.* energy efficiency, control of the retail market for oil products).

Modernising the energy infrastructure – particularly oil refineries and the electricity system (*e.g.* power plants, network and management) – and improving corporate governance of energy companies will require significant and sustained efforts and investments. In the case of Albania, this will require close collaboration with donors and strategic investors.

Ongoing reforms and insufficient enforcement capacities add another level of complexity to the need to co-ordinate public policies on multiple and interrelated fields (transport, housing, tax, environment, social development, etc.). Addressing this challenge will require the development of new co-ordination tools and performance indicators.

Finally, broad public consultation is of key importance in the process of adopting the new *Energy Sector Strategy*. This should contribute to enrich the debate, raise awareness, and encourage stakeholders and the public to endorse the planned reforms.

Market reforms and regulation

Key issues

- ***Effective regulatory enforcement***
- ***Tax and bill collection***
- ***Below-cost pricing***
- ***Quality of supply***
- ***Corporate governance***

Energy regulatory reforms were initiated in the early stages of Albania's transition period, reflecting the adoption of new laws for oil upstream (1993 and 1994), electricity (electric power and regulation of power sector, 1995) and oil products (1999). These laws aimed to establish a market-based, legal framework for the energy sector, focusing primarily on electricity. In 2003, the *Power Sector Law* replaced the initial law of 1995. The 2003 legislation aimed to ensure the conditions for a safe and reliable electricity supply through an efficiently functioning market. Granting power to the ERE, particularly in setting end-use electricity tariffs, was a key development in this direction.

The legal framework adopted since 2003 specifies three important objectives: energy price and tariff setting; re-structuring and privatisation of the electricity sector and of ARMO; and opening of the electricity market, including public service obligation.

In 2007, Albania prepared a draft law for natural gas. Overall, the legal framework for electricity and natural gas (in the future) is largely harmonised with EU Directives, particularly the 2003 EU Directives on the internal energy market (for electricity and gas) and the Energy Community Treaty for a regional energy market in SEE. Albania signed the Energy Charter Treaty in 1994 and ratified it in 1999.

Pricing and taxation

In 1991, the Albanian government liberalised the prices of crude oil production and oil products. Electricity prices continued to be regulated by the government until being transferred (in principle) to an independent regulator in 1996.

Oil products

Since 1991, the domestic oil refineries and oil product importers have been free to set wholesale and retail prices. As imports now account for 75% of supply, these prices largely follow international markets. In 2002, the government gradually began introducing a comprehensive tax system, comprising both an excise tax and VAT. A 2006 revision of the 2002 law applies the following taxes to oil products:

- Crude oil and natural gas (produced domestically or imported) are subject to profit tax (25%) and VAT (20%).
- Oil products refined domestically are subject to internal refinery tax (8%), excise (EUR 0.10/kg for heavy and residual fuel oil; EUR 0.10/L for motor fuels), profit tax (25%) and VAT (20%).
- Imported oil products are subject to excise (EUR 0.10/kg for heavy and residual fuel oil; EUR 0.10/L for motor fuels), profit tax (10%) and VAT (20%).[83]

The tax component in the final price of diesel (57%) and gasoline (66%) is largely in line with most European countries. As of December 2007, average retail prices in the capital city were EUR 1.10 for diesel and EUR 1.15 for gasoline (RON 95).

Despite improvements in regulation, smuggling, fuel quality issues and partial tax collection remain persistent problems for Albania. The retail network (510 fuel stations) is too large for an estimated total consumption of around 1.2 Mt. It seems that Hellenic Petroleum – which is both a dominant supplier and an important retailer – may effectively limit wholesale and retail competition amongst private companies.

Electricity

In 1996, responsibility for setting maximum electricity tariffs (caps or ceiling tariffs) was transferred to the ERE. However, the regulator was unable to exercise this power because it lacked the financial resources to hire the necessary expertise. Thus, until 2002, the government's caps on electricity tariffs – which were far below the real cost of electricity – remained in place. The combination of low tariffs and low payments created a situation in which KESH (the state-owned electricity company) lacked sufficient revenues to carry out proper system maintenance. Peak demand subsequently increased, causing severe damage to the power system and making it even less reliable. This reduced consumer confidence in KESH and prompted non-payment – even by the users who are able to pay their electricity bills.

83. Custom tax on LPG was abolished in 2006.

In 2002, the government increased the ceiling tariff and, together with KESH, proposed to the ERE a two-tier tariff for household customers. The new pricing scheme, which the ERE approved, aimed to discourage the use electricity for heating purposes by offering a low tariff (EUR 0.04/kWh) for the first 300 kWh consumed per month and doubling the tariff for additional consumption. The ERE also approved preferable rates for several categories of customers, including water supply companies, bakeries and religious institutions.

The *Power Sector Law of 2003* confirmed the ERE's full authority and responsibility to set electricity tariffs. At the same time, the *2003 Energy Sector Strategy*[84] outlined the need to set cost-reflective electricity tariffs and phase out cross-subsidies, while protecting low-income households. The ERE subsequently approved a tariff methodology, following a public hearing with the main stakeholders. This methodology sought to address a major issue for the ERE related to the high number of customers, mostly households, that have no meters installed and are, therefore, invoiced on a flat tariff basis with minimum assumptions[85] made about their consumption levels.

Between 2003 and 2007, the ERE increased the electricity tariffs by 16% for all consumers, arriving at prices of EUR 0.057/kWh for households and EUR 0.065/kWh for private industries.

In parallel to the price adjustment process, in 2004 the government set up a direct subsidy scheme for vulnerable household customers for the first-tier tariff (now below 220 kWh/month). The Ministry of Social Affairs identified around 190 000 households that have received a total allocation of EUR 5 million against paid electricity bills (*i.e.* consumers receive an allocation upon presenting proof of bill payment).

The KESH Action Plan 2006-08 (approved by the government and donors in 2005) outlines three key objectives:

- Increase the average tariff by 8% every year, for all consumer categories (10% for households and 5% for other customers).
- Phase out preferable rates (except for water companies) by 2008.
- Install meters for all customers and eliminate the practice of "minimum use assumptions".

Company re-structuring and privatisation

In the area of company re-structuring and privatisation, the Albanian government's priorities have been to upgrade and modernise energy infrastructure, and to re-structure state-owned companies. The *1998 Privatisation Law* states that, in strategic sectors,[86] a minimum of 30% of the capital of state-owned companies can be sold to strategic investors, according to criteria defined by the government.

---

84. The 2007 update confirmed the *Strategy's* aim to "reach realistic and market energy prices." This indicates that regulated prices (based on a tariff system/calculation methodology) shall be "based on justified costs of operation, maintenance, replacement, construction or reconstruction of facilities and environmental protection costs, taking into account a reasonable rate of return on investments in energy plants, facilities, networks or systems. Tariff systems shall be non-discriminatory and transparent."

85. The ERE set new rules for this non-metered tariff, taking into account customer location (urban or rural area).

86. The role and scope of these sectors does not appear to be defined clearly.

Unbundling state-owned companies to prepare their privatisation has been a major step in this direction. In the oil sector, the upstream company Albpetrol sh.a. (including the companies SERVCOM and Transnafta shpk) and refining company ARMO sh.a have been gradually re-structured to create joint-stock companies, and then prepared for privatisation to strategic investors. In 2005, an auction was held for the companies SERVCOM (in Fier) and Transnafta (in Patos), however the outcome was inconclusive. It is expected that the shares of Albpetrol and ARMO will also be auctioned. The privatisation price of Albpetrol is expected to reflect the value of its oil and gas reserves, as well as existing joint ventures in exploration and production.

KESH has been going through various stages of re-structuring and unbundling over the past five years, with the aim of enhancing overall performance and corporate standards. On one level, the unbundling process aims to separate activities that will be regulated (transmission, dispatch and distribution) from commercial activities (generation, trading and supply). On another level, it seeks to break up natural monopoly activities in order to support open competition within rules set by the regulatory framework. In 2004/05, KESH separated its main activities by transferring ownership and operation to three fully owned subsidiaries:

- OST, the transmission system operator, operates the transmission grid and dispatch.
- KESH Generation (KESH Gen) manages power generation (mostly small to large hydropower plants).
- KESH Distribution (OSSH) is responsible for the distribution network.

The final fate of the three companies remains uncertain. OST may yet be transformed into an independent state-owned company that owns, maintains, operates and expands the transmission system. KESH Gen will remain under KESH ownership until an eventual privatisation decision. In late 2006, the government decided to privatise KESH Distribution to a strategic investor and selected the World Bank Group to act as government advisor in preparing and launching (in December 2006) an open, international tender. A final decision on ownership of KESH Distribution is expected in the last quarter of 2008. The government expects that the investor will bring capital investment, experience and international managerial skills, as well as the modern technologies needed to enhance distribution operations. Sale of the company may be coupled to a performance contract based on action plans developed jointly by the government and KESH.

Energy market structure and opening

METE and the ERE share joint responsibility for preparing the opening of the electricity market to competition. In line with the Energy Community Treaty, the *Power Sector Law* and secondary regulation (including electricity tariff methodologies for generation, transmission, distribution and regulated and/or captive customers, adopted in 2004 and 2005) set the conditions for eligible customers to choose their suppliers. The eligibility status can be granted to customers connected to the medium- and high-voltage grid who consume more than than 1 GWh per year. In line with the Energy Community Treaty requirements, the status should have been extended to all non-household customers from January 2008. However, implementation will be slow given that as of January 2008, KESH remained the sole supplier.

The *Law* and secondary regulation also cover third-party grid access for local and foreign qualified suppliers, which are licensed by the ERE.[87] The authorities also prepared a transitory market model, moving from the single buyer/vertical contract model to a system based on bilateral contracts that should conform with the ERE electricity market rules. In December 2007, a new market model was adopted in order to comply with the provisions of the Energy Community Treaty.

Discussion

The Albanian framework for energy regulation largely reflects the policy progress achieved over the last decade. Albania has adopted oil and electricity laws and secondary regulation, and established an independent electricity regulator with broad powers, including authority over final customer prices. Also, clear advancement has been made towards cost-reflective electricity prices and an EU-model tax system. The re-structuring of the state-owned energy companies has enhanced their technical, economic and corporate performance. In particular, the two-year action plan for KESH provides a clear benchmark of goals, priorities and implementation. The process of unbundling KESH has advanced notably with the creation of a transmission system operator (OST) and a distribution company (KESH Distribution), which is being privatised. Also, the preparation for the introduction of competition in the electricity market starting in 2008 has progressed well. The retail oil market is liberalised and supplied by private operators.

Beyond the notable achievements described above, and despite continuous efforts, Albania has not yet realised the full and effective enforcement of the regulatory framework. The oil market is still affected by product smuggling, fuel quality issues and only partial tax collection. As a result, the administration lacks resources to apply the rules in the sector.

For electricity, despite clear progress over the last four years, the persistence of insufficient metering, unpaid bills and illegal connections has capped KESH revenues, which are badly needed to maintain and improve the system. Electricity demand, including peak demand, has outpaced system additions leading to significant load shedding/rationing. This was aggravated in 2007 by a drought and a tense import situation, both of which led to significant price increases and ultimately prompted the government to privatise the distribution company.

All these factors create a challenging investment environment. It is difficult to attract a strategic investor that would be willing to sustain the re-structuring of the electricity company while the government and the regulator continue to undertake preparations for a timely market opening (*e.g.* reform the price and payment structure, establish market rules and market design). Re-structuring the energy sector is a complex process in any country and delays are not uncommon. Continued government resolve and close monitoring are critical throughout this long and difficult process.

87. The ERE regulates (through published tariffs) access to the transmission and distribution electricity grid.

After a relatively long transition period, the ERE is strengthening its role and functions. It still needs to consolidate its independence and authority, in particular to set final prices in a firm and neutral way. Cost-reflective tariffs (that account for externalities and reduce cross-subsidies) are now crucial in order to maintain the infrastructure, attract investment and prepare for competition. Although the electricity market has been formally opened, actual switching of suppliers remains constrained by several structural factors, including the monopoly situation of KESH and ongoing network deficiencies. The government and the electricity sector need to renew their efforts to support Albania's participation in the regional electricity market, including synchronisation with the regional grid and UCTE.

Energy security

Key issues

- ***State of the electricity infrastructure***
- ***Increasing demand***
- ***Cost of imports***

Energy supply security is a priority for the *Energy Sector Strategy* and the government: the objective is to ensure regular energy supply to the markets at affordable prices. However, the energy system is under considerable stress for several reasons. In 1990, Albania inherited outdated energy technology and an energy infrastructure that had depreciated considerably due to inadequate investment and maintenance. In recent years, individual components of the electricity system have been further stressed by the rapid increase in energy demand and by structural transformation, as well as by increased consumption of energy imports (at international prices) as domestic supplies decline. Supply bottlenecks and demand imbalances (due, in part, to excessive electricity use for heating and non-payment) have constrained electricity supply and harmed the stability of the grid.

Albania's energy mix has become dominated by oil products, fuelwood and electricity, which collectively make up 98% of TPES. Energy imports have skyrocketed to 50% of TPES in 2005, compared to 11% in 1990. Oil products are of particular concern in that 76% of demand is met through imports. However, oil import sources and maritime routes are relatively diversified within the Mediterranean basin. The annual costs of energy imports are about EUR 330 million, or 26% of the country's trade deficit. According to Albania's *Energy Sector Strategy*, this figure could double or even triple by 2020. The *Strategy* highlights the need to address energy security concerns by implementing action plans in the following areas: to enhance electricity generation, transmission and distribution in order to improve energy efficiency; to increase the use of renewable energy resources; and to increase the use of LPG.

The government took additional measures to enhance security of supply by approving (in 1999) and revising (in 2004) legislation that sets a minimum level of oil stocks. The legislation enables the government to access such stocks, including those held by the

General Directorate of State Reserves, in case of emergency. The oil storage capacity currently amounts to 120 kt or approximately 30 days of consumption.

Discussion

The persistence of electricity disruptions and grid instability, as well as increasing energy imports, has raised security of supply concerns – beyond Albania's energy sector and beyond its own borders. Economic activity and trade balances have been significantly impacted, and the grid's capacity limits and instability complicate interconnections and prevent synchronisation. Given the structural complexity and multi-dimensional character of energy security and risks, Albania needs to adopt a comprehensive and co-ordinated approach to structural reforms. The government has demonstrated its will and commitment through sustained market reforms that progressively address the inadequacies in the energy sector and the imbalances of demand.

Ongoing modernisation of electricity facilities (notably the establishment of a centralised and remote dispatch centre and new interconnection lines to neighbouring countries) will enhance network reliability in Albania. Government policies to improve energy efficiency and to diversify the energy mix (through LPG and renewable sources) will also contribute to energy security. Other key components include enhancing emergency management capacities and the development of a national energy security system, based on building (by 2015) an oil stockpile of 90-days capacity and accumulate reserves (including industry stocks) in compliance with EU quality standards.

Energy Efficiency

Key issues

- ***Programme implementation***
- ***Electricity payment***
- ***Available expertise***
- ***Financing***

Despite the low level of energy consumption per capita, Albania's energy intensity remains high, reflecting high transformation losses (40%) that result from outdated equipment and technologies which have been badly maintained over decades of service. Inefficient use of energy and high use of electricity for heating, in particular, also generate high losses. Improving energy efficiency has been a policy priority of the government. The *Energy Sector Strategy* identifies energy efficiency measures, particularly in industrial and residential sectors, as critical to addressing the electricity supply/ demand imbalances. The *Strategy* estimates the economic energy saving potential at 22% of TFC by 2015[88] and describes two possible future scenarios. In the "passive energy scenario" (*i.e.* business as usual), TPES will increase from 2.4 Mtoe in 2005 to 2.8 Mtoe by 2015. By contrast, the "active energy scenario" shows that enforcement

88. Broken down by sector, the potential is as follows: transport (27%), industry and agriculture (25%), services (18%) and residential (7%).

of proposed energy efficiency measures could reduce TPES to 2 Mtoe over the same timeframe.

METE has overall responsibility for policies (targets and priorities) and regulations related to energy efficiency and renewable energy. It is supported by the NRA, which has also a broader role in the promotion of energy efficiency and renewables. The Energy Efficiency Centre Albania-EU has carried out numerous energy audits in various sectors to assess energy efficiency potential and identify appropriate measures. It also trained energy experts (notably auditors) and contributed to various international/donor projects.

The *Energy Efficiency Law of 2005* is the main legal tool to enhance efficient use and reduce losses in the energy sector. The *Law* states that METE, through the NRA, shall prepare a National Energy Efficiency Programme (NEEP) every two years. The first programme (2007-09) has not yet been prepared. The *Law* outlines four other main provisions:

- Creation of a database (using data submitted by energy suppliers and medium-to-large consumers) to support studies on energy conservation (NRA responsibility).
- Application of energy labels that indicate consumption levels on household appliances.
- Energy audits (to be conducted every three years) of large consumers[89] or consumers that receive public funding.
- Establishment of an Energy Efficiency Fund to co-finance energy efficiency investments (at present, local banks and IFIs rarely finance such investments).

In 2002, the *Law on Heat Conservation in Buildings* set a building code for all new construction, stipulating minimum performance levels for thermal insulation and the installation of central heating systems (*i.e.* boiler-based, but not electricity heating). However, municipalities lack the resources and competences needed to monitor or sanction the code's implementation.

Albania's existing building stock is poorly insulated and, in most cases, uses electricity for space and water heating, which accounts for more than half of household electricity consumption.[90] The *Energy Sector Strategy* identified three least-cost efficiency measures that could have noticeable impacts on efficiency: switching from electricity to direct heating (LPG) and boilers; improving insulation, and tightening or changing windows; and enhancing compliance with the building code for new buildings.

Within industry, the light industry (*e.g.* food processing) and construction material sectors show particular potential for energy efficiency, despite their smaller size and low level of activity. This could be achieved by reducing their overall energy use and promoting co-generation when there is a need for hot water. Since 2005, the ERE has applied a reactive power tariff (based on a specific meter) for medium-to-large customers. This tariff aims to create incentives for more rational energy use while

89. Large consumers are defined as those with annual consumption of more than 1.4 GWh of electricity, 200 tonnes of coal, 150 tonnes of oil or 100 000 m^3 of natural gas – or with a total energy consumption higher than 9 ktoe.

90. Average annual consumption for a household is 4 600 kWh, broken down as follows: space heating (34%); water heating (20%); cooking (25%); appliances (15%); and lighting (15%).

also improving management and efficiency of the grid and providing adequate prices for suppliers.

The transport sector is witnessing a rapid increase in oil consumption, which is exacerbated by the fact that the fleet of trucks, light vehicles and cars run at a low efficiency because of age, inadequate maintenance and low fuel quality. The *Energy Sector Strategy* promotes the development of dense and reliable public transport systems (both urban and inter-urban), as well as the use of freight trains and larger trucks (over 8 and 16 t capacity) for industry and smaller cars for personal use. The *Strategy* discusses the use of tax incentives in these areas.

Albania has developed a range of international co-operation projects to foster energy efficiency and the use of renewable energy. In 2006, Albania received EUR 9 million (in the form of a bank guarantee for investment loans) and technical assistance from Kreditanstalt für Wiederaufbau (KfW, Germany) for a programme entitled *Promotion of Renewable Energy and Energy Efficiency*, the aim of which is to prepare feasibility studies for energy efficiency projects at end-users and small hydropower. Various other projects, financed by USAID, UNDP and the Global Environment Facility (GEF), focus on improving energy efficiency by promoting the installation of thermal insulation in existing residential buildings.

Discussion

Albania's energy intensity is high. In addition, energy demand is increasing rapidly, especially for oil products, electricity and fuelwood. The combination of low efficiency, high demand and higher energy prices will increasingly harm business competitiveness in Albania and will have a negative impact on household revenues. The significant energy savings potential (particularly for major energy-consuming sectors) outlined in the *Energy Sector Strategy* will translate into economic and operational gains only if energy prices stimulate behavioural changes and investment in new and more efficient equipment and appliances. (This assumes a parallel improvement in payment discipline.)

The electricity price reforms implemented in Albania provide a signal to customers to become more efficient. However, the lack of meters, the problem of non-payment and ongoing electricity rationing all serve as obstacles to behavioural change, as does the lack of information on, advice concerning and support for alternative options (*e.g.* insulation, other fuels such as LPG, and more efficient equipment and appliances). In addition, Albania has not yet developed financing for such expenses and investments.

Albania has adopted a detailed and comprehensive regulatory framework and established appropriate tools (*e.g.* data, studies, appliance labelling and standards, energy audits, building codes and a proposed energy efficiency fund). In addition, existing agencies have acquired broad, operational experience in conducting technical and/or economic appraisals to identify and develop projects to encourage energy efficiency. However, these agencies lack the local networks and resources to reach small-to-medium consumers; it is important to establish connections with local energy agencies that can ensure the eventual support of independent auditors and consultancy firms.

With the broad support of international donors, Albania has launched an integrated energy efficiency approach that aims to develop viable pilot projects and attract banks to enter the local market for small-to-medium consumers. The energy efficiency potential in public administrations is considered significant and is essential in their drive to reduce operating costs (particularly for energy) and improve quality of services. Concerted and transparent effort to improve energy efficiency in public administration could also serve as an example for other sectors.

Energy and environment

Key issues

- ***Urban pollution***
- ***Fuel quality standards***
- ***Increasing road transport***

Data show that Albania's air-borne pollutant emissions in 2005 were 32 kt of SO_2 and 4.60 Mt of CO_2, representing an overall decline of 26% compared to 1990 levels. However, the country's carbon intensity was 0.96 kg of CO_2 per thousand USD of GDP – more than 2.2 times the average for OECD Europe. In purchasing power parity (PPP) terms, it is at 0.31 kg of CO_2 per thousand USD (PPP year 2000) or 6% below the OECD Europe average.

Oil accounts for 97% of total CO_2 emissions, reflecting a high share (53%) from the transport sector. The remaining CO_2 emissions derive from industry (13%), residential (5%) and other sectors (29%). The high share of oil and transport in total emissions, and the relatively low level of CO_2 emissions, reflects that almost all power generation derives from hydropower. Even though emissions have declined, air pollution in urban areas has risen significantly, largely due to increased emissions from road transport (old fleet, low fuel quality) and households (inefficient wood stoves).

The Ministry of Environment, Forest and Water Administration (MEFWA) is responsible for environmental policy, regulation and enforcement in co-operation with other relevant ministries. The *Environmental Protection Law* (adopted in 1993 and revised in 2003) provides the legal basis for its role and functions. Albania is committed to applying EU legislation on pollutant emissions, particularly the EU Directive on large combustion plants to new thermal power plants (by 2017).

Albania signed the Convention on Long-Range Transboundary Air Pollution (CLRTAP). It also ratified (October 1994) the United National Framework Convention on Climate Change (UNFCCC), which entered into force in January 1995. Albania finalised and submitted its First National Communication to the UNFCCC in 2002, and is preparing the Second National Communication for the end of 2008. In addition, Albania ratified the Kyoto Protocol in 2004 as a Non-Annex 1 country; it is therefore eligible for CDM projects and has selected the Climate Change Unit at the MEFWA as the Designated National Authority (DNA) for CDM. Initial estimates indicate an annual CDM carbon potential of about 2 Mt CO_2 per year (or an investment of EUR 12 to 18 million), primarily on energy efficiency, solar water heaters, small hydropower and biomass. The World Bank is currently supporting a pilot project on carbon finance.

THE ENERGY SECTOR

Albania faces key challenges directly related to the structure of its energy supply. The most pressing issue is the lack of domestic capacity for thermal electricity generation (currently about 200 GWh per year) compared to the country's hydropower output (which has increased from 2.8 TWh in 1990 to between 4.0 and 4.5 TWh over the 1999-2005 period). Hydropower output is highly dependent on the hydrology of a given year. Albania's potential output exceeds its generation capacity in some years; in others, the hydrology conditions are less favourable and the country needs to import electricity capacity. In recent years, Albania has become a net importer of electricity.

Albania's domestic oil and gas sector has experienced a rapid decline in recent years. Better technological and resource management practices are needed to enhance production at existing fields and, thereby, maintain fixed levels of production as long as possible despite the natural decline of exploitable resources. At the same time, high growth in the transport sector's demand for diesel oil and gasoline is certain to increase dependence on imports of oil products.

The actual rate of fuelwood harvesting – as opposed to the officially reported levels (230 ktoe) – is estimated at 300 to 350 ktoe. This level is unsustainable, even in the medium term, without undertaking a major re-forestation effort.

Fossil fuels

Key issues

- ***Increased demand for oil products***
- ***Declining domestic oil production and refining***
- ***Quality of products***
- ***Effective retail competition***

Lignite

Domestically produced lignite and natural gas were important fuels for heavy industries during the era of central planning in the 1980s and 1990s. Demand for these fuels has fallen off with the closure of most heavy industry (due to lack of competitiveness) or because high production costs prompted users to switch to other fuels.

Albania's lignite reserves are located in four basins: the largest reserves are found in Tirane-Durres and Memalia (in the north and western parts of the country). Total reserves are estimated at 115 Mtoe,[91] however, the lignite is of low quality with high contents of sulphur (3 to 5%), ash (30 to 60%) and moisture (up to 60%). It also has low calorific value (8 400 to 16 400 kJ/kg). In addition, lignite seams are relatively deep (300 m) and slim (maximum 1 to 2 m), increasing the costs of extraction.[92]

In 2006, lignite production reached only 9 ktoe or less than 0.5% of TPES, compared to more than 20% in the 1980s. Production was focused mainly at the state-owned Memaliaj mine and three small mines in Korca (all privately owned). Coal consumption is limited to the metallurgical and cement industries, which rely on imports of better quality coal. Some foreign companies have indicated interest in building coal-fired power plants, which would also use imported coal, but no developments have materialised to date. Albania's *2007 Energy Sector Strategy* does not envisage any significant development of lignite production before 2015.

Natural gas

Albania's natural gas reserves are estimated at 3.6 bcm (1.5 Mtoe), comprising mostly gas-condensates and associated gas. Domestic production of natural gas began in the 1960s; however, investment declined in the 1980s, leaving only a few wells (Divjaka, Frakull, Ballaj-Kryevidh and Polveçe) in operation by Albpetrol. Today, production and use of natural gas are very limited. In 2005, existing fields supplied about 3.5 Mcm (10 ktoe) of gas, only 0.4% of TPES as compared to 6% in the 1980s. Natural gas is used mainly in the oil refinery of Ballsh.

According to the *2007 World Bank Regional Gasification Study*, demand for natural gas in Albania could reach about 1 bcm per year by 2015. The bulk of demand (60%) would be used for power generation, with remaining demand split between services (20%), residential (12%) and industry (8%). However, major investment (about EUR 200 million) would be needed to build a suitable transmission and distribution network (including interconnection gas lines and an internal gas transmission network). Alternatively, Albania could opt to import natural gas through Croatia and Montenegro (5 bcm capacity), from FYR Macedonia or Greece, or through the Trans-Adriatic Pipeline (TAP) project (see chapter on Oil and Gas Transportation). It remains to be seen whether any of these options will be realised in the medium term.

Crude oil

Albania's crude oil reserves are mostly non-conventional (*e.g.* heavy, asphalt-resinous and sulphuride) and are estimated at 450 Mt. In 2006, Albpetrol produced 382 kt of crude oil from more than 3 000 wells,[93] located in seven oil fields in Southern Albania. This amounted to almost one-third of domestic crude needs.

Production rates in the oil sector have fallen due to lack of investment in new fields and modern extraction technologies. In 1994, Albpetrol signed a 25-year agreement with foreign oil companies to improve recovery rates at existing oil fields in Patos-Marinza, notably by drilling 400 new wells. However, almost 15 years later, there have been no developments based on this agreement, largely because of the political unrest

91. Significant reserves of peat also exist in Albania, but are plagued by similar problems in terms of quality and cost of extraction. If used to produce energy, these peat reserves would also require additional equipment to limit pollution.

92. The current cost of extraction is EUR 63/t in the Memaliaj mine.

93. Flow rates of wells in Albania are very low: 0.2 to 1.5 m^3/day in sandstone and 2.0 to 12.0 m^3/day in limestone.

in 1997. In 2005, a Canadian company, Bankers Petroleum Albania Ltd, drilled a few new recovery wells at the existing Patos-Marinza oil field. According to the *Energy Sector Strategy*, additional production is projected to reach up to 330 kt by 2015.

Oil products

Albania's two refineries, Ballsh and Fier, process domestic crude oil. As a result of declining production of domestic crude[94] and deterioration of facilities, they operate at only about 30% of their nameplate capacities. The Ballsh refinery (1 Mt/y), which was commissioned in 1978 using then-outdated Chinese technology, initially had the capacity to produce various oil products (including motor fuels). The Fier refinery produces heavy products (fuel oil and bitumen). Both refineries belong to the state-owned ARMO; together they supply about one-third of the domestic market. The future of refining in Albania is somewhat uncertain: major technology upgrades will be needed to comply with European fuel standards and environmental performance.

Oil product imports, mostly motor fuels from Greece and Italy, account for more than two-thirds of domestic sales (1.2 Mt/y). Imports are supplied through two sea terminals (Vlora and Bishti i Palles) and then distributed to some 510 fuel stations, which are owned and operated by private groups and individuals. In late 2007, the government decided to upgrade and expand these sea terminals, with additional storage for oil products (340 000 m^3) and LPG (29 000 m^3) at a cost of EUR 30 million.

LPG consumption in Albania is increasing rapidly, especially in households (currently at 20 kg/inhabitant per year) as a replacement for electricity, diesel and fuelwood as heating and cooking fuel. Based on experience in other countries[95] and increasing discipline for electricity payments, LPG consumption is expected keep rising. Increased demand may ultimately support the construction of a new oil product terminal in Seman (with an annual planned capacity of 15 kt).

Albania's *Energy Sector Strategy* projects that the combination of increased demand for motor fuel and LPG will raise the share of oil product imports to almost 90% by 2015 – despite an expected increase of domestic crude production.

Despite strict regulation of the oil products sector, product smuggling is still common, as are problems with fuel quality and tax collection. This has resulted in an oversized retail network for oil products.

Discussion

Albania's production, import and use of fossil fuel underwent a major transformation over the past 15 years. Lignite and natural gas production have been almost phased out, leaving only marginal consumption. The decline of domestic oil production and oil refining has been countered by growing imports (mostly of motor fuels and LPG) to respond to rapidly increasing demand. Oil products are now the largest contributor to the energy mix, and to Albania's total import balance.

94. The Ballsh and Fier refineries are designed to use only domestic crude qualities, preventing the imports of other crude.

95. By comparison, inhabitant consumption per year is 55 kg in Greece and 109 kg in Portugal.

Existing oil production is of low quality; refining capacity is limited by outdated and obsolete equipment. These factors are increasingly problematic given the competition from imported oil products that are cheaper and of better quality. Significant investment would be needed just to maintain (let alone expand) upstream and refining capacities. This would be very difficult to finance through the budgets of the state companies or that of their sole shareholder, the state itself. Nevertheless, recovery rates at existing oil fields have attracted foreign investment. This indicates a potential for additional output, which should benefit the main oil refinery and possibly attract investment for its modernisation.

Despite a full liberalisation of oil product prices, Albania's retail oil market is undermined by problems that are common throughout the Western Balkan region, namely smuggling, poor fuel quality and lack of competition. These issues highlight the need for the administration to better assume its regulatory functions. Resolution of these problems would increase government tax revenues and benefit consumers. The government is considering an option to extend the ERE's responsibilities to the oil retail sector (*e.g.* licensing, competition and quality of products).

The development of a market for LPG reflects a maturation of Albania's household energy market. In the medium term, this would pave the way for the introduction of natural gas. However, supply options depend largely on a regional approach for gas needs that are, in fact, relatively small.

Electricity

Key issues

- ***Demand increase and peak***
- ***State of facilities***
- ***Cross-subsidies***
- ***Payment discipline***

Electricity consumption in Albania has been increasing at an average of almost 5% per year over the period 2000-06, reaching 3.9 TWh[96] (without counting losses of 2.2 TWh). Peak demand increased to 1.3 GW in 2006, up from 0.9 GW in 1995. Residential demand accounts for 76% of total electricity consumption; industry accounts for 20% and other sectors for the remaining 4%.

This trend and the structure of electricity consumption (Figure 10) result from its extensive use for heating (particularly by households), as well as the country's slow industrial activity. Much of the increase in consumption has been stimulated by three factors: tariff levels that are well below cost; low payment discipline; and widespread use of illegal connections.

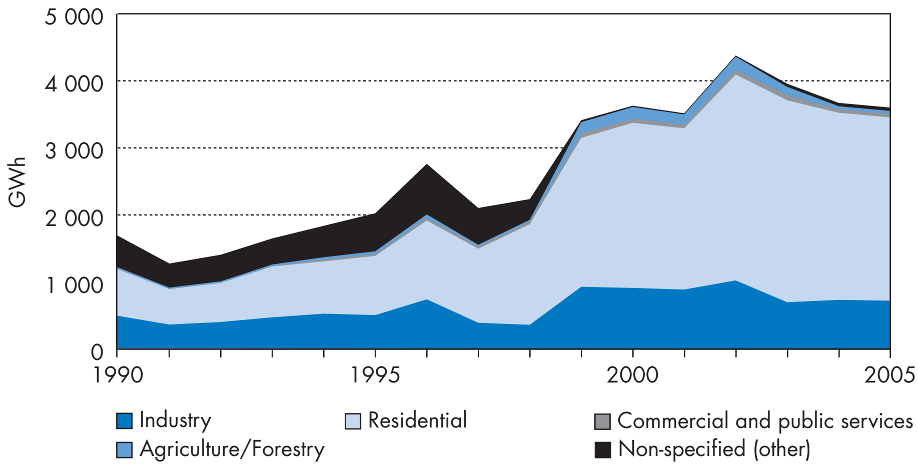
Albania's electricity system relies mainly on three large hydropower plants connected to the high-voltage grid. Despite progress in its rehabilitation and upgrade, the electricity

96. Actual demand and peak (without load shedding) are estimated to be at least 20 to 25% higher.

system is still in a fragile state. In particular, the structural safety of the country's hydropower dams has been the focus of much concern.[97]

The electricity network has been progressively linked with the neighbouring countries (two lines to Greece, one each to Montenegro and Kosovo) and will be reinforced by the construction of new lines to Montenegro, Kosovo and, possibly, Italy.

Figure 10 ....Electricity consumption by sector in Albania, 1990-2005 (GWh)



Source: IEA statistics.

Electricity generation and supply

Albania's installed generation capacity is based almost entirely on hydropower. In 2005, total capacity was about 1 500 MW and generated 5.5 TWh. KESH owns and operates all plants, except a few small hydropower plants that are now under private ownership. All of Albania's electricity plants were built between the 1960s and the early 1980s, using mostly Soviet or Chinese technology. Their current condition reflects a severe lack of maintenance.

Three hydropower plants on the Drin River (1 350 MW) provided 86% of total generation in 2005; other hydropower plants are located on accumulation lakes but are much smaller (Mat River – 49 MW; Bistrica River – 27 MW).

The only remaining thermal power unit (60 MW, diesel, based on Czech technology) at Fier operates at only 7 to 12% of its rated capacity. Refurbishment of this unit, which is the least deteriorated, would require EUR 18 million.

The government and KESH have launched or envisage several new hydropower and thermal plant projects. The hydropower plant at Kalivaci (84 MW) is under construction (an Italian investor), with commissioning scheduled in 2010. The Ashta plant (44 MW) is in the tender process for selection of an energy performance contract. Both projects are financed under concession agreements.[98]

97. Inspection visits by SECO (Swiss development agency) in 2007 identified structural risks at several hydropower dams.

98. Standard terms share generation between the investor (90%) and KESH (10%).

KESH is planning a 97 MW combined cycle diesel or natural gas generation plant in the port of Vlora, at an investment cost of about EUR 75 million. This project received funding, in 2004, from the World Bank, the European Investment Bank (EIB) and the European Bank for Reconstruction and Development (EBRD). However, construction has been delayed due to opposition by the local population on environmental grounds. Another combined cycle plant (3x135 MW) is also in the planning stage.

Albania has been a net electricity importer since 1997. This is a result of increasing electricity demand and peaks, and of the limited availability of generation capacity, which was aggravated by droughts in 2000, 2001 and 2007. Albania imports electricity mainly from Bosnia and Herzegovina, Bulgaria, Greece, Serbia and Kosovo. Imports have increased steadily in recent years from 0.4 TWh in 2005 (8% of total consumption) to 1.8 TWh in 2007 (about 30% of consumption). Experts project that electricity imports will increase to 2.4 TWh in 2008 and then decline to 2.0 TWh in 2009.

Electricity network

Albania's transmission grid comprises mostly 220 kV and 110 kV lines. Since 2004, ownership and operation of sub-stations has been ensured by the transmission system operator, OST, which is a KESH subsidiary.

The original distribution system, composed of lines of less than 35 kV, was based on Soviet and Chinese technology. It has been largely replaced by new equipment over the last decade. Albania's distribution network is distinctive because of the low density of customers outside of urban areas (less than one-third Western European averages). This raises investment costs of long-distance supply lines. KESH Distribution is responsible for the electricity distribution to all 900 000 final customers and for maintenance of the grid. Since 1999, METE and KESH (with the support of donors) have been able to rehabilitate the distribution system in Albania's ten main cities.

Albania's network operators face five main challenges:

- Overloading of several 220 kV transmission lines, which results in losses, sub-standard voltage levels and load shedding.
- Lack of system flexibility (in the absence of a day-ahead trading system), which reduces system capacity and reliability, is exacerbated by outdated and inefficient communication systems.
- High technical losses caused by reactive power.
- The age and poor maintenance of 220/110 kV sub-stations.
- The instability of the grid, which limits interconnection capacities.

High network losses have plagued the efficiency and operation of Albania's electric system for more than a decade. In 2006, technical losses in the transmission system amounted to about 6% (256 GWh) of total electricity consumed, although it should be noted that this is a decline from 340 GWh (9%) in 2001. In the distribution system (also in 2006), technical losses accounted for more than 18% (1 073 GWh) of total electricity consumed and commercial (non-technical) losses accounted for 16.5% (930 GWh). Overall, Albania's electricity system is losing 24% of domestic electricity production, which reduces revenues by 16.5%.

Collection of electricity tariffs is increasing significantly, from 77% in 2003 to 89% in 2006. However, extensive use of electricity for heating continues to overload the distribution system, leading to outages, increased losses (by a factor of four to five times), and damage or destruction of equipment. Reactive power has also been a problem, but is been progressively addressed (see Energy Efficiency section). A schedule is in place to create a national dispatching centre, which will replace an outdated control system and communication equipment.

Albania has established interconnections with three neighbouring electricity systems: Greece (Elbasan-Kardia: 400 kV, 1 100 MW); Kosovo (Fierza-Prizren: 220 kV, 250 MW); and Montenegro (Vau Dejes-Podgorica: 220 kV, 250 MW). System instability reduces the effective interconnection capacity to 380/400 MW, but still enables KESH to import significant quantities of electricity. Two new interconnection lines (400 kV) are scheduled, at an estimated cost of EUR 155 million: Albania-Montenegro (Elbasan-Tirana-Podgorica in 2009) and Albania-Kosovo (Tirana-Kosovo B power plant in 2010). These new lines will increase import capacity from 380 MW to 600 MW (current peak demand: 1 300 MW). A submarine cable to Italy is also planned. The Albanian grid is now interconnected with the Western Balkan region. However, it is not yet synchronised with the UCTE because voltage in Southern Albania is much too low.

Various donors are providing technical assistance and financial support to the Albanian government and to KESH to upgrade the country's electricity system. The World Bank has provided almost EUR 100 million to rehabilitate various transmission and distribution networks within the *Power Sector Rehabilitation and Re-structuring Project*. The future interconnection line to Montenegro has been co-financed by Kreditanstalt für Wiederaufbau (KfW, Germany) and through Italian assistance.

Electricity regulation and market

The *Power Sector Policy Statement*, adopted by the Albanian government in 2002, set the objective of establishing an electricity market that provides reliable, safe, and adequate electricity supply at reasonable prices and in manner that is economically and environmentally sound. The government aims to address the chronic power cuts and restore full electricity supply to customers by 2009.

The regulatory framework is built upon the *Power Sector Law of 2003* and secondary regulations (2004 and 2005). It is enforced by the ERE, which also sets final customer tariffs. In line with requirements of the Energy Community Treaty, the Albanian government aims to enable all non-residential customers to choose their supplier (KESH or an alternative) as of January 2008. In order to facilitate this choice, the *Law* sets out the conditions of operations for independent power producers (IPPs) with more than 5 MW capacity and for small power producers (small hydro and co-generation below 5 MW) – in particular the conditions for selling electricity to eligible customers and distribution companies at market prices.

Discussion

Albania's electricity system faces multiple challenges, not the least of which is the need to supply rapidly increasing demand across a large and low-density territory. It must also maintain and rehabilitate outdated generation and transport facilities. The main goals for the future are to interconnect with the grids of neighbouring countries, and to re-structure the incumbent company, KESH, in preparation to opening the electricity market to competition.

Efforts in these areas have been hampered by low electricity prices and low payment discipline, as well as by very high technical losses in the electricity system. The gap in electricity supply, due to rapid increase in demand and fluctuating hydrology, has been managed through load shedding across consumers and through electricity imports. However, the use of imports is limited due to capacity constraints and higher costs, which are in excess of current domestic tariffs. The persistence of this imbalance is pushing Albania's electricity system to its limits.

KESH is not in a position to keep abreast of rapidly increasing demand, and to modernise and expand its generating plants and network. Nor is it ready to play a significant role in regional trade. Only sustained and effective structural reforms, building on those initiated by the government in 2003, can progressively overcome the system's structural inefficiency. Cost-reflective pricing and enhanced payment discipline are a key focus of the government, the ERE and KESH; both will contribute to stabilising demand and to collecting sufficient revenues to sustainably maintain and expand the facilities with adequate management.

Efforts to reduce the volume of electricity-based heating will be effective only if all consumers are obliged to pay their electricity bills and are given access to other options (*e.g.* LPG and efficient stoves) at affordable prices. It is crucial to reduce the high network losses towards the ambitious objective of 13% by 2015 (non-technical distribution losses to 3%, and transmission and distribution losses to 10%). New interconnections and generation capacities will help to reduce the supply gap in a stabilised situation. It remains to be seen if a fully privatised distribution system will improve company management and bill collection.

Over the past decade, Albania has achieved important and broad regulatory reforms in its electricity sector, particularly in two areas: a market-based regulatory framework largely in line with the Energy Community Treaty requirements, and the re-structuring of KESH, the incumbent electricity company.

Aside from adapting the infrastructure to new technical, regulatory and market conditions, Albania's greatest challenges relate to the final steps to re-structure the electricity sector and it subsequent market opening. The authorities must advance their efforts to open the market to competition, notably through the preparation and approval of market rules and the unbundling of the transmission network infrastructure. Initiatives taken in this regard have already improved the network's efficiency and increased interconnection capacities. Effective competition will depend on the success of reforms in achieving market fundamentals.

Heat

Key issues

- ***Electricity for heating***
- ***Customer information***
- ***CHP market potential***

The district heating (DH) systems in Albania's main cities were built in the 1960s, but then abandoned in the early 1990s due to the lack of maintenance and high operating costs. Many coal-fired, combined heat and power (CHP) plants, which provided heat to oil refineries and industries, were also decommissioned. In their place, public buildings were equipped with heat-only boilers (at low efficiency); some continue to operate despite high costs of maintenance and input fuel.

Given Albania's current economic and energy situation, a least-cost analysis or feasibility study would almost certainly conclude that it would make more sense economically to install other heating options (*e.g.* building or individual boilers, heaters or stoves using LPG, or fuel oil or wood) than to rehabilitate old DH systems. The fact that the heating season is relatively short in Albania strengthens the argument against a large investment in such a major overhaul of outdated DH systems, as does the eventual need to re-connect the buildings to the DH system, which would require keeping their hot-water circuits in pristine condition. This would be a particularly difficult challenge after almost 40 years of poor maintenance and inadequate investment. Similar conclusions – *i.e.* that rehabilitation is not the most favourable investment – would probably apply to heat-only boiler systems with low efficiency.

Space and water heating is the second largest energy use in Albania, after road transport. More than half of the energy consumption in space heating draws on electricity, as does 86% of water heating. Such high levels of electricity consumption overload the networks and are, at the current tariff levels, very expensive for customers. Thus, the availability of and access to safe, efficient and affordable heating and cooking alternatives is of primary importance for households. Locally sourced and relatively cheap fuelwood is a common fuel for household space heating, but is used inefficiently and, therefore, required in large volumes. It is difficult to use fuelwood in urban areas because of issues related to storage and chimneys.

LPG is more flexible and covers a broad range of uses, which helps to explain its recent rise in consumption. The *Energy Sector Strategy* identifies significant growth potential for LPG. However, its price (EUR 0.90/L) is relatively high and the quality is irregular, in part because LPG is traded in small volumes and the LPG infrastructure is still limited. Oil products, such as light fuel oil, provide another option for individual houses and stoves, or for building boilers. However, oil products are more difficult to use than LPG. Energy-efficient heat pumps can also provide valuable alternatives for space and water heating, but rely on electricity supply.

Regarding heat required for industrial processes and services (*e.g.* hospitals and tourism), CHP plants can provide a valuable option and even generate revenues from the sale of electricity. An audit-based study carried out by the Energy Efficiency

Centre Albania-EU outlined the low efficiency of existing heat-only boilers (fired by coal or light fuel oil) and the potential of small- to medium-sized CHP plants using heavy fuel oil and wood waste. The *Energy Sector Strategy* foresees the development of small CHP plants to produce more than 0.2 Mtoe (or 7% of TPES) by 2020.

Discussion

A major challenge facing Albania's electricity system is the need to encourage consumers to switch to alternative sources for space and water heating, as well as for cooking.

The *Energy Sector Strategy* outlines the advantages and potential of LPG, while also recognising the need to strengthen the distribution network in order to attract and satisfy customers in terms of quality, reliability and price. It also supports other alternatives such as fuel oil boilers for buildings and houses, efficient wood stoves and heat pumps. Information awareness campaigns will be needed to ensure that consumers understand this increasing diversity and complexity of alternative sources.

De-centralised heat and power generation has potential in some sectors. For the investor, these options have the advantages of high efficiency and rapid payback (if the electricity purchase tariff is attractive). They also provide the grid operator with an opportunity to reinforce networks in consuming areas.

Renewable energy

Key issues

- ***Aged hydropower facilities***
- ***Hydrology variations***
- ***Lack of forest management***
- ***Availability of adequate technology***
- ***Low energy prices***

Renewable energy sources account for a significant share of the energy mix in Albania. In fact, hydropower accounts for almost 20% of the country's TPES and 96% of the electricity mix (2005). Fuelwood is also important and, according to official statistics, accounts for almost 10% of TPES. This represents a significant decline since 1990 when fuelwood accounted for 27% of TPES, and a moderate decline since the 2001 level of 14% of TPES. Other experts estimate the share of fuelwood to be at least 15% of TPES.

KESH owns 10 large and medium-sized hydropower plants and 83 small plants. The three largest, on the Drin River, have a combined capacity of 1 350 MW. In 2005, they accounted for 92% of available installed capacity and 96% of total generation (see Electricity section). KESH's small hydropower plants (less than 1.2 MW) add 14 MW of capacity but are in poor working condition or out of commission due to outdated technology, lack of spare parts and poor maintenance.

Fuelwood is used extensively in Albania, particularly by households in rural and mountainous areas. Energy consumption surveys carried out (in 2005) by the former National Energy Agency estimate that actual fuelwood consumption may be closer to 300 to 350 ktoe. This decrease in fuelwood consumption reflects the decline in rural population (with significant population shifts to cities and abroad), as well as increased use of electricity and oil products.

Renewable energy potential

Around 35% of Albania's technical hydropower potential has already been exploited, leaving additional estimated resources of around 2 000 MW for a total potential generation of 6.5 TWh. Beyond the need for rehabilitation and new investments, hydropower remains highly dependent on hydrology and has, in some years, been affected by drought/dry periods.

Large projects under development include the Vjosa (up to 495 MW) and Devolli cascades (up to 320 MW). The Kalivaci (84 MW) plant is under construction, to be followed by the Ashta plant (44 MW). A total of 41 identified small size projects would add another 140 to 150 MW (or 700 GWh). In 2007 the government awarded concessions for 16 small hydropower plant projects for 43 MW.

With German co-operation,[99] METE and the NRA are undertaking a specific project that focuses on the legal and economic conditions of small hydropower plants, and also provides bank guarantees for investment projects. A new *Law on Concessions* (adopted in 2007) sets compulsory long-term purchase contracts with feed-in tariffs for small hydropower plants.

Fuelwood and biomass have a large potential, provided forests are adequately managed and agriculture waste is used locally. Forests cover a large part of Albania's territory (23.5%) with proven reserves of fuelwood estimated at 125 to 250 Mcm (or 6 Mtoe).[100] However, the lack of forestry management coupled with extensive cuts (estimated at 1.8 to 2.5 Mcm or 250 to 350 ktoe for domestic and neighbouring markets) – especially illegal cuts – have endangered the resources in some parts of the country and led to significant deforestation.

There is little exploitation of agricultural waste (*e.g.* vegetal and animal) in Albania. Biofuels could deliver new potential for the energy sector. A law adopted in 1999 envisages the use of 5% of biodiesel by 2010; however, few concrete projects are in place to meet this target. Municipal waste incineration has not been considered due to its high cost and environmental impacts. The recovery of biogas from existing landfills (for use in CHP plants) may be feasible and, in fact, eligible for financing based on the Kyoto Protocol's clean development mechanism (CDM).

Solar water heaters are proven technologies to supply domestic hot water to the service sector (*e.g.* hospitals and hotels), industry and households. However, low electricity prices and non-payments are obstacles to their widespread installation and use. Solar panels are available on the market and significant volumes have been installed. In 2005, a total of 6 700 m^2 were installed (60% by services, 40% by households). This

99. KfW project *Development of Renewable and Energy Efficiency* (see "Energy Efficiency" section).

100. Based on inventories conducted every 10 years by the Forestry Directorate (Ministry of Agriculture).

is three times the 2002 figure and brings total installations to 32 000 m^2 (equivalent to around 50 GWh per year or 1% of electricity consumed by households in 2005). Using the equipment rate in Greece, it is estimated that Albania's total potential for solar panels is 125 MW (or 1.8 million m^2), which would justify the development of local manufacturing to substitute imported equipment. UNDP is supporting a programme (2007-12) to install 50 000 m^2 of solar panels based on grants and fiscal incentives.

There is potential to tap wind energy on the Adriatic coast. However, it has not been studied in detail due to a lack of reliable data. The current instability of Albania's electricity grid would be an obstacle to connecting windmills. Geothermal potential is quite limited.

Renewable energy policy

With the exception of hydropower, Albania made little effort to promote and exploit renewable energy sources in the 1990s. However, renewable energy is a priority of the *2003 Energy Sector Strategy* and its 2007 update. At the 2020 horizon, the *Strategy* envisages significant declines in the share of fossil fuels (-60%), large hydropower (-15%) and fuelwood (-7%), countered by corresponding increases in the share of other renewables (+18%). This 18% increase would be broken down as follows: small hydropower (+7%), small co-generation fuelled by biomass (+6.5%), solar energy (+3.5%), wind energy (+1%) and geothermal (+0.2%).

METE and the NRA, together with the Energy Efficiency Centre Albania-EU and various donors, have been active in the area of renewables, particularly for large and small hydropower, and for solar water heaters. The government considers hydropower as the backbone of power generation and has set a priority to rehabilitate or replace existing plants to reinforce their reliability, safety and output. The government has developed two main tools to promote investment: concessions for large hydropower; and guaranteed tariffs (EUR 0.057/kWh) and purchase agreements for small plants.

A specific law for renewable energy is also envisaged to support the objective of an 18% share of new renewable energy use (in addition to large hydropower and fuelwood) by 2020. Solar water heaters can sustainably and effectively substitute electricity at competitive conditions provided equipment is reliable and reasonably priced. Local manufacturing, the development of after-sale services and financial incentives should reinforce the attractiveness of solar panels.

Discussion

The government's renewable energy policy has made some progress, notably in securing financial resources for infrastructure rehabilitation and improving investment conditions through the new *Law on Concessions* and the purchase tariffs for small hydropower plants. The significant untapped potential of hydropower offers interesting opportunities but would require careful planning, notably regarding hydrology and environmental impacts. New hydro capacity to be commissioned in the coming years may not be large enough to compensate for outages of existing capacity due to lack of maintenance or urgently needed repairs.

Uncontrolled harvesting of fuelwood, for domestic use and export, is leading to deforestation in parts of Albania. The use of inefficient stoves creates indoor and outdoor pollution, and leads to health problems. Effective forestry management is needed to control and better value the resource, notably the possible use of wood waste in small CHP plants.

The Albanian government has an ambitious target of increasing the share of non-traditional renewable energy (*i.e.* sources beyond hydropower and fuelwood) to 18% of TPES by 2020, bringing the total share of renewables to 40% of TPES. Solar energy for water heating has been the most rapidly increasing non-traditional renewable energy source in recent years. However, given the small base from which it began, its contribution to TPES remains modest. Solar power clearly provides services to customers and reduces the burden on the electricity system; the challenge now is to support market penetration without subsidies. One option may be to provide investment financing to households through progressive repayment on the electricity bills. Information is still lacking on the potential and possible development approaches for biomass/biogas, biofuels, wind and geothermal. Albania also needs to establish a global and coherent regulatory framework for renewables (notably purchase tariffs) and reinforce institutional capacity to effectively support their development.

OVERALL RECOMMENDATIONS

In addition to the recommendations and key findings included in the Overview and in the regional chapters, the government of Albania may consider the following recommendations useful:

Institutions and overall strategy

- Reinforce the institutional structure, particularly in relation to policy development and reform; provide adequate staff and resources to ensure that ministries and their agencies can fulfil their mandates.
- Complete the process of separating policy making from regulation enforcement and ownership of state companies by transferring control of such companies to a separate state body.
- Improve inter-administration co-operation between energy and other public policies, particularly policies on environment, transport and housing; enhance coherence of *Energy Sector Strategy* through multi-sector action plans.
- Continue to give priority to the development of energy policy and reform plans, with particular focus on the action plan of the *Energy Sector Strategy;* establish clear timelines and responsibilities, and reinforce the consultation and monitoring process.
- Continue to ensure high quality of energy statistics, forecasts and least-cost plans as key decision-making tools.

Market reforms and regulation

- Continue to develop and adapt the energy regulatory framework in accordance with the Energy Community Treaty and EU regulation.
- Give priority to effective and monitored enforcement, notably by providing sufficient resources and power to the administration.
- Ensure the independence of the ERE, particularly in its goal to implement cost-reflective electricity pricing, which will need to be combined with effective metering and payment.
- Assess the feasibility of introducing peak tariffs and interruptible contracts to improve investment conditions and mitigate peak demand.
- Continue the re-structuring and effective unbundling of the electricity sector towards international corporate standards to enable third-party access and attract new entrants.
- Privatise state energy companies, taking into account energy security and competition conditions.

Energy security

- Continue to give priority to energy security through comprehensive and effective policies, notably sustained market reforms, modernisation of infrastructure and sustainable energy.
- Continue to enhance diversification of energy sources and imports, notably through interconnection; further integrate energy efficiency and use of renewable sources as tools for energy security.
- Prepare the foundation for an energy security system, particularly in relation to emergency and crisis management; build sufficient reserve stocks of oil products.

Energy efficiency

- Implement the National Energy Efficiency Programme (NEEP) with clear objectives and priorities; enhance co-operation between national and local energy agencies and networks.
- Continue to give priority to energy efficiency within the energy policy; improve integration of energy efficiency in the reform of the energy sector and in other public policies (*e.g.* social, environment, transport, buildings and security).
- Adopt policies to ensure high energy-efficiency standards for new public buildings and the purchase efficient equipment, appliances and vehicles.
- Accelerate the adoption of EU regulation (notably of building codes and appliance labelling) and ensure its effective implementation.
- Consider options to develop financing schemes under cost-effective conditions.

Energy and environment

- Adopt an action plan for the environment and climate change, with quantitative objectives to reduce air pollutant and CO_2 emissions; provide sufficient resources to achieve these objectives.
- Ensure that EU regulations are effectively enforced, particularly the EU Directive on large combustion plants and limits on urban pollutant emissions.
- Continue to explore options for active participation in the Kyoto Protocol's flexibility mechanisms (particularly CDM) that target energy efficiency and renewable energy.

Fossil fuels

- Ensure close monitoring of oil product needs (notably LPG) and of retail market operations to ensure adequate supply (in volumes and quality) at competitive prices.
- Consider transferring to the ERE regulatory powers on the retail oil market.
- Progressively enforce EU regulations for fuel quality standards, as well as for safety and environment in the oil sector.
- Finalise the re-structuring and privatisation to strategic investors of upstream oil and refining assets.
- Consider the introduction of natural gas in a global energy policy, taking into account energy security, economics, regulatory and operational considerations.

Electricity

- Update the *Power Sector Policy Statement*; reinforce implementation and monitoring tools of METE and the ERE.
- Pursue implementation of the KESH action plan 2007-09, particularly in terms of company re-structuring, full metering of customers and bill payment to reduce non-technical distribution losses to 3% by 2015.
- Take appropriate measures to reduce technical transmission and distribution electricity losses.
- Pursue the rehabilitation and adequate maintenance of electricity infrastructures to enhance reliability, efficiency and diversification, and ensure operational cross-border capacities.
- Ensure that grid access tariffs and electricity prices cover all costs, including investment in new facilities.
- Enforce legislation in line with the European Union and the Energy Community Treaty, enabling effective third-party access and effective customer choice.
- Consider transforming the transmission system operator, OST, into an independent body under state ownership.
- Consider innovative ways to attract new players, notably independent power producers, in electricity generation and trading.

Heat

- Favour the development of economically viable alternatives to electricity for space heating within the context of energy efficiency improvements; provide adequate information and advice to customers (*e.g.* awareness campaigns and local information centres).
- Consider introducing incentive-based electricity purchase tariffs and access to the grid for CHP plants.

Renewable energy

- Adopt a renewable energy action plan with sufficient financial resources, notably to national and local agencies, to reach the 40% renewable energy target by 2020.
- Ensure, as a priority, the rehabilitation of existing hydropower plants with structural risks and the commissioning of new units, taking into account hydrology and environmental impacts.
- Enforce strict control on the harvesting and trade of fuelwood, within a comprehensive forestry management plan; support market penetration of efficient wood stoves, notably through minimum performance standards.
- Prioritise market tools (*e.g.* feed-in tariffs and green certificates) in line with EU regulation; apply purchase obligations and tax incentives for renewable electricity, for a fixed period of time.
- Reinforce the solar water heater programme; consider a study on the potential of biomass and wind energy.

Map 6.................Bosnia and Herzegovina's energy infrastructure

The boundaries and names shown and the designations used on maps included in this publication do not imply official endorsement or acceptance by the IEA.

V. BOSNIA AND HERZEGOVINA

BOSNIA AND HERZEGOVINA ENERGY HIGHLIGHTS

Table 17 .... Energy snapshot of Bosnia and Herzegovina, 2005

	Bosnia and Herzegovina	Western Balkan region	OECD Europe
Total primary energy supply (Mtoe)	4.9	38.7	1 875
Total final energy consumption (Mtoe)	3.0	25.4	1 340
Energy consumption (toe) per capita	1.27	1.62	3.50
Electricity consumption (kWh) per capita	2 320	2 970	6 145
Energy intensity of GDP*	0.19	0.25	0.15
Carbon intensity (kg CO_2/GDP*)	0.62	0.69	0.33
Net imports as % of TPES (Dependence)	32%	**	44%

* In terms of purchasing power parity; in toe per thousand USD (in year 2 000 US dollars).
** Not calculated to avoid double counting due to intra-regional trade.
Source: IEA statistics (with additional data from administrations in Montenegro and Kosovo used for calculation of averages for the Western Balkan region).

The country includes the Federation of Bosnia and Herzegovina (FBiH, representing Bosniak and Croat communities) and the Republika Srpska (RS, representing the Serb community). The electricity networks of the two entities were re-integrated in 2003 and subsequently re-integrated with the UCTE network in 2004, providing more reliability of supply.

Apart from medium-term energy sector objectives adopted by the State Council of Ministers in 2004, Bosnia and Herzegovina has no formal national or regional energy policy or reform plans. Even these adopted objectives have yet to be translated into specific and coherent actions and programmes.

The regulatory framework in Bosnia and Herzegovina reflects the fragmentation, complexity and weakness of the energy institutions and policies. Despite progress in the electricity sector (particularly in transmission, with the creation of a single system operator and a national regulator), the country lacks a comprehensive and uniform energy regulation covering other energy forms. A lack of reliable and harmonised energy data further complicates or prevents effective regulation.

Bosnia and Herzegovina's energy import dependency is low at 38%, reflecting significant domestic production of coal, wood and hydropower. However, the country is 100% import dependent for oil and gas, and import volumes are increasing. Import sources and routes are diversified for oil products; however, there are no regulations on minimum oil stock levels and no gas storage facilities.

BOSNIA AND HERZEGOVINA'S ENERGY CHALLENGES

The absence of a comprehensive and coherent national energy policy is at the crux of many of the energy problems in Bosnia and Herzegovina. Despite combined efforts of governments and donors, the country's institutional energy structure lacks the capacities, means and powers to effectively undertake energy policy making and enforcement. Existing government bodies are understaffed and available statistics are insufficient.

Another major challenge is that the energy system in Bosnia and Herzegovina is both overly complex and highly fragmented. This creates additional challenges on many levels:

- Inadequate regulation of operators and markets increases the risks of abuse of dominant position, and of non-transparent and discriminatory behaviours.
- Government responsibilities are unclear with respect to state-owned companies. Decisions to award electricity plant concessions to private investors without open and transparent tenders undermine the effectiveness and economic benefits of reforms.
- Persistent fragmentation of the electricity sector, coupled with a lack of effective regulation, threaten its sustainability in the long term and increase the risk that the sector will be marginalised in the region.

In the electricity sector, the overall institutional fragmentation – on top of the legal and physical separation of the system – adds complex problems for Bosnia and Herzegovina. This is in addition to the normal technical, economic, regulatory difficulties and barriers common to an unbundling and liberalisation process. For this reason, a primary objective should be to create a functioning domestic electricity market. A national least-cost investment plan for electricity should provide a ranking of the most viable investments and be co-ordinated with the grid operator, the regulator, and with other Western Balkan partners in the Energy Community.

Energy transformation in Bosnia and Herzegovina (particularly power generation) leads to high losses (40%) due largely to outdated equipment and technologies, and the limited share of CHP in the energy mix. Energy end-use is also inefficient. Lack of reliable data makes it difficult to estimate the energy efficiency potential of the country. The lack of a comprehensive energy policy or structured institutions results in a lack of focus on energy efficiency and security. Bosnia and Herzegovina is the only country in the Western Balkan region (or Central Eastern Europe) that has not yet established such policies and institutions.

Ministries at the state and entity levels are responsible for environmental protection and have adopted a *National Environment Action Plan*. However, institutional and regulatory divergence, along with the lack of policy enforcement, reduces the Plan's effectiveness. Consolidation of policy, regulatory and institutional frameworks is key for effective action.

A clear, structured and publicly endorsed national energy strategy is required to initiate and sustain energy reforms; it should be backed by adequate institutional structure and regulatory framework. A federal energy system in Bosnia and Herzegovina is achievable, and should encompass a common policy and institutions. Significant ongoing efforts will be needed (in the medium term) to catch up with neighbouring countries in regards to compliance with EU requirements.

INTRODUCTION

Until 1992, Bosnia and Herzegovina was a republic of the former Socialist Federal Republic (SFR) of Yugoslavia; it declared independence after similar declarations were made by the neighbouring countries of Slovenia and Croatia. This declaration of independence was followed by a three-year war, which left more than 250 000 people – mostly civilians – dead or wounded, and displaced more than 60% of the population (another 25% were forced to seek refuge abroad).

The Dayton Agreement, signed in 1995 (under the supervision of the international community) by the parties in conflict in Bosnia and SFR Yugoslavia confirmed the borders of Bosnia and Herzegovina. It also established a central government, based in Sarajevo, in charge of foreign affairs, defence, economic and fiscal policies, with a presidency that rotates amongst the three main ethnic communities (Bosniak, Croat and Serb). Within the borders of Bosnia and Herzegovina there are two entities[101] that perform the remaining governmental functions within their respective territories: the Federation of Bosnia and Herzegovina (FBiH; representing Bosniak and Croat communities) and the Republika Srpska (RS; representing the Serb community). The international community mandated a High Representative as the highest political authority in the country and assigned military forces – first under a UN mandate, then a NATO-led force and, finally (since 2005), an EU security force.

Each of the two entities covers approximately half of the territory of Bosnia and Herzegovina, which comprises 51 129 km^2. The country is bordered by Croatia to the west, north and south, by Serbia to the east, and by Montenegro to the southeast. Bosnia and Herzegovina is almost completely landlocked; its small Adriatic Sea coastline has no large port. Mountains dominate the centre and south; plains and hills prevail in the north. The climate is mainly continental, with hot summers and cold winters.

A 2006 census estimates the population of Bosnia and Herzegovina at 3.9 million, of which 54% live in FBiH and 46% in RS. This is a dramatic decline given a pre-war population of 4.4 million. Sarajevo, the capital of the country and of FBiH, is the largest city with 385 000 inhabitants (2005), followed by Banja Luka (the capital of the RS with 175 000 inhabitants), Mostar (the capital of Herzegovina, 105 000 inhabitants), Zenica and Tuzla. More than 55% of the country's population is rural.

The recent war (1992-95) destroyed infrastructure and buildings, and negatively affected the country's economic activity. In 1995, gross domestic product (GDP) was less than 20% of its pre-war level. Since the war ended, reconstruction efforts and international aid (which still account for 20% to 25% of the country's current account balance) have contributed to boosting GDP growth at an average annual rate of 6%. In 2005, the country's GDP was about EUR 6.5 billion in real terms (or EUR 25.5 billion in PPP terms) or almost 75% of its pre-war level. Since the adoption (in 1996) of the convertible marka (BAM) as the national currency,[102] annual inflation has remained below 6%.

101. Brcko is a small and separate district in the north of the country. It is under the direct responsibility of the state government.

102. The convertible marka (BAM) was pegged at 1:1 with the Deutschmark and, since 2002, has maintained this peg against the Euro (EUR 1.00 to BAM 1.95).

Unemployment has remained extremely high at 44%, particularly among the younger segments of the population. Poverty is widespread, officially affecting almost 20% of the population. The collapse of traditional heavy industries (*e.g.* steel, chemicals and weapons) and light industry (notably food processing) has increased dependence on imports. This has led to a current account deficit and an external debt that reached 30% of GDP in 2005. Export levels are well below pre-war levels and mainly consist of low value-added materials or semi-processed products (*e.g.* coal, iron ore, lead, zinc, manganese and bauxite). The structure of GDP is now dominated by services (62%), followed by industry (29%; including a few large aluminium and steel plants) and agriculture (9%). Foreign direct investment (FDI) has been limited (annual average of EUR 200 million) and is directed mainly to services and large existing factories.

Bosnia and Herzegovina remains politically divided. Over the last decade, it has struggled to address the multiple challenges of economic reconstruction, focusing primarily on the reform of economic policy and regulation to rebuild competitiveness. The challenge has been exacerbated by the emigration of most of its skilled and educated people to more economically advanced countries in the Western Balkan region and in Europe. In 2005, the country joined the EU Stabilisation and Association Process, which has been the largest aid donor.

ENERGY DEMAND AND SUPPLY

Methodology and sources

The two agencies for statistics in Bosnia and Herzegovina – the Federal Office of Statistics (in FBiH) and the Institute of Statistics (in RS) – again began collecting primary energy data after 2000. For the most part, this was limited to energy supply data provided by energy companies. To date, no reliable, comprehensive national energy or electricity balance or data sets are available on a regular basis.[103] In fact, the most recent energy balance or Eurostat/IEA/UNECE Annual Energy Questionnaires dates back to 1996. Bosnia and Herzegovina is the only country in Europe that does not submit such data. A third body, the State Agency for Statistics, operates at the national level. However, it lacks a clearly defined role on energy and does not consolidate energy data. Resource allocation for energy statistics is extremely scarce: there is only one staff member focusing on energy within each organisation.

With the aim helping the three statistical institutions reinforce data collection, the Swedish Statistical Office is carrying out a three-year (2007-09) technical assistance project.[104] It focuses particularly on the demand side and seeks to build capacity in producing national energy balances according to international standards and to provide training in data analysis. Activities are co-ordinated with two ongoing technical assistance projects: the World Bank Energy Sector Study (2006-07), which is conducting sample

103. The published IEA energy balances and data are based on various domestic and international sources, and are available online at: www.iea.org/Textbase/stats/index.asp.

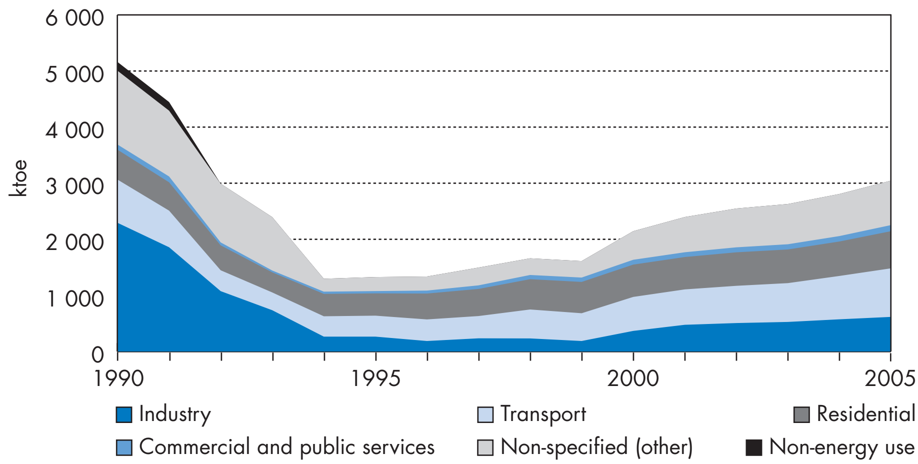
104. Funded by the Swedish International Development Agency (SIDA).

customer surveys in the residential, service and industrial sectors; and the EU CARDS Technical Assistance programme to Support the Energy Department (TASED) of the Ministry of Foreign Trade and Economic Relations (MOFTER) (Box 4).

Demand

In 2005, total final energy consumption (TFC) in Bosnia and Herzegovina was 3 Mtoe, according to IEA statistics. The largest share of consumption was oil products (36%), followed by electricity (22%), coal (22%), natural gas (7%), heat (7%) and fuelwood (6%).[105] The largest consumer of energy is the transport sector (almost 30%), followed by residential (22%), industry (20%) and services (4%).[106] Overall, TFC is almost 2.5 times higher than in 1996, but still only 55 to 60% of its pre-war level.

Figure 11 ....Bosnia and Herzegovina's total final consumption by sector, 1990-2005



Source: IEA statistics.

Supply

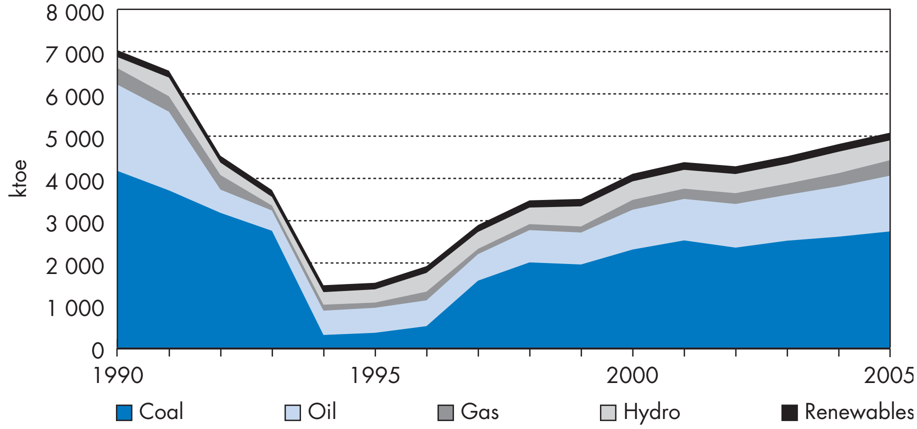
In 2005, total primary energy supply (TPES) reached almost 5 Mtoe, almost two-thirds of the pre-war level, broken down as follows: coal (54%), oil products (26%), natural gas (9%), hydropower (7%) and fuelwood (4%).[107] Domestic production, mostly coal, accounts for more than two-thirds of TPES. Oil products and natural gas volumes are supplied through imports. The country is a net exporter of electricity (3.5 TWh or 27% of generated electricity) and of coal and fuelwood (to a lesser extent).

105. This figure is likely an under-estimation, as fuelwood is used extensively by rural and urban households. The TASED programme prepared detailed energy balances for 2005 and estimated the share of fuelwood in TFC at 15%.

106. "Non-specified" sectors account for more than 20% of TFC.

107. TASED estimation for fuelwood is 8% of TPES (2005).

Figure 12 .... Bosnia and Herzegovina's total primary energy supply by fuel, 1990-2005



Note: TPES excludes electricity trade.
Source: IEA statistics.

Energy intensity

Energy intensity is high in Bosnia and Herzegovina. In 2005, it was estimated at 0.77 toe per thousand USD of GDP (in year 2000 USD), almost four times the average for OECD Europe. This reflects high levels of energy losses, which are estimated at 40% of TPES. Measured at purchasing power parity (PPP), the ratio is 0.19 toe/GDP compared to average levels of 0.15 toe/GDP for OECD Europe (PPP year 2000). By contrast, annual electricity consumption per capita was 2 320 kWh, compared to average levels of 6 145 kWh in OECD Europe.

ENERGY POLICY AND INSTITUTIONS

Institutions and overall strategy

Key issues

- *Weak administrations*
- *Multiple administrative levels*
- *Lack or absence of policy and reliable data systems*
- *Ownership of reform plans*

Institutions

The structure of the energy administration in Bosnia and Herzegovina reflects the country's divided political situation. At the state level, the focal point for energy is the Energy Department of the ***Ministry of Foreign Trade and Economic Relations*** (MOFTER). The Department's main responsibilities include the co-ordination of general energy and environment policy, international relations and donor-funded projects. However, the resources allocated to this department are inadequate: it has a staff of six, including an assistant minister, a department head and two senior advisors.

At the entity level (meaning FBiH and RS), the ministries in charge of energy retain most of the responsibility for policy and regulatory design. In both ministries, an assistant minister is in charge of energy. However, ministry powers are weak and resources are scarce.

- At the FBiH ***Ministry of Energy, Mining and Industry*** (FMEMI), the Department of Energy includes three sections: Electricity; Oil/Gas and Thermal Energies; and Energy Indicators and Diversification. Over the past three years, its staff – primarily professionals and engineers – has been halved to six individuals.
- At the RS ***Ministry of Energy and Mining*** (RSMEM), the Energy Department is composed of four sections: Electricity; Energy; Oil and Gas; and Energy Development. Its staff has also been reduced to six.

Between 2003 and 2005, Bosnia and Herzegovina created three electricity regulatory authorities:

- The ***State Electricity Regulatory Commission*** (DERK)[108] is based in Tuzla and has 20 staff.
- The FBiH ***Regulatory Commission for Electricity*** (FERK) is based in Mostar and has 25 staff.
- The RS ***Regulatory Commission for Electricity*** (REERS) is based in Trebinje and has 24 staff.

DERK has responsibility over transmission, co-operating with the Competition Council and the Communication Regulatory Agency. The two entity regulators are responsible for generation and distribution.

In principle, MOFTER has a co-ordination role over a large scope of policy and regulatory issues in the energy sector. In reality, the entity ministries are reluctant to consult and co-ordinate. Similarly, attempts to consolidate the activities of the three regulators, and to extend their scope to natural gas and heat, have been stalled. Offices for these administrations are located in five different cities across the country, which further complicates communication and organisation.

Energy policy and strategy

Bosnia and Herzegovina has no formal energy policy documents or reform plans – at either the state or entity level – adopted by the governments or by the Office of the High Representative (OHR). However, in 2004, the Bosnia and Herzegovina Council of Ministers adopted the following medium-term objectives:

- Attract domestic and foreign investments.
- Ensure reliable energy supply, according to defined standards and the lowest price possible.
- Integrate with international markets by developing consolidated markets for electricity and gas, and by introducing competition and transparency.
- Protect the interests of consumers.
- Enhance rational and efficient use of energy resources.
- Ensure environmental protection, according to domestic and international standards.
- Increase the use of renewable energy.

108. Also known by the English acronym SERC.

- Fulfil the commitments of the Energy Charter Treaty, as well as other international agreements and conventions.

These objectives have yet to be formulated into specific and coherent actions and programmes at the national and entity level. At the entity level, the government of FBiH adopted (in 2000) the Electricity Policy Statement and (in 2005) the Plan for Power Capacities Development, which focuses on possible new electricity generation plants. In RS, the reference policy document is the 1998 strategy for the *Elektroprivreda Republike Srpske* (EPRS or Republika Srpska Electricity Company), which was prepared by an engineering company, Energoproject (based in Belgrade).

Several international technical assistance projects have provided support for policy, statistics and regulatory development (Box 4). In 2004, the World Bank's *Poverty Reduction Strategy Paper* (*PRSP* 2004-07) listed the following objectives for energy sector reform:

- Stimulate national and international investment.
- Ensure a more reliable supply of energy, in accordance with defined quality standards and at lowest prices.
- Join the international energy market through the operation of integrated markets for electricity and gas.
- Enhance cost-effectiveness and rational use of energy sources, and improve energy efficiency.
- Implement liberalisation, and introduce competition and transparency.
- Ensure the protection of the environment in accordance with national and international standards.
- Protect the interests of system users.
- Increase the use of renewable energy sources.
- Meet the conditions of the Energy Charter Treaty, as well as other international contracts and agreements.

Box 4 .... International technical assistance projects on energy policy and statistics in Bosnia and Herzegovina

Assistance in Establishing the Energy Department at MOFTER (2001-06): This project is a multi-country technical assistance programme, funded by the Canadian International Development Agency (CIDA) and supported by the Southeastern Europe Electrical System Technical Support Project (SEETEC Balkans). Its main objectives were to: assist the core team at MOFTER in setting up the Energy Department; and define and implement the Department's mission. The project reviewed and recommended structure, methodologies, tools and administrative systems (including equipment) needed to establish the Energy Department. It also enhanced team capacities to define and implement the Department's mission, roles and responsibilities. Similar tasks were also performed for the two entity ministries. (See www.seetec-balkans.org for more detail.)

Technical Assistance to the Statistical Offices of BiH (2006-09): This project is supported by SIDA and Statistics Sweden, within a regional and multi-sector programme. Its main objective is to provide advice and capacity building to the energy departments of state and entity statistical offices. The project aims to assess the energy statistics system in Bosnia and Herzegovina, and to propose and jointly implement methodologies and tools to establish a data system that is harmonised with international methods and principles. This will enable the State Agency for Statistics to effectively prepare and submit Eurostat/IEA/UNECE Annual Energy Questionnaires by 2009.

Technical Assistance to Support the Energy Department of MOFTER (TASED) (2006-09)[109]: This project is supported by the European Technical Assistance programme in Southeast Europe (CARDS) with the objective of helping MOFTER's Energy Department develop an energy strategy. The project focuses providing assistance in five key areas: an energy database; energy balances and projection models; a capacity development programme; co-ordination with international organisations; and information dissemination. The project builds on the results of the World Bank Energy Sector Study, as well as on the energy statistics provided by the Swedish (SIDA) technical assistance project with the statistical offices.

Energy Sector Study in BiH (2006-08): This project is supported by the World Bank (Power III programme) and by a consortium led by the Energy Institute Hrvoje Požar (EIHP) of Croatia. Its main objectives are to carry out a comprehensive study of all segments of energy supply and demand, to prepare energy balances and forecasts, and to develop optimisation tools (including a sectoral least-cost planning model). See www.eihp.hr/bh-study/reports.htm for more detail.

Discussion

Institutions

Despite combined efforts of governments and donors, the institutional energy structure of Bosnia and Herzegovina remains fragmented, weak and incomplete. The institutions for energy policy making, enforcement and statistics are understaffed and lack financial resources. The gas and heat sectors lack adequate regulation. Regulatory agencies have been established for the electricity sector; although they have adequate resources, their authority remains weak, notably over price setting. A lack of clarity regarding institutional responsibilities with respect to ownership of state-owned companies creates a situation in which energy companies (particularly electricity utilities) are gaining a strong influence over energy policy. In the RS, the governmental strategy was even developed by the electricity company. Agencies for implementing policies related to oil stocks, energy efficiency and renewables have not yet been established.

The complexity of administration (two administrative levels spread across five cities and a separate body for each energy field in each political entity) raises many questions in terms of policy, organisation and allocation of resources. Such fragmentation limits the administration's ability to push through reforms and to control the state energy companies. As a result, these companies have maintained extensive power and influence over energy policy and legislation.

109. The project was suspended for ten months and resumed again in October 2007.

Based on the experience of advanced reform processes in other Western Balkan countries (and in countries outside the region), it is hard to envisage how effective reforms can be developed, implemented and sustained in Bosnia and Herzegovina without a critical mass and authority in central administrations. Effective co-ordination and progressive consolidation of the institutional structure is also critical to reform. As outlined by the World Bank (World Bank, 2004), the de-centralised government structure created by the Dayton Peace Agreement was designed to promote political stability and democratic representation in decision-making processes. In reality, the system has led to fragmentation of the infrastructure, of the energy service delivery companies and of sector oversight in general.

It must be emphasised that the imperative for consolidating the policy, regulatory and institutional energy framework is economic – not political. Consolidation will bring significant gains in efficiency and coherence. It will also enhance credibility and strengthen the investment and operation of regulatory frameworks, which is critical to the economic and financial rationale of projects financed by donors, lenders and investors. An independent technical and applied research body, possibly an energy and environment institute, would provide powerful support in establishing and strengthening a viable structure in Bosnia and Herzegovina.

Policy

As a result of the weakness and fragmentation of its central administrations, Bosnia and Herzegovina lacks a consistent and co-ordinated vision of energy reforms, policy and statistics. This has slowed or prevented an effective regulation of energy companies and markets, at the expense of the competitiveness of the country, consumers and industry. The lack of clear, coherent and sector-wide policy guidelines and reform plans for the energy sector raises concerns as to the strength of the regulatory framework. It also hampers the creation of an attractive investment and operational framework, and leads to delays in infrastructure investment and modernisation.

In order to initiate and sustain energy reforms, Bosnia and Herzegovina needs a clear, structured and publicly endorsed national energy strategy, backed by an adequate institutional structure and regulatory framework. In order to effectively implement energy policy, the country needs to adopt a national vision and build consensus through a broad and thorough consultation process. As the experience of other European countries shows, a federated energy system in Bosnia and Herzegovina is not an obstacle *per se* to progress. However, there should be agreement on common policy objectives and a clear division of institutional responsibilities. Independent and accurate energy balances, statistics and indicators are prerequisites for effective and efficient policy making and regulation. Only a national and public data system can provide the necessary and reliable data to all stakeholders. The data system should be established by the state and the statistical offices of both entities, and should cover energy supply and demand, in line with Eurostat/IEA/UNECE standards

Donor programmes and projects have been vital to helping authorities rebuild institutions, data systems, policies and regulations. MOFTER has taken an active co-ordinating role, despite its limited resources and authority. Various technical assistance projects have helped to develop the future national energy strategy and to put in place the tools (*e.g.* energy balances, data and decision-making instruments) required for effective and balanced energy reforms. Nevertheless, strong ownership – by the administrations – of this process and adequate capacity building are needed to produce effective and sustainable results in line with the *2004 Declaration of Bosnia and Herzegovina Council of Ministers*. Recent progress on policy and regulation for electricity indicate that progressive and effective reform is not only feasible, it is beneficial for the sector and for electricity customers. However, in a sector dominated by strong energy monopolies and companies (both domestic and foreign), a clear energy reform plan will face numerous and complex obstacles. Problems related to outdated equipment and industries – as well as widespread poverty – need to be taken into account.

Market reforms and regulation

Key issues

- ***Incomplete and fragmented regulation***
- ***Co-ordination of regulation enforcement***
- ***Cross-subsidies***
- ***Company re-structuring***
- ***Investment authorisation procedures***

In Bosnia and Herzegovina, the development of a new regulatory framework for energy has focused on electricity. In 2004, Parliament adopted the *Law on Electricity Transmission, System Regulator and Operator in Bosnia and Herzegovina*. One of the *Law's* main objectives is to achieve an open and unified electricity market. To this end, the *Law* also set out the guidelines for establishing the State Electricity Regulatory Commission (DERK) to regulate the transmission network. This function is now ensured by a separate transmission system operator (TSO), Elektroprenos BiH. In 2002, the two entities adopted two separate electricity laws covering generation and distribution, thereby creating the Regulatory Commission for Electricity in Federation of Bosnia and Herzegovina (FERK) and the Regulatory Commission for Electricity in Republika Srpska (REERS). The powers of the regulators are broad and include licensing, setting network access tariffs and end-user energy prices, and protecting customers.

Several successive technical assistance projects (funded primarily by the European Union and USAID) have focused on developing the regulatory framework for the transmission network and establishing DERK. A new capacity building project (funded by the European Union) at DERK aims to unify the electricity regulatory structure and regulation, and to extend expertise to the gas sector. As of early 2008, there was no comprehensive regulatory structure in place for the sector. For electricity (and, ultimately, for gas), the main focus is on adopting legislation that is compatible with the Energy Community Treaty.

Pricing and taxation

Until 2002, electricity prices in Bosnia and Herzegovina were determined by the energy companies and approved by the governments. Since then, entity regulators have taken over the function of setting and regulating electricity end-use prices. Electricity prices have progressively increased toward cost-reflective levels, particularly since the early 2000s. The two entity regulators set and regulate wholesale and retail prices for coal products and electricity tariffs. By contrast, the regulators do not set retail prices for natural gas and oil products. Fuelwood prices are also unregulated, but closely follow electricity and gas prices.

Table 18 .... Energy prices in the residential sector of Bosnia and Herzegovina, 2003-07 (in EUR/Unit)

	2003	2007
Electricity (kWh) • Day • Night	 0.07 0.04	 0.08* n/a
Gas (m^3)	n/a	0.33
Brown coal (tonne)	54.00	42.00
Lignite (tonne)	38.00	22.00
Heat (m^2/y)**	0.53	n/a
Light fuel oil (L)	0.51	0.72
Heavy fuel oil (<1.2% S) (tonne)	n/a	380.00
LPG bottle (L)	n/a	0.45
Wood (m^3)	n/a	20.00 – 35.00
Diesel (L)	n/a	0.95
Gasoline RON 95 (L)	n/a	1.00

* 2005.
** Price is declared per square meter per month, based on a year-round flat tariff.
Note: VAT (17%) applies for residential customers and, since 2005, on most oil products and automotive fuels.
Sources: ERRA; Federal Office of Statistics; World Bank (2007).

Company re-structuring and privatisation

After the war, reconstruction of destroyed or damaged infrastructure has mobilised important resources. When possible, reconstruction projects have been combined with upgrading and modernisation of equipment (notably of the electricity system network).

Efforts to re-structure companies and sites have focused on lignite mining and electricity sectors. Lignite mines play an important economic and social role; they are the main fuel provider to thermal power plants (TPPs) and a major employer. In recent years, redundancy plans were implemented at several mines (in both the FBiH and the RS) in order to reduce the number of miners to reflect actual lignite demand and price. Overall, mining staff decreased from 29 000 in 1990 to only 16 000 in 2002. Following the OHR audit results of 2003, which outlined serious financial failures and mismanagement, the operation and management of the three entity electricity power companies have been reformed.[110] Improving corporate governance, particularly financial disclosure and asset management, remains an important objective for these companies.

The unbundling of monopoly activities has advanced well in the electricity sector, notably with the creation (February 2006) of both a state TSO and an independent

110. "A Special Auditor, appointed by the Office of the High Representative (OHR) to analyse the work performance of all three power companies during 2002, found mismanagement, conflicts of interest, theft, neglect, favouritism, inadequate and inefficient budgeting, poor cash flow management and financial record keeping. This cost the BiH power sector more than EUR 120 million in lost revenue in 2002. There are serious accusations in the Audit Reports which resulted in the dismissal of the Executive Director and the whole Steering Board of Elektroprivreda of the Republic of Srpska." In *Arrested Development Energy in the Balkans: Energy Efficiency and Renewable Energy,* Bank Watch. Available online at: www.bankwatch.org.

system operator (ISO). In 2005, the transmission divisions of the three entity electricity companies were merged to become Elektroprenos BiH (based in Banja Luka). Elektroprenos BiH now has sole responsibility for maintenance and construction of the transmission grid (110 kV to 400 kV). As the state TSO, Elektroprenos BiH has its own staff of 1 500; it derives its resources through regulated tariffs approved by DERK. Operation, management and control of the grid, including dispatching and balancing, are ensured by the state ISO (based in Sarajevo) and regulated by DERK. A similar process to separate the distribution networks by creating distribution system operators (DSOs) is ongoing in each of the three electricity companies.

Economic and corporate conditions are not yet suitable to consider the privatisation of state-owned electricity generation companies and lignite mines. However, EPRS (the electricity company in the RS) is structured such that the holding company (which is 100% owned by the government of RS) owns 65% of the shares in each of its 10 subsidiaries (five generation and five regional electricity distribution companies). The remaining 35% is owned by various private shareholders and quoted on the Banja Luka stock exchange.

Energy market structure and opening

In line with the Energy Community Treaty, preparations to open the electricity market to competition have focused on setting regulatory conditions for third-party access to the grid and allowing large customers to choose their suppliers on the free market. State and entity regulators control access to the electricity transmission and distribution network. Opening the market for eligible customers was carried out in phases. In January 2007, markets were opened to customers that consume at least 10 GWh of electricity per year (33% of all non-residential customers). The market was further opened in January 2008 to customers that consume at least 1 GWh per year (57% of non-residential customers). In January 2009, it will be open to all non-residential customers. However, because the three vertically integrated electricity companies remain the sole suppliers in each of their commercial areas, eligible customers cannot yet exercise their right to choose suppliers. Attracting new operators to enter the market and provide alternative supplies at fair conditions remains a considerable challenge.

Each year, the ISO prepares a 10-year *Plan for Generation Development* at the national level, which is used as a basis for the two entity ministries: the Ministry of Energy, Mining and Industry (FMEMI) for FBiH; and the Ministry of Energy and Mining (RSMEM) for RS. Both ministries adopt their own plans and grant authorisation for new investments in electricity generation, in line with national and entity regulations and in co-ordination with the TSO. In June 2005, FBiH adopted a plan for 2 600 MW of new capacity. FMEMI launched a public tender for projects in July 2006; however, as of early 2008, no decisions on major facilities had been taken. The RSMEM plans around 3 000 MW of additional capacity and directly awarded concessions to three new lignite power plants: Gacko II (600 MW) with CEZ of the Czech Republic; Ugljevik II (600 MW) with Slovenske Elektrane (HSE) of Slovenia; and Stanari (410 MW) by Energy Financing Team (EFT Ltd., United Kingdom). These projects were awarded without open tender and without co-ordination with the TSO. In both entities, the regulators issue construction licences authorised by the ministries.

Discussion

The energy regulatory framework in Bosnia and Herzegovina reflects the fragmentation, complexity and weaknesses of existing energy institutions and policy. In addition to the common technical, economic and regulatory difficulties and barriers, the unbundling and liberalisation process in Bosnia and Herzegovina is further complicated by the legal and physical separation of the electricity system in two or three blocks. For this reason, an intermediate objective should be to create a functioning domestic electricity market – before opening the energy market to competition and open trade.

It is encouraging to see some progress in the electricity sector, in particular its transmission segment. However, there is no comprehensive and uniform energy regulation that covers all types of energy in Bosnia and Herzegovina. The lack of reliable and harmonised energy data further complicates or prevents effective regulation. Electricity regulation is different in each entity; moreover, its enforcement is split between the national and entity levels, as well as between generation, transmission and distribution. The persistence of this complex and fragmented situation raises concerns regarding the effectiveness and efficiency of regulation of operators and markets. It also highlights the risks of abuse by a dominant company or agency, and of non-transparent and discriminatory behaviour.

Efforts have been made to increase final electricity prices towards cost-reflective levels; however, these have held back in recent years. Such efforts were initially conducted by energy companies, but regulators now share part of this responsibility. The remaining issues are significant and include gradually incorporating all costs in prices (including capital investments and externalities) and phasing out cross-subsidies. There has also been progress in taxation, in particular for network energies. However, illegal imports of oil products reduce tax collection with respect to transport fuels. Prices remain distorted for natural gas and district heating.

Efforts to re-structure state-owned companies have focused on electricity transmission, with the establishment of a single TSO and ISO for Bosnia and Herzegovina. The process has remained limited in the rest of the electricity sector. In addition, although corporate governance standards (particularly financial disclosure) have improved since 2003, Bosnian companies lag behind their counterparts in other areas of the Western Balkans in terms of efficiency and in terms of overstaffing in the two largest companies. At present, large-scale financial support provided by multilateral and bilateral donors is allocated mainly to physical rehabilitation of infrastructure – little is left for re-structuring companies and re-organisation of management.

In RS, the concession award for new electricity generation plants – without open tenders or a least-cost investment plan – raises major concerns about competition, as well as about the availability of lignite reserves for existing plants, future interconnection and transmission capacities. Another risk is that large investments under these non-transparent conditions will create a strong dependency and an imbalance in the relations with the authorities, notably in terms of regulatory issues (particularly on air pollutant emissions) and enforcement of contract obligations. Authorities should take care to ensure that the weak and fragmented state of regulation and enforcement in Bosnia and Herzegovina does not create a situation in which investments fail to comply with the legal requirements of the Energy Community Treaty. Such a situation would undermine the competitive conditions of the domestic, regional and EU electricity markets and, ultimately, result in extra costs for customers.

Sectoral policies

Key issues

- ***Fragmented or non-existent sectoral policy and regulation***
- ***Lack of an institution for policy, regulation and enforcement***
- ***Lack of reliable and comprehensive data***

Energy security

Overall, Bosnia and Herzegovina's energy import dependency is relatively low (38%) reflecting domestic production of coal, fuelwood and hydropower. Nevertheless, the country is 100% import dependent in terms of oil and gas – and demand volumes are increasing. Import sources and routes are diversified for oil products (Bulgaria, Croatia and Serbia). However, Bosnia and Herzegovina relies solely on Russia for natural gas via a single pipeline. Stocks of oil products and coal are operational, but there are no regulations on minimum stock levels. The country has no gas storage facilities.

The main energy facilities in Bosnia and Herzegovina include one oil refinery and 11 large electricity plants. The electricity mix is dominated by lignite (55%) and hydropower (45%). The electricity networks of the two entities were re-synchronised in 2003, before both networks were re-integrated with the UCTE network. This re-integration provides more reliable import capacity.

Energy efficiency

Energy transformation in Bosnia and Herzegovina results in high losses – in the order of 40% – due largely to outdated equipment and technologies, and to the limited share of combined heat and power (CHP) in the energy mix. Energy end-use is also inefficient. The lack of reliable energy statistics, particularly in the end-use sector, makes it difficult to estimate the energy efficiency potential on the supply and demand sides. Buildings are generally poorly insulated, generating heat losses of more than 30%.

The 2004 State Policy Declaration listed energy efficiency as a priority area; however, as of early 2008 no administration had been assigned responsibility to address the issue, nor had any specific policy or legal framework been developed. Two ongoing technical assistance projects (Box 4) focus on energy efficiency and energy conservation. These technical assistance proposals (to be finalised in 2008) are expected to focus on an overall policy and regulatory framework in line with EU standards.

Energy and environment

According to available data (Vestreng, 2007), emissions of SO_2 in Bosnia and Herzegovina amounted to 427 kt in 2004. For the same year, the IEA estimated total CO_2 emissions in the country at 16.3 Mt, broken down as follows: energy sector (52%), others, including construction and agriculture (16%), transport (14%), industry (13%)

and residential (5%).[111] Emissions have tripled since 1995,[112] and increased by 21% between 2000 and 2004 as economic activity has recovered. Coal accounts for 75% of emissions, followed by oil products (21%) and natural gas (4%).[113] Coal also causes serious environmental impacts (see Coal section).

MOFTER is responsible for the environment at the national level, through its Environmental Protection Department, which has a focus on international relations. At the entity level, responsibility is given to the Ministry of Environment and Tourism (in FBiH) and to the Ministry of Spatial Planning, Civil Engineering and Ecology (in RS). A *National Environment Action Plan* was adopted in the early 2000s, however no institutions have yet been given the capacity to carry out its implementation. Furthermore, no registry or monitoring of large emitters has been put in place, and overall data collection on air pollutant emissions is not yet established. The two entities have adopted separate laws, regulations and standards for environmental protection, including laws on air protection (2002 and 2003). However, the laws are relatively weak and no agency has been made responsible for their enforcement.

The country is committed to adopting and enforcing key EU environmental regulations, in particular the EU Directive on large combustion plants by 2017, to be fulfilled by large emitters including lignite power plants. In addition, environment impact assessments (EIAs) should be generalised and fulfil EU standards.

Bosnia and Herzegovina signed but did not ratify the Convention on Long-Range Transboundary Air Pollution (CLRTAP) and the Protocol on Further Reduction of Sulphur Emissions. The government did ratify the UN Framework Convention on Climate Change (UNFCCC) in 2000, and ratified the Kyoto Protocol in April 2007. However, at the time of this Survey's publication, no Designated National Authority had been identified nor had a CO_2 registry been established. A First National Communication to the UNFCCC Secretariat is scheduled to be submitted in 2008.

Discussion

The lack of a comprehensive energy policy and structured institutions in Bosnia and Herzegovina has led to a lack of focus on energy security and efficiency. No policies exist and no institutions have been assigned to focus on these issues. Bosnia and Herzegovina is the only country in the Western Balkan region (or, indeed, in Central Eastern Europe) in which this is the case. The objectives, priorities, means, institutional organisation and responsibilities for energy security and efficiency could be established within the framework of a comprehensive and coherent national energy policy. Once such a framework is in place, significant and ongoing efforts will be needed to catch up with neighbouring countries and comply with the EU requirements.

Experience in other countries has shown that the establishment of a focal point is of primary importance for energy security. At minimum, the focal point's mandate should

111. The figure is insignificant for the residential sector due to a lack of data on consumption as well as for fuelwood.

112. No data is available for 1990.

113. Emissions from combustion of fuelwood are unknown but likely to be significant given its extensive use.

include an advisory and co-ordination role in emergency situations, and a responsibility to monitor the establishment and management of strategic oil stocks (and, eventually, natural gas stocks). The focal point's broader functions can be determined at a later stage of policy elaboration.

In both IEA member countries and other countries with economies in transition, experience has shown that issues related to energy efficiency are best addressed through the design, implementation and monitoring of an action plan that is enforced by national and local agencies. The action plan can be based on the results of the EC Technical Assistance to Support the Energy Department (TASED) of MOFTER and World Bank studies (Box 4), which outline potential energy savings by sector and by technique. These studies have shown that, despite relatively low energy prices, both the energy and end-use sectors have significant economic potential to be gained through improved energy efficiency. Harmonising regulations in Bosnia and Herzegovina with the existing EU *acquis communautaire*, as well as effective enforcement, will require significant institutional effort. Priority could be placed on appliance standards and labels, thermal building codes, and vehicles standards (*e.g.* emission limits, efficiency requirements and labels). The bodies responsible for energy efficiency could be housed within an energy and environment institute.

Despite the allocation of responsibility for environmental protection (to ministries at the national and entity levels) and the adoption of the *National Environment Action Plan*, the institutional and regulatory divergence between ministries and the lack of policy enforcement reduce the effectiveness of these measures. Clearly, consolidation of policy, regulatory and institutional frameworks is a prerequisite for effective action. The preparation of a First National Communication to the UNFCCC would contribute to this process.

Lack of progress in these three key policy areas (energy security, energy efficiency and environment) could lead to significant consequences in both the short and long term – including energy shortages, lack of industrial competitiveness, and health and agriculture problems arising from environmental pollution.

THE ENERGY SECTOR

Coal

Key issues

- ***Low productivity and high costs***
- ***Failure to meet emission limits***

Lignite and brown coal provide the bulk of the country's energy supply and electricity generation, accounting for 54% of both. Proven reserves of lignite (estimated at 3.7 billion tonnes) and brown coal (2.2 billion tonnes) are located in four basins: Tuzla (Kreka, Banovici and Djurdjevik); Middle-Bosnia (Kakanj, Zenica and Breza);

Ugljevik; and Gatac. Lignite and brown coal qualities range from low to medium in terms of calorific value, and generally have low to medium sulphur content. Coal from the Ugljevik mine has a high sulphur rate at 4 to 6%.

In 1991, the 30 mines across Bosnia and Herzegovina produced 18 Mt of coal, including 10 Mt of brown coal. Production dropped dramatically to only 1.5 Mt (0.5 Mtoe) in 1994, then climbed again to 8.8 Mt (2.7 Mtoe) in 2005. At that time, 62% of the production derived from 11 open cast mines located in the FBiH (employing 14 000 miners) and the remaining 38% from two open cast mines in RS (employing 2 000 miners). The mines in FBiH are state-owned and sell most of their production to the nearby power plants of the Power Utility of Bosnia and Herzegovina (EPBiH). The RS mines of Ugljevik and Gacko are integrated with the nearby power plants of Power Utility of Republika Srpska (EPRS). More than 75% of the coal produced in Bosnia and Herzegovina is consumed by electric utilities; the rest is sold to industry and households, or is exported to Croatia.

The RS government privatised the Stanari lignite mine to EFT Ltd., which plans to build a new TPP on the site (see Electricity section). Concession projects with foreign investors have been approved for the power plants at Gacko II (CEZ of Czech Republic) and Uglevik II (Slovenske Elektrane of Slovenia).

The average price (EUR 1.80/GJ) paid for coal by electricity plants does not fully cover mining costs, which are high because of low labour productivity (annual production per employee is estimated at 0.4 t in FBiH and 1.65 t in RS) and the use of obsolete mining equipment. In 2004, overstaffing in FBiH mines[114] was estimated at about 60% – despite earlier efforts to reduce redundancy (World Bank, 2004). Mines continue to accumulate losses as their costs exceed the economic break-even point, estimated at EUR 2.00/GJ. As a result, mining companies are unable to cover pension schemes and remediation costs. Direct state subsidies partly compensate for the mine losses, which creates an indirect subsidy for electricity prices.

Coal mining and combustion have significant environmental impacts, notably in terms of the acidification of soils. Compulsory calcification[115] is a simple and low-cost conventional measure to mitigate acidification and devastation of land.

Depending on the price competitiveness of coal, the outlook to 2015 for lignite production in Bosnia and Herzegovina is expected to remain stable (8 to 9 Mt) or increase (12 Mt).

114. During and after the war, the coal sector was the main employer for soldiers and war veterans.

115. Land calcification is a compulsory measure in countries with considerable coal/lignite-based energy industry. The process involves mixing fertilisers with limestone to provide calcium, which is then introduced to the land on regular basis. Regular soil sampling needs to be undertaken by a competent public institution, and should be provided without additional costs for the landowners. Calcification eradicates acidification and limits the impact of heavy metals, which require much more expensive and demanding restoration procedures.

Discussion

The combination of low productivity (due to overstaffing) and lack of investment in advanced technologies has led to the economic difficulties in the coal sector. Despite substantial direct public subsidies, power plants in Bosnia and Herzegovina pay high prices for coal.

This situation calls for a thorough re-structuring and modernisation plan to reach commercially sustainable production and cost levels. Such a plan should focus on increasing production at the most viable mines and closing those that are least viable, with a plan to cover social (*e.g.* early retirement, training, small business support) and environmental costs. In 2004, the World Bank estimated this would cost EUR 260 million, with 75% of these funds directed toward mines in the FBiH. The structure, operation and management of remaining mines would need to be improved to meet EU standards. With lower costs and higher revenues, these mines should be able to cover operating, social and environmental expenses.

If public subsidies are needed to cover social and environmental costs of mine closures, a transparent scheme could be established during a transitional period. Such a scheme should be controlled by an independent regulator. This regulator would also need to regulate the structure and level of mining costs to ensure economic balance and a fair price for consumers. The regulator should also oversee the licensing of operators and ensure they fulfil their obligations, notably with respect to social needs and site remediation. The recent privatisation of three mines in the RS, which was done without an open tender, raises concerns over the privatisation process and the outlook for sufficient reserves at existing power plants, in particular for Gacko I. Significant investment is also needed to ensure that coal-fired units comply with the EU Directive on large combustion plants by 2017.

Oil products

Key issues

- ***Product quality***
- ***Smuggling***
- ***Compliance with EU regulations***

Oil reserves in Bosnia and Herzegovina are estimated at 50 Mt and have not been fully exploited. The country's only refinery (1.5 Mt/y) is located at Bosanski Brod in the northwest of RS, and is linked to the Adria pipeline from Croatia. It suffered heavy damages during the war, and operated sporadically between 2004 and 2006 because of financial problems. Until the Bosanski Brod refinery resumed operation in 2006, oil product imports (mainly from Croatia and Serbia) supplied the market with low-quality fuels. The transport sector accounts for about 80% of oil product consumption, driven by private vehicles and, to a lesser extent, by trucks. This reflects the lack of public urban and inter-urban transport.

In contrast to most Western Balkan countries, Bosnia and Herzegovina has no regulation for maximum price of oil products. In principle, taxes (including VAT of

17%, sales and excise taxes, and custom duty) are applied to oil products; however, oil smuggling and tax evasion are serious problems. In 2005, the number of operators in the country surged to around 85 importing companies, 370 wholesale firms and 1 000 filling stations. This is excessive for a country that consumes an estimated 1.1 Mt. Retail prices for gasoline generally follow international markets and increased to EUR 1.00/L in September 2007.

The retail network in FBiH is controlled predominantly by small, independent private owners and international oil companies. Following the privatisation of Energopetrol (a state-owned oil retail network with 66 stations) in 2006, the company was purchased for EUR 110 million and is now majority owned (jointly) by MOL of Hungary and INA of Croatia.

In the RS, the retail network for oil products was recently integrated with Bosanski Brod refinery, which was 65% state-owned. In 2005, the RS government launched a tender to privatise the refinery, together with its lubricant plant (at Modrica) and retail network (brand name Petrol), at the price of EUR 285 million. The conditions of sale included assuming a debt of EUR 190 million and investing at least EUR 220 million in upgrading the refinery's outdated technology and equipment. The Russian company Neftegazinkor, a subsidiary of state-owned Zarubezhneft, was awarded an 80% stake in the refinery (at a cost of EUR 40 million) and the retail network (EUR 10 million), as well as a 76% stake in the lubricant plant (EUR 40 million). Neftegazinkor is committed to further investing EUR 1 billion (with a loan from Russia's Vneshtorgbank), notably to increase the oil refinery capacity from 1.5 to 4.2 Mt/y, to start supplying products at EURO IV standards by 2008, and to reach full capacity in 2010. The domestic market is too small to absorb this additional production; thus, Bosanski Brod would have to export most of its production to other markets, which implies significant competition between suppliers. This planned increase in output and quality will transform the supply structure and markets in the country and across the Western Balkan region.

In 2002, the Council of Ministers adopted the *Decision on the Quality of Liquid Oil Fuels,* requiring that oil product imports meet EU quality standards. Nonetheless, because of lax enforcement, most imported oil products (legal or illegal) do not comply with EU standards.

Discussion

The oil sector in Bosnia and Herzegovina has slowly recovered from the war of 1992-95, largely by re-establishing oil product flows, the retail network and operation of the sole refinery. However, policy objectives and regulatory frameworks have yet to be established. As a result, the quality of products remains low, and illegal imports and tax evasion are widespread. The wholesale and retail markets lack transparency and competitiveness, and the price for these conditions is borne by consumers and taxpayers.

Privatisation of sector assets is one means to finance the modernisation of the oil infrastructure and to align business practices with the rest of Europe. In this respect, progress has been made through two major privatisation efforts. However, the potential interest of legitimate and strategic investors is undermined by persistent regulatory weaknesses, and by the pervasiveness of oil product smuggling and tax evasion.

The establishment and enforcement of clear regulations will be all the more important given the sale of the sole refinery to interests that control upstream supplies. Its capacity expansion will also need to be monitored to guard against the risk of creating a dominant player on which supply dependency is high. The need to privatise and modernise the sector and to establish a new regulatory framework is made more challenging by two factors: the highly competitive regional market and the fact that most output must soon comply with the higher fuel standards of the European Union.

Natural gas

Key issues

- ***Small and fragmented network***
- ***Absence of regulation***
- ***Cross-subsidies***

Natural gas was introduced to Sarajevo in 1975 as a means of limiting air pollution. The pipeline was extended to several small cities and industries, notably the Zvornik aluminium plant and the Zenica Mittal Steel mill. Gas supplies were disrupted during the war, but have since resumed in Sarajevo and other cities. It is now the most widely used fuel for heating in residential areas connected by gas, which account for about 20% of the country as a whole (60 000 households).

The overall import capacity in Bosnia and Herzegovina, which flows through this same pipeline, is 0.75 bcm per year. This is far beyond total annual domestic consumption of only 0.4 bcm (0.35 Mtoe) in 2005, or 7% of TPES. This low level of natural gas consumption reflects reduced industry activity and the small size of the gas distribution network. Industry still accounts for the larger share (65%) of gas consumption, followed by households and district heating (32%), and services and others (3%).

An outlook to 2015 (World Bank, 2007) projects an increase in the country's natural gas consumption to 1.5 bcm per year. However, it should be noted that a previous outlook projected consumption of 0.8 bcm for 2005 – more than twice the actual level consumed. Still, the potential for growth exists – both in areas already connected to the gas network (particularly for CHP) and through network extensions to other major cities (*e.g.* Banja Luka, Zenica and Mostar). In these three cities alone, the 2015 outlook for aggregate gas demand has been estimated at 1 bcm per year, for an hourly peak of 280 000 m^3 (World Bank, 2007) at a total investment cost of EUR 185 million. Studies show that gasification would also be commercially viable in eight to ten other cities and urban centres (*e.g.* Bijelina, Brcko, Tuzla and Doboj), provided the gas transmission pipeline passed nearby. Construction costs of new transmission lines, either leading from the existing trunk line in Bosnia and Herzegovina or from neighbouring countries (Croatia to the south and west; Serbia to the east), to supply such an extended distribution network are estimated at EUR 300 to 500 million. This overall cost would include a gas storage facility in a salt mine near Tuzla.

To date, Russia is the sole source of gas imports. Gazprom's contract was initially managed by Energoinvest. Since the late 1990s, the contract has been managed by BH-Gas Sarajevo, which is the single wholesale supplier and the transmission operator in the FBiH (overseeing 132 km of the main transmission pipeline). Two other companies, Gazpromet Pale and Sarajevogas Lukavica, operate the transmission pipeline (62 km) in the RS and also distribute the natural gas. Another company, Sarajevogas Sarajevo, is the largest gas distribution company, serving 94% of the country's gas consumers. Two small local gas distribution companies also exist: Visokogas Visok (in FBiH) and Zvornik Stan (in RS).

At the national level, no regulations apply to the natural gas sector: in the RS, the electricity regulator (REERS) partially covers the gas sector; and in the FBiH, the Ministry of Energy, Mining and Industry retains some authority. For the most part, gas transmission and distribution companies determine tariffs and price levels for final consumers. In September 2007, the regulated residential price of natural gas was EUR 0.33/m^3.

Bosnia and Herzegovina is in the preparation phase of establishing a natural gas law, under the co-ordination of MOFTER and with support from USAID. The draft law is modelled on the electricity sector, with a single TSO regulated by the national regulator and distribution companies regulated by entity regulators. The new regulation aims to align with the relevant EU Directive, as required by the Energy Community Treaty.

Discussion

Natural gas accounts for a small share of the energy mix in Bosnia and Herzegovina due to the limited distribution network, the fragmentation of the infrastructure, and the lack of coherent legal frameworks for investment and operation. Domestic gas consumption is well below existing pipeline capacity. However, the high share of natural gas in the energy consumption mix of Sarajevo highlights the significant market potential of gas, especially as a substitute to fuelwood and coal. Gas would be a much cleaner option than current combustion technologies, which are proving harmful to the environment (deforestation) and human health (indoor and urban air pollution). There is also significant potential for natural gas in co-generation plants (*e.g.* CHP units, industry and services). In the three largest cities after Sarajevo, which have an aggregate population of 325 000, potential annual gas demand is estimated up to 1 bcm.

However, estimates of potential demand are not sufficient to attract investment. With prices driven by international market forces, natural gas faces stiff competition from other fuels, many of which are not cost-reflective in themselves. Lignite benefits from direct and indirect subsidies in power generation and in the residential sector. Electricity benefits from subsidised tariffs in end-use sectors, especially the residential sector. Fuelwood prices are volatile and reflect uncontrolled illegal cuttings.

The lack of policy and regulation adds to risk and uncertainty associated with investment. All these factors create additional costs and barriers that make it difficult to adequately maintain existing natural gas facilities, let alone develop new networks to enhance its use. If steps are taken to address these issues – at both national and regional level – and demand for natural gas increases, the government might wish to assess ways to diversify supply routes and sources (despite decades of reliable supply from Russia), and to create a gas storage facility (to reduce supply risks and increase peak supply).

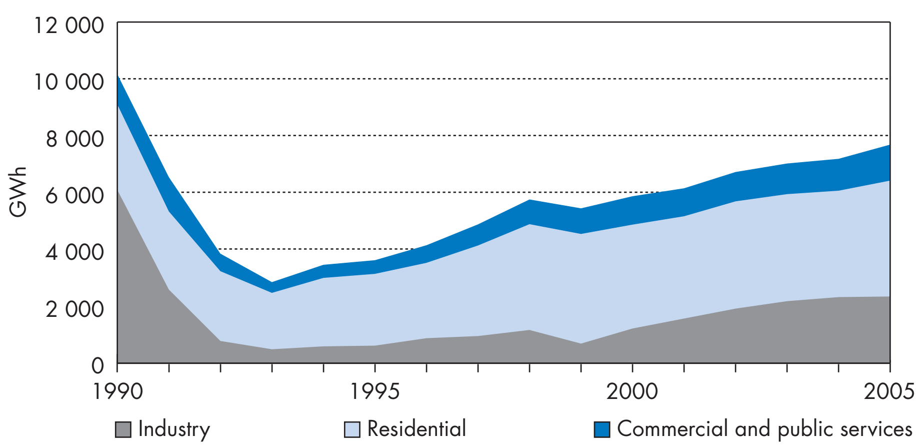
Electricity

Key issues

- *Rehabilitation of infrastructure*
- *Grid losses*
- *Lack of cost-reflective prices*
- *System and regulation fragmentation*

In 2006, reported TFC in Bosnia and Herzegovina was 11.2 TWh (an increase of 18% over 2000) and peak electricity demand reached 2.0 GW. In 2005, the residential sector accounted for 53% of TFC, followed by industry (30%) and services (17%) (Figure 13). These figures reflect the relatively high use of electricity for heating (World Bank, 2004) and relatively low level of industrial activity.

Figure 13 ....Electricity consumption by sector in Bosnia and Herzegovina, 1990-2005 (GWh)



Source: IEA statistics.

Power generation and supply

Of a total installed capacity of 3.6 GW in 2005, hydropower generation accounted for 54% and thermal generation (mostly lignite fired) for 46%. In terms of TPP generation, the eight largest plants accounted for 56% of the 13.3 TWh generated in 2006, with an average energy efficiency around 30%. The share of power generation from the country's 11 hydropower plants (HPPs), including three water storage plants, varies from 40 to 45% depending on annual hydrology. The capacity use of existing plants has increased but remains low (estimated below 50% in 2004). In addition, there are a few small hydropower and industrial power plants.

Bosnia and Herzegovina is a net electricity exporter (1.3 TWh in 2005; 2.1 TWh in 2006). It has not recovered its pre-war level of generation (14.6 TWh in 1990) due to lack of maintenance and spare parts, and the slow replacement of obsolete units.

The country's large power plants are owned and operated by three state-owned electricity companies:

- Elektroprivreda Bosne i Hercegovine (EPBiH) or Power Utility of Bosnia and Herzegovina has an installed capacity of 1.8 GW; it is located in Sarajevo and serves the Bosniak community.
- Elektroprivreda Hrvatske Zajednice Herceg Bosne (EPHZHB) or Power Utility of Herzegovina has an installed capacity of 0.8 GW; it is located in Mostar and serves the Croat community.
- Elektroprivreda Republike Srpske (EPRS) or Power Utility of Republika Srpska has an installed capacity of 2.6 GW; it is located in Trebinje and serves the Serb community.

EPBiH and EPHZHB are fully owned by the entity governments; EPRS is majority state-owned with a minority private ownership of its subsidiaries.

There are various investment projects in the electricity generation sector in Bosnia and Herzegovina. The state-owned electricity companies have developed rehabilitation and upgrading plans for existing plants, including TPPs Kakanj and Tuzla (EPBiH) and about 1.5 GW of hydropower plant capacity. EPRS expansion projects are envisaged for the TPP Gacko II (600 MW) and Ugljevik II (600 MW) through joint ventures with strategic investors (*e.g.* CEZ for Gacko II).

New TPP projects for export exist in Bugojno (EPBiH), Kongora (EPHZHB) and Stanari (EPRS) for a total of 1.6 GW. The first two projects were expected to be built on the basis of build-operate-transfer (BOT) plan. The third was expected to use a build-own-operate (BOO) framework with Energy Financing Team (EFT) Ltd. and the possible support of an EBRD loan. In July 2007, a tender was launched for the Stanari project to select the plant constructor. In November 2007, a NGO raised to the EBRD various issues about the investor and the project.[116] In December 2007, the Stanari TPP was designated a priority electricity project "of regional significance" by the Energy Community, a decision that was criticised by a coalition of regional NGOs (Bank Watch, 2008).

New HPP projects in the RS include the Buk Bijela (450 MW),[117] Gornji Horizonti and a project on the River Vrbas for a total of 1.4 GW. In FBiH, the Glavaticevo project (172 MW) has been selected as a priority. Both entities awarded concessions for new small HPPs: in FBiH, four units were awarded on a BOT basis to an Austrian consortium; and in RS, up to 100 concessions were awarded with a total capacity of up to 230 MW.

116. See *Letter to the EBRD regarding the procurement notice for the Stanari thermal power plant project* from the Centre for Environment (Banja Luka)/Bank Watch, 16 November 2007. http://bankwatch.org/project.shtml?apc=147579–c–1&x=2058627.

117. This project was also challenged by NGOs; see *Arrested Development: Energy Efficiency and Renewable Energy in the Balkans*; Bank Watch 2005, http://bankwatch.org/documents/arrested_development_05_05_1.pdf.

If all these investments were undertaken, installed capacity in Bosnia and Herzegovina would increase by about 6 GW – almost twice the existing installed capacity – with excess generation capacity directed toward export markets. However, this is not feasible within the context of existing grid and interconnection capacities[118] and will require major investments in the transmission network, which would be very difficult to finance at current tariff levels.

Electricity network

Much of the electricity transmission and distribution grid, particularly in central Bosnia, was destroyed or severely damaged during the conflict of 1992-95. After the war, the priority was to reconstruct and repair the transmission and distribution networks.[119]

The transmission grid in Bosnia and Herzegovina is based on 400 kV, 220 kV and 110 kV lines. Until 1999, each state-owned electricity company owned and operated its own grid, at which time the Joint Power Co-ordinating Center (ZEKC) was established as a focal point for the national grid. In 2004, the government created a single, national TSO known as Elektroprenos BiH (Transmission Company BiH), which is located in Banja Luka. The TSO owns the national grid and, since 2005, has been responsible for its maintenance, construction, and expansion, according to a 10-year *Transmission System Development Plan*, which is revised annually. Since 2006, the TSO has been backed by an ISO BiH (known locally as NOS BiH and located in Sarajevo), which ensures operation of the grid (notably dispatching, market balancing and the purchase of ancillary services). Each year, ISO BiH prepares a generation development plan for the following 10 years, which is supposed to be used by the entity electricity companies. To date, the companies have not followed this plan. Transmission and generation plans must be approved by DERK.

In the past, the EPRS grid was synchronised with the power system of Serbia and Montenegro, while the EPBiH and EPHZHB grids were synchronised with the UCTE system. This prevented interconnection and synchronisation of the network within Bosnia and Herzegovina. In 2004, the three grids were re-synchronised with UCTE and re-organised into a single system, now operated in Bosnia and Herzegovina by Elektroprenos BiH and ISO BiH. This achievement was jointly carried out by public authorities, state-owned electricity companies and donors. Re-synchronisation with UTCE was also undertaken by all grids in the Western Balkans (with the exception of the Albanian grid).

The three state-owned electricity companies are also responsible for electricity distribution (for below 110 kV network) and serve their respective populations (EPBiH - 600 000; EPHZHB - 150 000; and EPRS - 400 000). There is a separate distribution company (Elektrodistribucija) for the Brcko district (20 000 customers). Overall, collection rates are high. However, distribution losses are also high at around 20% (depending on the network), especially in comparison to overall network losses, which were 28% in 2004 (IEA, 2007a).

118. Major new thermal projects (Gacko II and Stanari) were not communicated to the TSO and ISO.

119. Reconstruction efforts included the damaged transformer stations of Mostar and Tuzla, which were crucial to reconnect and re-integrate the power grid of Bosnia and Herzegovina, as well as to the reconnection (in 2004) with the two UCTE systems of Western and Southeast Europe.

Electricity regulation and market

In 2000, the two entities adopted the *Electricity Policy Statement*, which is based on a consultant report adopted at the national level in 1999. Its main long-term policy objective is to establish a competitive electricity market in Bosnia and Herzegovina, thereby enabling all customers to choose their electricity supplier. The reform plan aims to ensure the sustainability and performance of the sector, and to introduce EU regulations, notably for effective competition.

The guiding principles for the reform included a vision of the electricity sector emerging from this reform process that:

- Performs efficiently, both technically and commercially.
- Enables efficient and effective competition.
- Meets international standards in four key areas: cost effectiveness; quality, integrity and reliability of service; system security; and the environment.
- Allows companies to recover their full costs, including a reasonable return on investment.
- Has a universal service obligation.
- Attracts private capital to the sector.
- Complies (in the medium term) with EU rules for the internal electricity market.

The State has adopted three laws to support this effort: the *Law on Transmission, Regulator and System Operator of Electricity* (2002); the *Law on Establishing the Transmission Company, Elektroprenos BiH* (2004); the *Law on Establishing an Independent System Operator, ISO BiH* (2004).

At the entity level, two separate laws on electricity generation and distribution were adopted by FBiH (2002, 2005) and RS (2002, 2003). As the State regulator, DERK is responsible for electricity transmission. Generation and distribution are covered by the entity regulators (*i.e.* FERC in FBiH and REERS in RS).

All three regulators share responsibility for setting electricity tariffs and prices. DERK approves transmission tariffs submitted by the TSO and publishes tariffs to access the network. The two entity regulators approve end-use prices. Despite the high cost of coal, current prices cover the costs of state-owned electricity companies and generate operating margins; however, they cover only 30% of asset depreciation and a small portion of pension schemes. Thus, the infrastructure (particularly the network) is not adequately maintained, even with the significant rehabilitation grants and loans provided by donors. Significant cross-subsidies persist and large energy intensive industries (*e.g.* aluminium plants near Mostar) benefit from subsidised, imported electricity.

As a complement to the unbundling of the transmission grid, re-structuring of the vertically integrated state-owned electricity companies has been based on the *Harmonised Action Plans for the Re-structuring of the Power Sector* (adopted by RS in 2003 and by FBiH in 2005). These plans comprise two main stages: re-allocation of assets into a joint-stock company; and commercialisation and unbundling of generation and distribution (by 2008). The first phase has been completed. In order to achieve the next stage, it is necessary to create a distribution system operator (DSO), as required by the Energy Community Treaty. On a positive note, corporate performance has improved, particularly transparency in accounting.

To date, the opening of electricity markets in Bosnia and Herzegovina to domestic and foreign competition has focused on three areas: setting eligibility consumption thresholds (see Market Reforms and Regulation section); connecting directly to the network; and third-party access to the transmission network, as described by DERK's *Rules on Third-party Access* (2006). Third-party access to distribution networks is monitored by the entity regulators. As of early 2008, no supplier switch has been reported.

Discussion

Despite serious damages to Bosnia and Herzegovina's transmission and distribution network, a minimum supply of electricity was maintained during the 1992-95 conflict. In the post-war years, with the assistance of donors and lenders, a major reconstruction of the grid and rehabilitation of generation capacity has been carried out. As a result of significant loans, which were not sufficiently monitored or controlled by the public sector due to weak and fragmented energy administrations, the electricity sector (along with related sectors such as coal and engineering services) has accumulated a major financial burden. This has become a major barrier for developing and enforcing electricity reforms to improve overall performance of companies and to create effective markets.

Total electricity demand has partly recovered to pre-war levels. However, industrial consumption remains low and is concentrated amongst a few large consumers. By contrast, household demand is inflated due to extensive use of inefficient electric heating. The likely trend for electricity demand in the medium term is a general decline, largely as the result of lower consumption for household electricity heating (in line with expansion of the natural gas network) and a levelling of the energy intensity of domestic demand. This projected trend assumes no industrial recovery or development of new medium-sized industries (*e.g.* light and transformation).

Significant progress has been achieved at the national level, particularly in adopting a single regulation for transmission, and in merging national transmission ownership and operation under a single regulator. As recently established bodies, the TSO and ISO need to strengthen their capacity and authority. A remaining weakness is that regulation and oversight for generation and distribution remains separated at the entity level. In addition, three separate entity companies operate a very fragmented distribution network, raising operational, efficiency and economic issues. The unbundling of these services has not advanced significantly, raising concerns about effective third-party access to the respective distribution networks.

Regulators now set tariffs and prices; however, these prices reflect only part of the costs for maintenance and replacement of facilities, as well as non-wage obligations (pensions). The price structure still subsidises households and large industries (*e.g.* aluminium). As a result, electricity prices are too low and distort the entire energy market in Bosnia and Herzegovina. There is a clear need to analyse the costs and benefits of these indirect support systems and, if justified, to establish a transparent, direct subsidy scheme.

The TSO is responsible for the country's transmission development plan and the ISO prepares a development plan for electricity generation (based on elements provided by the entity administrations and companies). However, there is little co-ordination with the electricity companies, as is evident in the fact that the range of proposed investment projects now on the table would triple the country's installed generation capacity. Even though these projects focus on export markets, their scope is not feasible within the context of current grid and interconnection capacities. Such major expansion would require significant investments in the transmission network, which would be extremely difficult to finance at current tariff levels. These projects need to be assessed under a comprehensive least-cost plan involving detailed analysis of domestic and export markets in a context of high volatility. It is also vitally important to consider that – in the context of fragmented and weak regulation and administration – powerful foreign investors could use major investments as a means to exert excessive influence on the markets and create a strong dependency.

Recent decisions (2007) by entities to award concessions without open tenders to private investors have raised concerns over transparency and the effectiveness of economic benefits at the local and national level. This creates a risk of further fragmenting the sector. At the 4th World Bank Poverty Reduction Strategies Forum it was "recommended urgent[ly] to develop, adopt and enforce a state-wide, uniform and transparent procedure for the construction of new generation plants in compliance with EU regulation" (Jenko, 2007). A national least-cost investment plan for electricity should rank the most viable rehabilitation and construction projects, and should be co-ordinated with generation and transmission planning undertaken by grid operators and regulators.

The electricity sector in Bosnia and Herzegovina still faces three main challenges: completing its rehabilitation; diversifying the power generation mix; and complying with EU environmental standards, in particular the EU Directive on large combustion plants. The sector also needs to improve overall technical and managerial performance, diversify the power mix (notably with CHP, small hydropower and biomass) in order to compete on export markets, and prepare for effective opening of domestic and regional markets. At the company level, this will require sustained effort to reach EU standards for corporate governance. At the ministry and regulator level, there is a clear need to strengthen ownership rights and sector oversight, as well as to consolidate and co-ordinate efforts at the state and entity levels.

The administration in Bosnia and Herzegovina needs to develop a national electricity policy that is co-ordinated and coherent, as well as an action plan backed by economic tools (particularly independent least-cost plans and demand projections). An integrated, least-cost plan for supply and demand would help prioritise refurbishment projects and reduce grid losses. The World Bank's *Energy Sector Study* should provide crucial information and tools, which can be further developed and applied by the administration in co-ordination with electricity companies. Persistent fragmentation of the electricity sector – in terms of both structure and regulation – is unsustainable in the longer term, and creates a risk that Bosnia and Herzegovina will be marginalised within the region.

Heat

Key issues

- ***High supply costs not fully covered by tariffs***
- ***High energy losses and consumption***
- ***Biased regulation***

As of 2006, DH networks exist in 17 cities in Bosnia and Herzegovina, including Sarajevo, Banja Luka, Tuzla and Zenica. Due to the lack of energy demand data, information on total demand and breakdown by sector is not available. The limited data available suggests that district heating covers about 12% of the country's household energy needs.

Total installed capacity[120] for district heating derives mainly from heat-only boilers; only the Kakanj and Tuzla TPPs supply heat to nearby city networks. In 2005, the volume of heat generated was about 8 300 TJ (0.2 Mtoe) and was based on oil products, natural gas and coal. The DH systems and networks in Bosnia and Herzegovina are owned and operated by 11 companies, all of which are owned by municipalities. Municipalities also set tariffs, generally below costs, leading to the deterioration of services and infrastructure. As a result of cross-subsidies in the gas tariff system, DH companies pay higher prices for natural gas than do households.

In 2004, the World Bank estimated the cost to refurbish viable DH systems in Bosnia and Herzegovina at about EUR 115 million, including EUR 22 million for the system in Banja Luka and EUR 20 million for Sarajevo. As of 2008, only the Sarajevo system (350 MW, serving 45 000 households) had been rehabilitated and upgraded. Other DH systems continue to be plagued by high (more than 60%) energy losses. As a result, operating costs are high and are not covered by heat tariffs, which are calculated per apartment or number of people, by area (m^2) or by household. Individual heat meters are virtually non-existent in the country.

Discussion

District heating accounts for a minor share of energy supply in Bosnia and Herzegovina due to the low efficiency of the system and deteriorating infrastructure. The system is unable to collect sufficient revenues to cover maintenance or investment costs. District heating faces stiff competition from electricity, fuelwood and natural gas, all of which benefit from direct or indirect cross-subsidies. The ambiguous role of municipal authorities – which act as owners, operators and regulators – has also been a factor in the system deterioration. The lack of energy planning at the municipal or local level hampers the collection of the data needed (particularly on the demand side) to develop a multi-energy optimisation approach.

An integrated system for managing energy demand and supply at the local level can be a powerful tool for attracting commercial investment in district heating or natural gas networks. The presence of an independent regulator is also important;

120. No official data available; estimations at 600 to 800 MWt.

this body should have authority to oversee the DH sector on the basis of a specific law (possibly a "heat" law). Clear progress in these areas should provide incentives to reduce generation and distribution losses, notably through investments by energy service companies (ESCOs), the introduction of building or apartment metering, and standard heating regulation.

On the basis of independent regulation and cost-reflective tariffs, the re-structuring of DH companies and refurbishment of viable networks will be needed to reach commercial conditions and attract financing from international financial institution loans and/or private investment. With an efficiency approach, the switch to CHP (using natural gas and biomass) should be a priority, along with the introduction of an attractive electricity purchase tariff for CHP. The extension of DH networks should be based on clear market potential.

Renewable energy

Key issues

- ***Quality and availability of data***
- ***Policy and regulatory framework***
- ***Resource management***

Bosnia and Herzegovina currently exploits two main renewable energy sources: hydropower and fuelwood. Hydropower accounts for 9.5% of TPES (2005) and up to 42% of the electricity mix, depending on annual variations in hydrology. Despite a broad refurbishment programme since 1996, several HPPs still need to be upgraded. In the late 1980s, the country's untapped economic hydropower potential was estimated at 22 TWh (5.6 GW capacity) for large units and at 2.5 TWh for small units. In RS, about 15 large hydropower projects have been proposed (amounting to 1.4 GW), as well as 41 small hydropower projects. In FBiH, the Glavaticevo project (172 MW) has been selected and four concessions awarded.

As of early 2008, none of these proposed projects has been built. In fact, several major projects have raised hydrological disputes with neighbouring countries (mainly Croatia and Montenegro). A case in point is the Buk Bijela HPP (450 MW) developed by EFT Ltd. under a concession scheme from the RS, which risks flooding an area in Bosnia and Herzegovina and Montenegro that is protected by UNESCO and the IUCN (International Union for the Conservation of Nature). Following a UNESCO recommendation in 2005, the two governments agreed to reconsider the project but failed to reach a final agreement: the government of Montenegro decided to stop the project; the RS government decided to redesign the project and proceed with its development.

Forests cover more than 50% of Bosnia and Herzegovina and produce more than 6 Mcm of fuelwood per year, which is sold domestically and abroad. Wood is also cut for the wood industry (*e.g.* building materials and furniture). Poor forest management, uncontrolled illegal cuttings and general neglect of wood residues have led to deforestation in some areas of the country. The exploitable potential of wood residues has been estimated at 1 Mcm per year (GTZ, 2003), enough to heat

130 000 households (300 000 inhabitants). Estimates indicate that 60% of households use fuelwood for space heating. Demand for fuelwood rises during winter months, leading to price inflation and increased competition in the wood transformation industry. In addition, low quality and inefficient wood stoves generate indoor and outdoor air pollution, leading to health problems.

Despite several donor-supported studies, there is a general lack of reliable and comprehensive information on the potential and use of other renewable energy sources. The potential for biomass is considered significant, based on the waste from forestry, wood transformation, agriculture and food processing. A landfill gas CHP project (350 kW) has been commissioned near Sarajevo. Solar water heaters have potential in sectors requiring significant volumes of hot water (*e.g.* hospitals and hotels) but low electricity prices are a barrier to their use. One local manufacturer in Zenica has taken the initiative to install 30 solar panels at its plant. The country's geothermal potential has been estimated at 33 MW. A pilot geothermal project in Sarajevo was designed at the end of 1980s but not realised due to budget difficulties. Other estimates (GTZ, 2003) indicate wind potential of 600 MW.

To date, no public institution has been made responsible for renewable energy sources in Bosnia and Herzegovina. However, the main universities and several NGOs have developed public awareness or research projects. The country lacks any comprehensive or coherent policy for existing renewable energy sources (*e.g.* refurbishment of existing HPPs, management and use of wood resources) or for tapping the economic potential of renewable energy. At present, the only support measure is the adoption of purchase tariffs for electricity generated using renewable sources at installations of up to 5 MW of installed capacity. Two separate entity laws, adopted in 2002 and 2003, set the minimum electricity tariff to be paid by the three electricity companies as follows:

- Small hydropower EUR 0.0396/kWh
- Landfill biogas and biomass EUR 0.0381/kWh
- Wind and geothermal EUR 0.0495/kWh
- Photovoltaic EUR 0.0544/kWh

Discussion

Hydropower and fuelwood contribute significantly to the energy mix in Bosnia and Herzegovina. Hydropower plays an important role in meeting domestic electricity supply (including electricity demand peaks) and in providing exports. However, existing plants and associated infrastructure need further refurbishment to increase output and reduce transmission losses. The proposed increase in the number of small and large hydropower projects raises important issues of generation and grid capacity management, as well as of water management and environmental impacts. The latter issues are complicated in that they are not confined by international boundaries.

Despite significant forest stock, the current exploitation and use (which is both intensive and inefficient) fuelwood is unsustainable. The lack of adequate and effective forestry planning and management, combined with inefficient use of fuelwood, is leading to deforestation, pollution and health problems. It also creates conflict with the wood transformation industry, one of the most active sectors in the country. Wood resources have significant potential; properly developed, they could support a sound strategy for meeting a large proportion of the country's heating needs.

The lack of information and data on renewable energy and its potential in niche markets are clear barriers to the development of these untapped resources. In addition, the lack of energy policies and institutions, and the absence of a dedicated agency for energy efficiency and renewable energy, further limit the development of a structured policy for renewable energy sources. Electricity companies are not positioned to play such a policy and regulatory role. The recent adoption of feed-in tariffs for small electricity generating units that use renewable sources is a step in the right direction. However, there is no comprehensive and clear regulatory framework to support licensing, investment and operation in renewable energy sources. Overall, project economics for renewable sources are generally not as attractive as for other energy sources, owing to higher initial investment costs.

Opportunities exist to bring renewable energy sources to export markets, notably for green electricity in the European Union. The Kyoto Protocol's flexibility mechanisms can provide additional financial support for new projects. Investments in de-centralised renewable energy systems have the potential to enhance energy diversification and security, create employment opportunities and increase revenues in poor rural areas. To create attractive investment conditions, priority should be given to developing a clear and comprehensive action plan for renewable energy. This action plan should be backed by independent institutions (agency and regulator), effective regulation and a complementary policy for energy efficiency. The energy efficiency policy should have a strong focus on households (*e.g.* building insulation and efficient wood stoves).

OVERALL RECOMMENDATIONS

In addition to the recommendations and key findings included in the Overview and in the regional chapters, the government of Bosnia and Herzegovina may consider the following recommendations useful:

Institutions and overall strategy

- As a priority, establish a broad energy administration, with central departments for policy making and statistics; equip this administration with sufficient authority and resources, eventually backed by a dedicated energy institute.
- Consider a plan to consolidate the structure and co-ordination of the energy administration through a national focal point, supported by branches in each entity of the country.
- Re-establish the government's authority over state-owned companies through a dedicated and empowered administration and clear rules for public governance.
- Adopt a comprehensive national energy policy with clear institutional responsibilities and an action plan, using the results of the World Bank study and EU CARDS energy strategy project.

- Establish, in accordance with international standards and on the basis of technical assistance projects, a national energy data system; develop related economic tools (*e.g.* indicators, demand forecasts and least-cost investment plans).
- Extend the scope of regulation to natural gas, heat and oil products; establish national agencies for oil stockpiling and renewable energy.
- Ensure close co-ordination and progressive consolidation of national and entity energy policies, as well as other energy-related public policies (*e.g.* environment, transport and housing).
- Adopt sectoral action plans for energy security, energy efficiency, environmental protection and renewable energy.

Market reforms and regulation

- Focus on creating a well-functioning domestic electricity market as a necessary step towards opening this sector to broader competition and trade; continue to deal with the technical, economic and regulatory challenges inherent to the process of unbundling and market liberalisation; take steps to address the even more complex problems associated with the legal and physical separation of the country's electricity system.
- Ensure close co-ordination and progressive consolidation of the electricity regulators and system operators, backed with sufficient resources.
- Ensure electricity regulatory frameworks are harmonised with requirements of the Energy Community Treaty and EU standards; pursue the progressive consolidation of these frameworks, as well as their extension to other energy products; create mechanisms for effective enforcement.
- Ensure that new investments and operations comply with economic, legal and competitive requirements and are under the control of regulators.
- Finalise reforms of end-use prices with full cost-recovery (including capital costs); phase out cross-subsidies.
- Enforce high corporate governance and social standards in state-owned companies; improve their economic efficiency.

Sectoral policies (energy security, energy efficiency and environment)

- Design and enforce an energy security system, including a focal point for managing emergencies; establish a security stock of oil products, in compliance with EU standards for quantity and quality.
- Adopt a robust and comprehensive action plan for energy efficiency, backed by clear regulation and enforced by national and local agencies.
- Make energy efficiency a priority for energy companies, especially in electricity generation and transport; consider implementing incentive regulation.
- Adopt and enforce regulations for appliance standards and labels, building codes and vehicle standards, in compliance with EU standards.
- Enforce the *National Environment Action Plan*; set a comprehensive and coherent national policy for air pollution, backed by appropriate institutional and legal frameworks.

- Harmonise and enforce regulations, notably on large air pollutant emitters.
- Enforce environment impact assessments (EIAs) in compliance with EU and international commitments.
- Ratify and apply relevant international agreements on environment; submit regular communications, notably to the UNFCCC; enforce the Kyoto Protocol with an outlook to developing carbon reduction projects under its flexibility mechanisms.
- Consider ways to reduce the environmental impacts of lignite, and of the intensive and inefficient use of fuelwood.

Coal

- Within a national policy for the coal sector, continue to re-structure and modernise coal mines; work towards economic equilibrium and full accounting for all social and external costs.
- Adopt and enforce (under the co-ordination of MOFTER and through the entity regulators) comprehensive regulation for coal mining, notably regulation of coal prices, a transparent subsidy scheme and privatisation of the sector.
- Mitigate environmental impacts of coal mining and combustion by adequate means (*e.g.* site remediation, emission filters and land calcification programmes).

Oil products

- Adopt and enforce (under the co-ordination of MOFTER and through the entity regulators) comprehensive regulation for the oil refinery and retail sectors.
- Ensure rigorous quality standards for oil products; improve control of tax collection; monitor imports and trade of oil products.
- Progressively work toward compliance with EU standards in relation to quality of oil products, environmental and safety performance of the refinery, and operation of the retail network.
- Take steps to diversify supply of crude oil (preferably in a regional context) and develop effective competition in the market; avoid dominance by one upstream supplier.

Natural gas

- Adopt clear policy guidelines for the natural gas sector, backed by institutional support at the national level.
- Adopt and enforce a single natural gas law for the gas sector in line with EU regulation; ensure that this law is enforced by a single regulator with sufficient authority (particularly in terms of setting tariffs and prices).
- Create a single TSO for the gas sector; consolidate the smallest distribution companies.
- Ensure sufficient investment to maintain existing facilities; apply a least-cost investment plan to properly assess the development of new infrastructure; ensure that capital costs for new infrastructure are fully covered by end-use tariffs.
- As natural gas demand increases, consider expanding the distribution network, diversifying supply sources and adding a natural gas storage facility, giving priority to national and regional projects.

Electricity

- Reinforce, update and implement the *2000 Electricity Policy Statement* using the results of the World Bank study and EU CARDS energy strategy project.
- Reinforce the authority and independence of regulators; consolidate regulators into a single structure with entity branches.
- Unify regulation for generation and distribution in line with EU requirements; ensure cost-reflective tariffs and reduce cross-subsidies; if justified, establish a transparent and direct subsidy scheme for large industries.
- Reinforce the authority of the TSO and ISO, with a priority to enhance grid performance; ensure third-party access and interconnection.
- Continue re-structuring of electricity companies towards EU standards for corporate governance; complete the unbundling process in line with EU regulation.
- Adopt a national least-cost investment plan (including generation planning and demand forecasts) under the supervision of the national regulator and ISO.
- Continue to rehabilitate infrastructure; diversify the power mix, notably with CHP, small hydropower and biomass.
- Adopt a single and transparent authorisation procedure for new power generation plants; ensure the openness and transparency of concessions, privatisations and partnerships in co-ordination with regulators and grid operators (under MOFTER control).

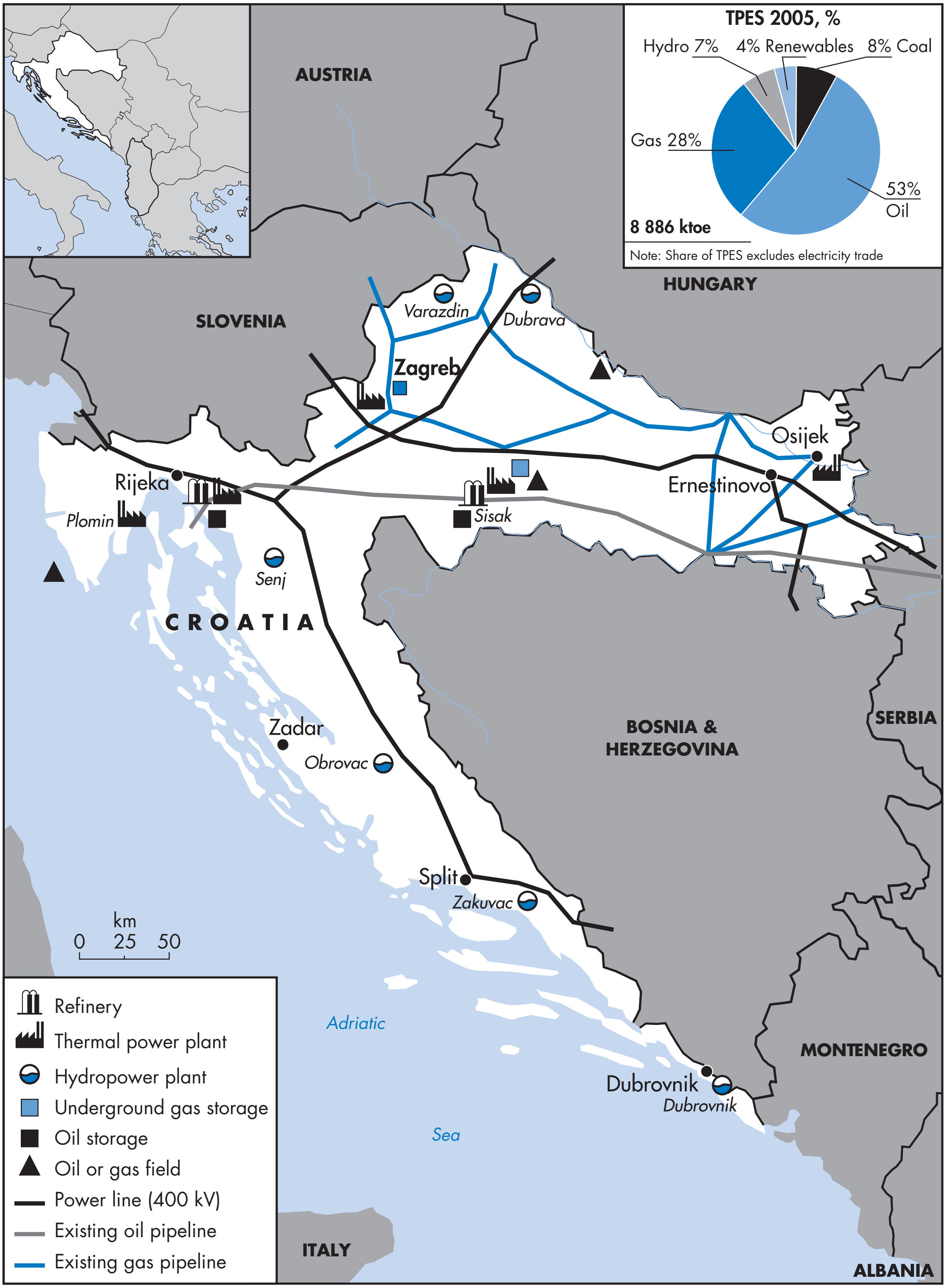
Heat

- Adopt national regulation for heat, with price regulation enforced by state and entity regulators.
- Introduce local energy planning and identify viable networks (under commercial conditions) for rehabilitation.
- Re-structure DH companies; encourage private sector participation (*e.g.* through concession and privatisation).
- Reduce energy losses; prioritise investment in CHP using natural gas or biomass.
- Introduce metering and automatic regulation on customer premises.

Renewable energy

- Develop a robust renewable energy action plan, including a study of potential resources and markets, enforced by a national agency and in synergy with energy efficiency and a least-cost investment plan for electricity.
- Consolidate and strengthen the approval and licensing process for hydropower projects, in line with EU standards and regulations, as well as international obligations.
- Extend minimum purchase tariff of renewable electricity and heat volumes to medium-sized units.
- Establish effective forestry management practices; control illegal wood cutting and trade; support efficient use of wood, including wood wastes.

Map 7..................Croatia's energy infrastructure



The boundaries and names shown and the designations used on maps included in this publication do not imply official endorsement or acceptance by the IEA.

VI. CROATIA

CROATIA'S ENERGY HIGHLIGHTS

Table 19 ....Energy snapshot of Croatia, 2005

	Croatia	Western Balkan region	OECD Europe
Total primary energy supply (Mtoe)	8.8	38.7	1 875.0
Total final energy consumption (Mtoe)	7.0	25.4	1 340.0
Energy consumption (toe) per capita	2.00	1.62	3.50
Electricity consumption (kWh) per capita	3 475	2 970	6 145
Energy intensity of GDP*	0.17	0.25	0.15
Carbon intensity (kg CO_2/GDP*)	0.40	0.69	0.33
Net imports as % of TPES (Dependence)	58%	**	44%

* In terms of purchasing power parity; in toe per thousand USD (in year 2000 US dollars).
** Not calculated to avoid double counting due to intra-regional trade.
Sources: IEA statistics (with additional data from administrations in Montenegro and Kosovo used for calculation of averages for the Western Balkan region).

At an early stage of the energy reform process, the Croatian government has set up an elaborate and comprehensive institutional framework with clear responsibilities. The government has adopted and regularly updated solid and broad energy policies focused on energy security, energy market opening and sustainable energy development. The administration has a high level of expertise.

Over the past decade, Croatia has achieved important and broad reforms in its electricity sector, in particular establishing a market-based regulatory framework that is largely in line with requirements of the European Union and the Energy Community Treaty. The regulatory framework establishes the conditions for investment and re-structuring the incumbent electricity company. Electricity supply has matched a rapidly increasing demand through successful efforts to modernise and expand generation and network capacity

Croatia's electricity network has been interconnected with the Union for the Co-ordination of Transmission of Electricity (UCTE) network. Reinforcement of the domestic network, through new capacity investment with Hungary and Italy, will enhance electricity security and market development (both domestic and regional). Croatia already plays a significant role in regional trade, notably due to its significant peak generation capacity (primarily, hydropower and co-generation gas) and large cross-border transmission capacity.

The government has set energy security as a policy priority. Croatia's domestic hydrocarbon and large hydropower production (accounting for 51% of electricity supply) keep energy and import dependence at levels well below other countries in the region. However, import dependence is growing for hydrocarbons.

CROATIA'S ENERGY CHALLENGES

Despite sound and detailed energy policy, Croatia has experienced delays in effective implementation. Continuous efforts are needed to further formulate policy, as well as tools for effective and efficient implementation and monitoring.

Croatia's electricity reform process is moving forward; however, time is needed to replace ageing and less efficient plants, as well as to implement EU legislation on pollutant emissions, particularly the EU Directive on large combustion plants and the EU Emission Trading Scheme. In addition, Croatia will have to devote significant financial resources to cover its 50% share of the cost of decommissioning the Krško nuclear power plant (NPP).

The Croatian government has stated its intent to reduce and, ultimately, to phase out electricity imports. Initially, this may appear as a valid way to reduce import dependence and enhance energy security; however, it would reduce diversification, which relies on interconnections. It would also not be compatible with the drive to create a regional electricity market and enhance security through integration, as envisaged in the Energy Community Treaty to which Croatia is a party.

Croatia has a significant energy saving potential – in the range of 25% of TPES. The government has given a clear policy priority to energy efficiency policies and sub-sector programmes backed by specific financing schemes. However, a comprehensive action plan for energy efficiency is not yet in place, nor has a national energy efficiency agency been established.

Croatia's *Energy Sector Development Strategy 2002 (ESDS 2002)* values the use of renewable energy, which is currently based mainly on large hydropower and fuelwood. It sets an objective to generate 5.8% of electricity from small hydropower by 2010 (from 1.4% in 2005) and establishes a goal to have renewable energy account for 12% of TPES by 2020. Despite various incentive-based policies and measures, Croatia has not yet attracted significant private investments in renewable sources. This raises doubts as to Croatia's ability to meet its ambitious targets.

Croatia signed the Kyoto Protocol in 1999 (as an Annex B country) and ratified it in April 2007. Croatia's target was to reduce CO_2 emissions by 5% (compared to 1990 levels) over the commitment period of 2008-12. Despite significant efforts to decouple pollution from economic growth, Croatia's carbon intensity is still high, although CO_2 emissions are still below Croatia's Kyoto Protocol target. Serious efforts are needed to decrease this level.

INTRODUCTION

The Republic of Croatia was part of the Kingdom of Serbs and Croats formed in 1918 and then a part of the Socialist Federal Republic (SFR) of Yugoslavia beginning in 1945. In June 1991, Croatia declared its independence. A four-year military conflict followed, resulting in significant human losses, massive refugee movements and destruction of key infrastructure. Croatia became a member of the UN in 1996 and an EU candidate country in June 2004.

Croatia has an area of 56 594 km^2 and borders with Slovenia to the north and the west, Hungary to the north, Bosnia and Herzegovina to the south and east, Serbia to the east and Montenegro to the southeast. Its coastline along the Adriatic Sea is almost 1 800 km and comprises more than 1 000 islands. The climate is mostly continental in the north and Mediterranean on the coast.

Croatia's GDP, in terms of purchasing power parity (PPP), was more than EUR 40 billion in 2005.[121] In real terms, the growth rate of GDP was 4.3%, reflecting a recovery to its pre-war levels. Per capita GDP was about EUR 9 000 in 2005. The population has remained stable since the end of the war (in 1995) at about 4.4 million (in 2005), with almost 800 000 living in the capital city, Zagreb. Inflation has dropped to 3.3% in 2005, but unemployment remains high, at almost 13%.

Since independence, Croatia's economy has been oriented mainly toward services, which now make up 60% of GDP. Tourism and light industries (*e.g.* food processing, machinery and pharmaceuticals) account for the lion's share of this figure. The energy sector accounts for about 5% of GDP. Energy-intensive industries, such as chemicals,[122] aluminium, paper, construction and shipbuilding, remain important. Croatia's main exports – food products and aluminium – are directed mostly to the European Union. Croatia is running a trade account deficit, which has increased its national debt to EUR 25 billion or 82% of nominal GDP.

ENERGY DEMAND AND SUPPLY

Sources and methodology

Energy data collection and compilation in Croatia is governed by the *Ordinance for Energy Balance*[123], which is in line with international standards. The Statistical Office ensures the primary data collection within the energy and end-use sectors. The Energy Institute *Hrvoje Požar* (EIHP) and the Ministry of Economy, Labour and Entrepreneurship (MELE) share the tasks of data compilation, energy balances and indicator formulation, analysis and information dissemination.[124]

121. Nominal: USD 23.1 billion, in US dollars of year 2000.

122. Chemical industry: 10.5% of 2004 GDP.

123. Official Gazette-OG, 33/2003.

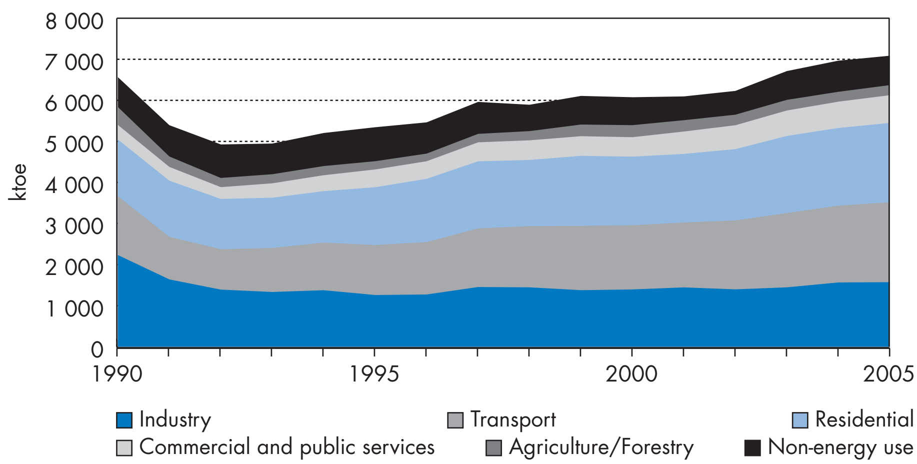
124. *Energy in Croatia, 2005*, available online at: www.mingorp.hr.

Demand

Croatia's total final energy consumption (TFC) has increased by one-third since 1995 at about 7 Mtoe. In 2005, oil products accounted for half of TFC, followed by natural gas (23%), electricity (17%), fuelwood (5%), heat (3%) and coal (2%) (Figure 14). Oil products are mainly used in road transport (51%), industry (23%), the residential sector (10%), agriculture (6%) and services (4%). Natural gas is used mainly in CHP (19% of the domestic supply) and industry (39%, including 16% as feedstock for a fertiliser plant). Natural gas is also used in residential (24%), service (5%) and other (13%) sectors. In contrast, electricity is consumed mainly in the residential sector (44%), followed by the service sector (29%) and industry (24%). Overall, the industrial sector consumes the largest share of energy (32%), followed by residential (27%), road transport (25%), services (10%) and agriculture (3%).

Since 1995, Croatia has experienced rapid growth in demand for oil products due to the rapid increase in individual cars and trucks. Between 2000 and 2005, TFC of oil products increased by an average of 3.3% per year, broken down as follows: transport (+4.5%), residential (+2.9%) and industrial (+3.4%).

Figure 14 ....Croatia's total final consumption by sector, 1990-2005



Source: IEA statistics.

Energy supply

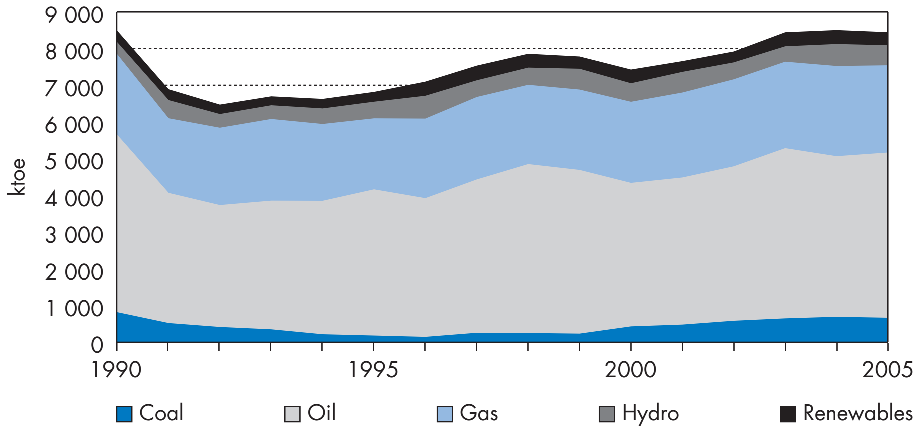
In 2005, Croatia's TPES reached 8.9 Mtoe – an increase of almost 15% since 2000 (and 25% since 1995), which brings the country close to 1990 levels. Oil (net of oil product trade) largely dominates TPES with a 51% share, followed by natural gas (27%), electricity imports and hydropower (11%), coal (7%) and fuelwood[125] (4%). Domestic production accounts for 42% of TPES, mostly natural gas (21%), oil (11%),

125. Other renewable energy sources (*e.g.* solar and biomass) are negligible.

hydropower (6%) and fuelwood (4%). Since 1995, the majority of TPES has derived from net imports, which account for 58% of TPES; this figure comprises crude oil and oil products (40%), coal (7%), natural gas (6%) and electricity (5%). Despite Croatia's large overall energy imports, the country is a net exporter of oil products and produces 78% of its natural gas supply. Hydropower accounted for 51% of total electricity generation; fossil fuels made up the other 49% with coal at 19% and oil products and gas at 15% each.

The *ESDS 2002* projects an almost 50% increase in TPES by 2030, with shares by sector increasing or decreasing as follows (2005/2030): natural gas (27%/31%); coal (7%/11%); non-hydropower renewables (3.5%/12.5%); oil products (51%/36%) and hydropower (6%/9%). The share of domestic production in TPES is expected to continue to decline to 30% in 2030.

Figure 15 ....Croatia's total primary energy supply by fuel, 1990-2005



Note: TPES excludes electricity trade.
Source: IEA statistics.

Energy intensity

In 2005, Croatia's energy intensity was 0.38 toe per thousand USD of GDP (in year 2000 USD), double the average for OECD Europe. In terms of PPP, Croatia's energy intensity was 0.17 toe per thousand USD of GDP (PPP year 2000), 13% above the average for OECD Europe. Annual electricity consumption in 2005 was 3 475 kWh per capita and 0.30 kWh per thousand USD of GDP, compared to average levels in OECD Europe of 6 145 kWh and 0.27 kWh. Although high in comparison to Europe, Croatia's energy intensity is much lower than most countries in the Western Balkan region, reflecting the high share of services and light industries in its economy.

ENERGY POLICY AND INSTITUTIONS

Institutions and overall strategy

Institutions

Croatia has an advanced institutional framework for the energy sector that includes a number of public agencies.

The ***Parliament*** approves the national energy policy as stated in the Energy Sector Development Strategy 2002 (ESDS 2002), determines and passes primary energy regulation, and receives reports from the Croatian Energy Regulatory Agency (CERA). It also appoints (and relieves of duty) the CERA's members.

The ***Ministry of Economy, Labour and Entrepreneurship (MELE)*** formulates energy policy, prepares primary regulation, drafts secondary legislation and/or regulations in collaboration with CERA, and proposes nominees to Parliament for CERA appointments. MELE approves construction of new facilities and infrastructure, as well as regulated final energy prices. The Ministry's Directorate for Energy and Mining includes three departments: Energy; Mining; and Strategic Planning and Energy Balance. The Energy Department is composed of the three divisions (*i.e.* the Energy Systems Division; the Gas and Electricity Division; and the Energy Efficiency and Renewables Division) and employs a staff of 22. The Directorate is headed by an assistant minister.

The ***Ministry of Environmental Protection, Physical Planning and Construction (MEPPPC)*** has responsibilities over energy-related issues including air pollution and climate change mitigation. Much of its work in relation to energy is undertaken by its Department for Environmental Assessment and Industrial Pollution and the Sector for Atmosphere, Sea and Soil.

The ***Energy Institute Hrvoje Požar (EIHP)*** was established in 1954 under the SFR Yugoslavia system as an energy policy and research institute for the entire country. After Croatia's independence, its structure and missions were reformed. It now has responsibility for energy statistics and for the design of energy policy concepts, including energy forecasts. The EIHP monitors implementation of policies and advises the government and energy operators. The Institute includes six departments and employs 65 experts.

The ***Croatian Energy Regulatory Agency (CERA)*** was established by the government (in 2004) as an autonomous, independent and non-profit public institution. Since 2005, it supervises the energy sector and markets. As the regulator, CERA's main tasks include licensing of energy operators, adoption of the tariff methodology for electricity, natural gas, heat and oil transport, and developing methodology for system balancing. It also prepares, with MELE, secondary legislation, and is responsible for protection of consumers and settlement of disputes. MELE also consults CERA to determine the levels of tariffs and regulated final prices (see below). CERA's funding derives from licensing fees and a levy on energy companies.[126] CERA has five commissioners, supported by a staff of 36 spread over six departments.

The ***Croatian Energy Market Operator (CEMO)*** began operating in 2005. It is responsible for the organisation of the electricity market, a role it fulfils as a public service under the supervision of CERA. Its main task is to ensure fair and transparent third-party access to operators. CEMO is currently part of Hrvatska elektroprivreda (HEP), the national power company, but will be unbundled and continue operating as a 100% state-owned company.

Local and regional authorities regulate energy services on local and regional levels, including the production and supply of heat, public lighting and gas distribution. They also participate in decision making on the location and type of construction of new facilities and infrastructure.

The ***Environmental Protection and Energy Efficiency Fund (EPEEF)*** was established by law in 2003. It finances programmes and projects in the fields of environmental protection, energy efficiency and use of renewable energy resources. It has a staff of 87.

The ***Energy Research and Environmental Protection Institute (EKONERG)*** is a public consulting company in the electricity and energy sectors, with additional expertise in the field of environmental protection. EKONERG has more than 100 experts on staff.

Croatia has a range of strong professional associations that are active across the energy sector. Their involvement provides a mechanism for competent discussion of policy options and smooth application of policy instruments and measures.

Energy policy and strategy

Key issues

- ***Lack of human resources in governmental bodies***
- ***Obstacles to implementing the ESDS and regulations***

Since the beginning of the transition process in 1994, the Croatian government has given priority to energy policy formulation through regular adoption of detailed energy strategies. In 1994, the government adopted a comprehensive energy strategy by policy area (*e.g.* market reforms and efficiency) and energy sub-sectors. This strategy aimed to establish a long-term vision: its main objective was to outline the necessary policies and measures, including economic, legal, organisational, institutional and educational aspects.

A second strategy was approved in 1998. Known as the *Energy Sector Development Strategy 1998* (*ESDS 1998*), it advanced the initial policy goals and direction of reform. Four years later, Parliament approved a new 10-year strategy, the *Energy Sector Development Strategy 2002* (*ESDS 2002*).

126. 0.06% of turnover.

Box 5..................Croatia's *Energy Sector Development Strategy 2002*

The main aims of the *ESDS 2002* are to:

- Improve energy efficiency in energy supply and demand, including increased use of natural gas and de-centralised generation (particularly co-generation).
- Enhance energy security, notably through links to international networks, participation in international energy markets, and development of transmission and distribution networks.
- Diversify energy products, sources and locations of facilities.
- Increase the use of renewable energy sources.
- Achieve market prices for energy; develop energy markets; re-structure and privatise state-owned companies.
- Enhance environmental protection and reduce environmental impacts.
- Enhance Croatia's economic competitiveness.
- Facilitate Croatia's EU accession process.

The thee-year *Programme of Implementation of the ESDS* outlines various priority measures and policy tools to reach the *ESDS* objectives, including:

- Establish a legal framework to liberalise energy markets.
- Privatise state companies in line with policy objectives.
- Formulate fiscal incentives, notably on energy efficiency for energy companies and customers.
- Enforce plans and measures for energy efficiency, use of renewable energy sources and environmental protection in case of market failures.

In addition a broad set of economic tools were established to assist policy makers in the development, implementation and monitoring of energy policy. These include energy supply and demand forecasts, a least-cost investment plan for electricity generation and energy performance indicators.

Croatia expects to complete a new energy strategy in 2008 and have it approved in early 2009. It is likely to focus on issues related to EU accession (negotiations on the energy chapter were opened in April 2008).

Discussion

At an early stage of the energy reform process, the Croatian government set up a comprehensive institutional framework with clear responsibilities and high-level expertise. Establishing and transferring responsibility to separate bodies has been key to developing an effective structure that comprises an independent regulator (CERA), a market operator (CEMO) and an investment support fund (EPEEF). Acting as the interface between the Parliament and the energy market, MELE has been the driving force behind energy policy design and implementation. At the same time, MELE has relied on de-centralised administrations for policy elaboration. The EIHP has been valuable as policy advisor and think tank, as well as in its role as an enforcer of regulation in support of CERA and CEMO.

The government has advanced well in separating its functions of policy making (through MELE) from regulation enforcement (through CERA) and operation of companies. This effort to deconstruct a monopoly situation effectively limits potential conflicts of interest that arise from having a single body acting as policy maker, regulator and owner of public companies. The separation is essential for effective and open energy markets. Transferring authority to set energy prices – from MELE to CERA – is a crucial step to finalising this process and ensuring that the Croatian energy sector is more in line with those of other EU and OECD countries.

Considering Croatia's bid for accession to the European Union, there is a need to address the matter of staffing within the energy administration, particularly the Energy Directorate at MELE and, to a lesser extent, CERA.[127] Reinforcing the staff numbers and ensuring competitive salaries will be critical to attracting additional high-level experts and decision makers.

Croatia has adopted and regularly updated solid and broad energy policies, with objectives largely compatible with the European Union and the IEA, and with a clear medium-term vision of the energy system. This has enabled the effective implementation of energy reforms including the re-structuring of state energy companies, the adoption of a regulatory framework and the development of policies to enhance energy efficiency. Continuous efforts are needed to further formulate policy and design tools (*e.g.* forecasts, least-cost plans and indicators) for effective and efficient implementation and monitoring.

Successive energy strategies, in particular the *ESDS 2002*, have focussed on energy security, energy market opening and sustainable energy development. Despite sound and detailed energy policy, there have been some delays in effective implementation. For example, a change in approach has delayed the development of an operational oil security system (in compliance with EU requirements). In addition, the opening of electricity and gas markets was declared for all industrial customers in July 2007. However, its effective realisation (*i.e.* supplier switch) has been limited by several structural factors, including the monopoly situation of incumbents, regulated tariffs and limited unbundling of the electricity transmission system. By contrast, Croatia's natural gas sector has been further unbundled in preparation for market opening to competition.

Participation in regional energy markets will be a challenge for Croatia. It has a relatively small market and, therefore, needs to enhance its competitiveness in the face of strong companies. At the same time, the country is also involved in regional projects, including the Pan-European Oil Pipeline and the Ionian-Adriatic Gas Pipeline, an LNG terminal on the Adriatic coast, underground gas storage, and new high-voltage lines to Hungary, Bosnia and Herzegovina, Italy and Montenegro.[128]

The modernisation of energy facilities and infrastructure, in particular oil refineries and CHP plants, will require domestic efforts and strategic partnerships with foreign investors. Croatia also needs to raise the corporate governance standards of its energy

127. The Energy Directorate employs 22 staff; CERA has a staff of 36 (2005).

128. Country connections listed in order of advancement of the respective projects.

companies to international levels. In order to move ahead on multiple public policy fronts (trade, transport, housing, environment, social and regional development, etc.), the Croatian government will need to develop new co-ordination tools and performance indicators. Effectively implementing the objectives of the *ESDS 2002* will be another challenge. It will be particularly demanding to finalise the alignment and effectively enforce the regulations on the EU *acquis communautaire*, in line with efforts toward EU accession.

In terms of sustainable energy, Croatia's energy intensity remains higher than the EU average and the share of renewable energy in the energy mix is still marginal, except for existing large hydropower. Comprehensive action plans for energy efficiency and renewable energy are not yet in place, nor has a national energy efficiency agency been established. Policies on research and development (R&D) in the energy sector need to be further developed, along with enhanced participation of Croatian companies in EU and joint international R&D activities.

Policy makers responsible for developing the new energy strategy (to be adopted in 2009) will have to address these issues in terms of policy design, implementation and monitoring. The consultation process for adopting the new strategy will be extremely important, and will benefit from an independent and open process involving a broad range of participants. This should enrich the debate and the consideration of policy options, while also raising awareness and ensuring policy endorsement by stakeholders and the public.

Market reforms and regulation

Key issues

- ***Authority for price and tariff setting***
- ***Market energy prices***
- ***Unbundling***
- ***Effective competition***

Croatia's regulatory reforms in the energy sector have four main objectives. First, to establish an independent and national energy regulator, which would serve, in turn, as a way to realise the second goal of achieving cost-reflective market energy prices and taxes. Introducing competition in energy production and supply will enable eligible customers to choose energy suppliers. Finally, separation of the transmission network from the Croatian electricity company, *Hrvatska elektroprivreda* (HEP), will guarantee non-discriminatory access to networks and competition (regardless of whether these assets remain under state ownership and state supervision).

The legal framework adopted in 2001 supports market opening by specifying four key aspects: *(i)* the methodology for setting energy prices and tariffs; *(ii)* the establishment of a regulatory body; *(iii)* the opening of the energy market, including public service obligations; and *(iv)* the re-structuring and privatisation of HEP and *Industrija nafte* (INA, forming the INA Group), the Croatian oil and gas company. The legal framework is based mainly on market requirements and encompasses the following laws:

- The *Energy Law* (OG, 68/01) and *Amendments* (OG, 177/04 & 76/07) define the role of the *ESDS* as the basic energy policy document, while also outlining the principles of the energy market, energy prices and tariffs, public service requirements and licensing principles.
- The *Energy Activities Regulation Act* (OG, 177/04) and *Amendments* (OG, 76/07) provide the framework for establishing CERA as an independent legal entity and define its mandate and responsibilities.
- The *Electricity Market Act* (OG, 177/04) and *Amendments* (OG, 76/07) define the organisation of the electricity market, including tariffs, eligible customers, and regulated third-party access to the transmission and distribution networks.
- The *Gas Market Act (*OG 40/07) determines market or public service activities, the responsibilities of gas suppliers, and the conditions for third-party access to the gas network.
- The *Oil and Oil Products Market Law* (OG, 57/06) introduces free market principles in the oil sector, and also defines negotiated third-party access to the transport system.
- The *Law on Environmental Protection and Energy Efficiency Fund* (OG, 107/03).
- The *Law on Heat Production, Distribution and Supply (*OG, 42/05).
- *Laws on Privatisation of HEP and INA* (OG, 32/02).
- The *Competition Act* (OG, 122/03) for all economic sectors and/or markets.

MELE and CERA adopted corresponding secondary legislation in 2006, including general conditions of electricity supply, grid code, electricity market rules and balancing rules. The legal framework for the electricity and gas sectors is harmonised with EU Directives, particularly the 2003 EU Directives on the internal energy market (for electricity and gas) and the Energy Community Treaty. Since 2005, CERA ensures the enforcement of this new regulatory framework, in particular the application of all energy tariffs.

Pricing and taxation

The *ESDS 2002* aims to "reach realistic and market energy prices" indicating that regulated prices (based on a tariff system and/or calculation methodology) shall be:

"…based on justified costs of operation, maintenance, replacement, construction or reconstruction of facilities and environmental protection costs, taking into account a reasonable rate of return on investments in energy plants, facilities, networks or systems. Tariff systems shall be non-discriminatory and transparent."

CERA is responsible for the methodologies to set tariffs for regulated energy activities (*e.g.* electricity generation for regulated customers; electricity transmission and distribution; electricity supply for regulated customers; gas transport and distribution; gas storage; management of LNG terminals; gas procurement; and gas supply for regulated customers). It carries out these roles after consulting MELE and energy companies. According to CERA methodology, energy companies submit their proposed tariff rates to MELE. After consulting CERA, MELE transmits its tariff proposal to the government for approval. This procedure for establishing peak tariffs for medium-to-large customers has been in place since 2007.

The *Ordinance on Setting Petroleum Product Prices* (OG 3/07) sets maximum prices based on an average regional price[129] and the average exchange rate of the national currency in relation to the US dollar. The maximum price includes the costs of primary storage and handling, as well as a profit margin. The government also sets a cap on the retail price of gasoline RON 95 (EuroSuper)[130] as a way to protect customers. Nonetheless, this cap applies only to INA, the national oil and gas company.

Network energy prices (electricity, gas and heat) still do not fully incorporate capital costs or environmental costs. Despite regular increases in household tariffs, cross-subsidisation still exists from industry to households (Table 20).

Table 20 ....Main energy prices in Croatia by carrier and sector, 2005 (in EUR/unit)

	Residential	Services	Industry
Electricity (kWh)	0.075	n/a	0.077
Gas (m^3)	0.320	0.330	0.340
Heat (kWh)	0.048	n/a	
Diesel (L)	0.910	n/a	
Gasoline RON 95* (L)	0.990	n/a	

Note: VAT included for residential.
* EuroSuper.
Sources: MELE, Energy in Croatia 2005.

Croatia has gradually reformed energy taxation in an effort to meet EU standards. Since 1998, the normal VAT rate (22%) applies on all types of energy. Excise duties[131] apply to all oil products for all customers and are paid by the refiner or importer on its storage facility. Regional administrations collect natural gas distribution taxes; municipalities collect heat distribution taxes through concession fees.

Company re-structuring and privatisation

The government has combined market-based regulatory reforms with a programme of re-structuring state energy companies, including HEP, INA and PLINARCO (the natural gas transmission system operator). The goal of this re-structuring is two-fold:

- To improve the economic, technical and corporate governance performance of state companies to meet international standards.
- To separate transmission and distribution network from commercial activities, while keeping both under state ownership.

Modernising and re-structuring the state energy monopolies has been an ongoing priority in Croatia's energy strategies. The medium-term objective has been to prepare companies for gradual privatisation. In 2002, the government adopted a law on the privatisation of INA and HEP, including re-structuring guidelines. The privatisation process for INA led to the first major sale of state assets to a foreign investor, with MOL of Hungary acquiring a 25+1% (in 2004). With MOL as a strategic partner, INA has adopted a modernisation plan (to 2012) for the oil refinery sector. The process

129. *Platt's European Markets*: CIF parity, Mediterranean Basis Genova/Lavera.

130. As of December 2007: ~EUR 1.10 per litre.

131. Since May 2007: EUR 0.40/L for gasoline and fuel oil; EUR 0.16/L for diesel.

to privatise HEP is expected to start in 2008. In the meantime, HEP has taken steps to modernise and re-structure its electricity generation, transmission and distribution facilities.

INA and HEP have both improved their management and corporate performance, including the implementation of accounting and disclosure standards (International Accounting Standards and International Financial Reporting Standards) in an effort to meet international and EU standards. They have also separated monopoly activities (transmission and distribution network) from commercial activities (generation and supply). The unbundling of natural gas transmission was completed with the creation (in 2001) of PLINARCO, a 100% state-owned company, fully separated from INA. PLINARCO acts as an independent natural gas transmission system operator (TSO). Croatia's 38 local gas distribution companies are mainly owned by municipalities, HEP or by private investors. HEP unbundled electricity transmission by establishing two separate divisions: HEP-Transmission System Operator (HEP-TSO) and HEP-Distribution System Operator (HEP-DSO). The account and management unbundling was conducted in 2004.

By law, gas and electricity transmission companies must remain under state or local ownership. Company tariffs, in particular transmission tariffs (for fair and open third-party access to gas and electricity networks), and annual investment plans are under the supervision and approval of MELE and CERA.

In parallel, the government's ownership rights and right to appoint executive management has been transferred to the Ministry of Finance. This move is an effort to separate shareholder and executive functions from MELE's policy and regulatory functions. The state is now better positioned to exercise its role as a shareholder in these commercial companies.

Energy market structure and opening

In accordance with EU regulations and the Energy Community Treaty, the government has set gradual objectives for market opening. This increases the number of customers that are eligible to choose their energy suppliers and negotiate supply contract prices[132] and conditions. The *Electricity Market Act* (2004) sets the eligibility conditions and implementation calendar as follows:

- 1 January 2005: customers with consumption above 20 GWh.
- 1 July 2006: customers above 9 GWh.
- 1 July 2007: all commercial customers.
- 1 July 2008: all customers.

Eligible customers also have the right to remain under the captive electricity market segment, which is supplied only by the incumbent, HEP. As of 2006, there were 39 eligible customers with annual consumption levels above 20 GWh, accounting for about 15% of Croatia's total annual electricity consumption. To date, none of them have switched from HEP, largely because the company remains the dominant supplier. Only households (eligible from July 2008) will have the right to switch back to the captive segment after being on the free market.

132. Regulated customers continue to be supplied by the incumbent at prices regulated by the government.

Electricity generation and supply to eligible customers is open to competition for traders and independent power producers (IPPs) operating co-generation plants or using waste or renewable energy sources. As of 2007, licences have been granted to 15 operators (11 traders, three producers and one supplier), giving them access to the transmission and distribution networks under third-party access regulated by CERA.

In accordance with the *Gas Market Act (2007)*, all customers (except households) became eligible in August 2007. Eligible customers include HEP and a fertiliser plant, which together accounted for 53% of total gas sales in 2007. As is the case with electricity, regulated third-party access applies for the gas sector – with the exception of access upstream pipelines under negotiated agreements. However, as INA remains the single natural gas supplier in Croatia,[133] no eligible customer could have exercised its right to switch suppliers. As is the case with HEP for electricity, INA is the sole gas supplier to regulated customers. INA provides supply, at regulated prices, through its 38 local distribution companies.

In regards to the organisation of the electricity and gas markets, the Croatian Energy Market Operator (CEMO) complements the role of HEP-TSO under the supervision of CERA.

Discussion

Two key actions have brought credibility and strength to regulatory reforms in Croatia's energy sector: the adoption (in 2001) of a new and comprehensive market-based energy framework; and the establishment of an independent energy regulator (in 2004).

The implementation of the *ESDS 2002* (based on *ESDS 1998)* was also a major step forward in this process: it has progressively enforced the rules and mechanisms for more rationale and de-centralised decisions at regulator and industry levels. The government has gradually transferred some of its regulatory responsibilities to CERA, thereby limiting eventual political interference and conflict of interest. Nevertheless, the government retains final decisions over various aspects of energy, including on price and tariff setting (for oil products, electricity and gas), as well as on authorising construction of new facilities and infrastructure. Completing the transfer of responsibility for these areas to CERA would bring further credibility to the regulatory framework, as has been demonstrated in other EU countries, including the new member states of Slovakia and Poland. At the same time, assurance of adequate funding will be crucial for CERA's independence from government or industry influence.

Balanced and transparent energy pricing and limited cross-subsidies between customers are prerequisites to maintain energy systems. They are also critical to attracting investment and ensuring effective opening of energy markets to competition. Thus, it is important for Croatia to finalise efforts to internalise all investment costs and externalities, and to phase out cross-subsidies. Peak tariffs are providing incentives

133. No gas distribution companies have declared their intention to supply customers outside their existing supply zones.

for rational energy use and more adequate prices for suppliers. The introduction of digital smart metering would facilitate the use of similar tariffs for households.

Efforts to re-structure and modernise the state companies in Croatia have progressed, but unevenly. In the oil and gas sector, INA is now partially privatised to a strategic partner (MOL of Hungary) and has undergone a major rationalisation process of its upstream gas and oil refining activities. INA's gas transmission activity was separated into PLINARCO, which now acts as the TSO. Gas distribution has also been separated into local companies. Underground gas storage remains under INA ownership.

By contrast, the electricity sector remains dominated by a vertically integrated company - *i.e.* HEP – that has a monopoly in terms of generation, transmission and distribution. Third-party access to the grid has been introduced, with MELE, CERA and CEMO monitoring to ensure transparent, fair and non-discriminatory terms. Nevertheless, HEP's control of generation in a relatively small eligible customer market limits customer choice and hinders the entry of new market players. Currently, INA and HEP remain the sole suppliers of gas and electricity to eligible and regulated customers.

Clearly, this is not the desired outcome. Croatia needs to advance efforts to separate ownership of electricity transmission assets and establish an independent and fully state-owned electricity TSO, as has been done in the gas sector. This will benefit new generation companies (particularly IPPs) and suppliers, and give eligible customers a broader choice of providers.

The privatisation of incumbents in a monopoly or dominant situation should not reinforce their market power. Privatisation of state-owned monopolies carries the risk that a private monopoly may emerge in their place – and be more difficult to regulate. Thus, before privatising any incumbent state monopoly, it is critical to establish a level playing field that encourages an effective opening of the market. This sets the stage for ensuring participation by a sufficient number of market players and for effective monitoring of third-party access by the regulator.

Energy security

Key issues

- ***Hydrocarbon imports and routes***
- ***Oil stock capacity and level***
- ***Energy emergency system***

The Croatian primary energy mix is comparable to most European countries, reflecting a high dependence on hydrocarbons with oil playing a dominant role and natural gas making up a significant share. In 2005, domestic hydrocarbon and hydropower production accounted for 42% of TPES; this is projected to fall to 38% in 2010. Hydrocarbon imports have increased by almost 50% since 1995, with a particularly noticeable rise in imports of crude oil.

Croatia's import sources and routes for coal and oil are diversified, coming from both Russia and the Mediterranean basin. The majority is transported via maritime routes to the port of Rijeka on the Adriatic coast and through the Adria pipeline to Croatia's two domestic oil refineries. By contrast, Croatia's current natural gas imports (20% of supply) come from a single supply country (Russia) through a single supply pipeline.

Despite its domestic resources, Croatia is increasingly dependent on oil and gas imports. The government has judiciously prioritised energy security as a key policy goal. To this end, it seeks to maintain the diversification of oil import sources and to investigate ways to diversify natural gas imports. The latter includes plans to build a LNG terminal on the Adriatic coast and to connect to new regional pipelines (see Gas section).

Energy facilities in Croatia are predominantly large plants (one oil terminal, two oil refineries and nine main power plants). The electricity network has been interconnected with the Union for the Co-ordination of Transmission of Electricity (UCTE) network since the period of the SFR Yugoslavia. In 2003, Croatia made significant investments to re-establish connections to the Western European UCTE (Zone 1) and the Southeast European UCTE (Zone 2), notably in the 400 kV transformer stations of Ernestinovo and Zerjavinec. Import capacities are now above peak demand.

Various efforts are underway to improve system reliability and, thereby, energy security. HEP TSO plans to build (by 2011) new lines to Hungary (400 kV Ernestinovo to Pecs) and Italy (submarine high-voltage direct current cable). The government has also stated an objective to reduce – and ultimately to eliminate by 2020 – electricity imports. This is an ambitious goal considering imports accounted for 49% (8.7 TWh or 0.7 Mtoe) of total demand in 2005.

Croatia has also taken steps to develop an emergency preparedness system, with particular focus on oil stocks in compliance with EU standards. The *2006 Oil Law* sets the conditions for compulsory oil stocks and for the creation of the State Agency for Mandatory Oil and Oil Product Stocks (SAMOOP). The SAMOOP is an autonomous public institution administered by a five-member governing council, which is appointed by the government. The Agency should increase its stockholding of oil products to 90 days of average consumption by 31 July 2012. This will require building 1.1 Mcm of new storage at a cost of EUR 200 million. A second category of mandatory stocks is to be held by oil operators (refiners, wholesalers, retailers, etc.). This will include oil product stocks (*e.g.* motor and jet fuel, and fuel oil). Leading up to 2011, the levels currently held by operators will be reduced in proportion to the increase of SAMOOP stocks (Table 21).

The *Energy Act* enables the government to take all necessary measures in case of unexpected or persistent energy shortages. In addition, the government will define emergency plans and procedures (*e.g.* demand restraint measures) in 2008.

Discussion

Croatia's energy and import dependence is lower than other Western Balkan countries, primarily due to lower energy intensity and the higher levels of domestic hydrocarbon and hydropower production. However, import dependence is growing. Thus, it is welcome that the government has set energy security as a policy priority. Plans are already at an advanced stage in terms of diversification of supply and sources of energy, notably with:

- A proposed LNG terminal on the Adriatic coast.
- A focus on increasing energy efficiency.
- An increase in the use of renewable energy sources.

Table 21 ....Planned compulsory oil stocks in Croatia

Year		2007	2008	2009	2010	2011	2012
Stocks held by SAMOOP	Days	40	50	60	70	80	90
	kt	356	480	575	671	767	863
Stocks managed by oil companies	Days	20	15	10	5	0	0
	kt	178	144	96	48	0	0
TOTAL	Days	60	65	70	75	80	90
	kt	534	624	671	719	767	863

Note: Domestic consumption is expected to remain stable at 3 500 kt per year during the period 2007-12.
Source: MELE.

Also, Croatia adopted a new law to establish an oil security system that will rely on a mix of public stocks (held by a state agency) and privately held industry stocks. This has been a welcome change of policy, moving in the direction of EU countries, and adding strength and credibility to the oil security system.

These sectoral policies have yet to be effectively implemented. It will be challenging – both technically and financially – for SAMOOP to build the required storage capacity and accumulate 90 days of reserves to comply with EU standard quality[134] by 2012. In addition, planned stock levels will need to be adjusted if oil product demand continues to increase (overshooting projected annual consumption levels of 3.5 Mt, as has been the trend over the past few years).

Croatia needs to establish and make operational a comprehensive emergency system to manage all aspects of a crisis situation, including the effective use of strategic oil stocks. The Croatian administration would benefit from the experience of neighbouring EU countries. One option would be to follow the example of the Slovenian agency ZORD, which uses foreign storage facilities to hold stocks abroad. Another would be to establish funding mechanisms, based on state guaranteed loans, for storage facilities and oil purchase as was done by the Hungarian agency KKKSZ.

As for security of gas supply, Croatia faces a situation marked by future declines in domestic production and steady increases in demand. It is also actively seeking to extend its distribution network. Thus, it is timely to consider options to build an underground gas storage facility, either independently within Croatia or jointly with other countries in the region.

134. These fuels are to be progressively available thanks to INA's oil refinery modernisation plan.

Reinforcing the UCTE interconnection through Hungary and Italy will enhance electricity security and market development (both domestic and regional). Although the government's objective to reduce and phase out electricity imports may appear, at first, as a way to reduce import dependence and enhance energy security, it will actually reduce diversification based on interconnections. It would also not be compatible with the drive to create a regional electricity market and enhance security through integration, as envisaged in the Energy Community Treaty to which Croatia is a party.

Energy efficiency and renewable energy

Key issues

- ***Programme implementation***
- ***Low energy prices***
- ***Investment capacities***

Strategy and institutions

Expressed in terms of purchasing power parity, energy intensity in Croatia – at 0.17 toe per thousand USD of GDP (PPP year 2000) – is lower than in other parts of the Western Balkan region. However, Croatia still has a significant energy saving potential (in the range of 25% of TPES[135]), which can be tapped economically on both supply and demand sides. Since the energy reform process began, the government has placed high priority on energy efficiency and enhancing the use of renewable energy.

The *ESDS 2002* identifies efficient use of energy and co-generation as policy priorities. The legislative framework to support these policies includes the *Energy Act*, the *Electricity Market Act*, the *Act on Regulation of Energy Activities* and the *Act on the Environmental Protection and Energy Efficiency Fund*.

MELE has the responsibility to design the energy efficiency and renewable energy policies and regulations in most sectors. It aims to adopt a national action plan for energy efficiency in 2008. At the local level, regional and local self-government bodies can also design measures. Other administrations and organisations are involved in various ways:

- The MEPPPC sets minimum energy performance of buildings and their energy systems (*e.g.* boilers and air-conditioners), and oversees a building certification system.
- CERA promotes energy efficiency in the energy sector through the network tariff system and monitors the feed-in tariff system for high efficiency co-generation and renewable energy.
- CEMO is responsible for contracting suppliers of electricity produced from renewable energy sources and co-generation under a minimum share scheme (5.8% and 2%, respectively); it collects a special fee on electricity tariffs and allocates these funds to renewables and co-generation-based electricity producers.

135. Based on studies, audits and estimates of the Croatian National Energy Programmes; reviewed also in the *In-depth Review of Energy Efficiency Policies and Programmes of Croatia*, Energy Charter Secretariat, 2005 (www.encharter.org).

- FEPEE finances investments on energy efficiency, use of renewable energy sources and environmental protection (see below and Environment section).
- EIHP supports the government in the design and implementation of policy for energy efficiency and renewable energy; it also advises energy utilities, particularly in terms of demand-side management programmes.
- The Croatian Cleaner Production Centre aims to lower energy use and reduce environmental impacts.
- HEP ESCO invests (as a third party) in energy efficiency projects with the support of the Global Environment Facility/World Bank Energy Efficiency Project.
- Several universities/faculties have active R&D programmes on energy efficiency and renewable energy.

Implementation and support programmes

Since 1997, Croatia launched a series of National Energy Programmes (NEPs) that focus on energy efficiency and renewable energy. To date, there are approximately 12 implementation programmes[136] (both vertical and horizontal) that reflect the successive *ESDS*. The key programmes for renewable energy sources are:

- BIOEN: to foster use of biomass and waste for energy.
- SUNEN: to develop the use of solar energy.
- ENWIND: to develop the use of wind energy.
- GEOEN: to develop the use of geothermal energy.
- MAHE: to facilitate rehabilitation and construction of small hydropower plants.
- KOGEN: to promote and develop co-generation.
- KUEN: to improve energy efficiency in DH systems.
- CROTOK: to develop integrated sustainable energy projects (including zero-energy houses) on the islands of the Adriatic Sea.

The financing of sustainable energy has been prioritised and the main measures defined by the *Act on Environmental Protection and Energy Efficiency Fund* (adopted in 2003). In 2005, the *Act* established the *Fund for Environmental Protection and Energy Efficiency* (FEPEE) to finance related investments by private operators and local authorities – primarily through long-term "soft" loans and grants. Since its creation, the FEPEE has provided a total of EUR 15 million of start-up funding to support 145 projects, focused on renewable energy (45%), energy efficiency (40%) and sustainable building (9%). This seed funding has enabled a total investment of EUR 187 million. Privately sponsored projects received about two-thirds of total FEPEE funding, the remainder was disbursed to local and regional authorities.

HEP ESCO also provides funding through the GEF Energy Efficiency Project: in essence, HEP ESCO operates as a developer through third-party financing. The six-year project has financing of EUR 30 million, provided by loans from domestic banks and the World Bank, a GEF grant, equity contributions from HEP, and refinancing from HEP and HEP ESCO. The current portfolio includes 44 projects. Commercial banks have not yet developed specific loan facilities in this field; however, the banks could receive EBRD lines of credit for energy efficiency and renewable energy projects.

136. For more detailed analysis and recommendations, refer to Energy Charter Secretariat (2005).

Sectoral assessment and programmes

Buildings account for the largest share of Croatia's TFC and have an economic energy saving potential estimated at more than 22%. The potential is even higher in apartment buildings, particularly those built before 1975. Estimates indicate that more than 83% of existing buildings have inadequate thermal insulation and that average consumption is about 300 kWh/m^2 (compared to 200 kWh/m^2 in existing buildings in Germany in 1993[137]). KUENzgrada is a NEP that covers existing and new construction in public, commercial and residential sectors. It targets the reduction of energy demand and the promotion of renewable energy use in the design, construction and use of buildings.

Croatia is aiming to make related regulations fully compliant with EU standards, including the building thermal code, *Rulebook on Energy Saving and Thermal Protection of Buildings* (adopted in 2005, applied since July 2006). However, its effective enforcement by the EIHP is problematic, notably in eastern rural areas. The code targets only the building envelope, stipulating a unit consumption of 150 kWh/m^2 compared to a level of 180 kWh/m^2 in the 1987 building code. The government envisages a regular system of energy audits and certification for buildings consuming more than the established threshold.

Energy use in transport, the second largest energy-consuming sector, is rapidly increasing – by 4.4% per year since 1995. Energy-saving potential in this sector is estimated at 25% of total consumption, mostly in road transport. The vehicle fleet has been largely replaced by more efficient models; however, mileage and the use of trucks are increasing. The modal structure of freight transport is dominated by road transport (63% of total), followed by railway (18%), pipelines (13%) and waterways (6%). TRANCRO was an NEP to promote energy efficiency in road, railway, sea and air transport. The deliverables of a three-phased project (over the 2002-04 period) included a database and forecast model of fuel consumption, a selection of most effective measures and awareness-raising activities.

The industrial sector's share in TFC has been decreasing since 1996 and is now concentrated in three main industries: cement, chemicals and food industry account for 66% of energy consumption. Thus, the Industrial Energy Efficiency Network Programme focuses on the most energy-intensive units in key industrial sectors and in public and commercial services. A related NEP, KOGEN, promotes co-generation, notably using biomass. In 2005, MELE and FEPEE initiated energy audits of 37 companies. The energy efficiency measures and investments made by these companies have focused on co-generation, biomass/waste utilisation and fuel substitution. As of 2008, this exercise will be mandated for units above a certain annual consumption level and regulated by a certification of energy auditors and a standardised procedure.

In the early 2000s, Croatia began introducing energy efficiency labelling and minimum performance standards for household appliances, in line with the EU *acquis communautaire*.[138] In 2005, a regulation established the labelling system for

137. Germany's 2001 building code reduced average consumption for new buildings to 70 kWh/m^2.

138. Including in the CEECAP project *Implementing EU Appliance Policy in Central and Eastern Europe* (www.ceecap.org), which was supported by the IEA and the government of the Netherlands, and which is now under the EU Energy Intelligent Europe programme.

several appliances.[139] Croatia has partially transposed the EU Directive on energy end-use efficiency and energy services (2006/32/EC) into national legislation. The EU Directive for eco-design energy-using products (2005/32/EC) will be transposed in 2008.

International co-operation

Croatia has developed significant international partnerships on sustainable energy development including the following:

- UNDP/GEF: *Removing Barriers to Implementation of Energy Efficiency Measures of the Residential and Service Sector* (since July 2005, EUR 3.6 million).
- World Bank/GEF: *Energy Efficiency Project* (2003-09, EUR 30 million) to support energy efficiency investments through HEP ESCO and *Renewable Energy Project* (2005-11, EUR 21 million).
- EU CARDS: *Approximation of EU Renewable Energy Legislation and Energy Efficiency Labelling (RELEEL)* (2007-09, EUR 0.5 million) to review and advise energy administrations on the regulatory and institutional framework for energy efficiency labelling. This project also supports the promotion of renewable energy, including eventual introduction of new tools such as green certificates; *Assessment of Wind and Solar Energy Resource in a Pilot Croatian Region* (2006-08) reviewed wind and solar energy potential and provided training.
- The EU *Energy Intelligent Europe* programme.[140]

Discussion

The government has given a clear policy priority to energy efficiency and renewables with policies and sub-sector programmes (*e.g.* the NEPs) that are comprehensive and well structured. An effective and complementary sharing of responsibilities for the policy and programme design has been set between MELE and other ministries, with the EIHP acting as advisor and co-ordinator. Over the last decade, the NEPs have been of high technical quality and relevance, and have been complemented by ambitious international projects, such as the HEP ESCO.

The government of Croatia has advanced the harmonisation of the EU *acquis communautaire* on energy efficiency, in particular for appliance labelling. It needs to accelerate and broaden this process and strengthen enforcement, particularly through the compliance of building codes and standards in the residential sector. Creation of the HEP ESCO and the FEPEE has facilitated effective and broad financing of energy efficiency, which is a major achievement in the region and for transition economies as a whole.

Despite sound policy and institutional design, the impact on energy intensity in the various sub-sectors has been minimal and the level of renewable investments has remained limited. These structural policies require effective energy pricing as well as other economic reforms and, thus, can deliver results only in the medium term. Implementation has also been stalled by the limited financial resources allocated to NEPs and to investment in project preparation. The absence of a national energy

139. Ref. OG 133/05 on energy efficiency labels for fridges, freezers and combinations thereof, washing machines, dryers and combinations thereof, dishwashers, ovens, light sources and air conditioners.

140. Croatia can now participate in this programme: http://ec.europa.eu/energy/intelligent/index_en.html.

agency fully in charge of programme implementation has also been a significant constraint.

A lack of quantitative objectives has made it difficult to monitor and evaluate the various programmes. In this respect, the future (2008) adoption of the national action plan for energy efficiency is a timely opportunity to consolidate efforts and resources on programme implementation. Two of the action plan's main tasks are: to redefine responsibilities between MELE, as policy designer and monitor, and other relevant administrations; and to establish a national energy agency, backed by a network of local agencies.[141] The action plan should also set clear, cost-effective and quantitative objectives and allocate adequate resources for the NEP programmes. An evaluation should be undertaken to assess the two financing tools (FEPEE and HEP ESCO) and propose improvements, which may include incorporating Kyoto Protocol flexibility mechanisms. The sustainability of these tools beyond the support phase is crucial and should lead to full autonomy of the ESCO.

Sustainable improvements of energy efficiency in transport remain complex: they depend on regional, national and local infrastructure projects, and on the decisions and behaviour of individuals. The systematic approach of the TRANCO programme provides a valuable tool to understand the dynamics of energy use in this sector and to identify effective policies and measures. Beyond the optimisation of vehicles, the only way to effectively and durably improve energy performance and reduce urban pollution is to re-balance investments toward public urban and inter-urban transport systems.

In industry, the focus on audits is appropriate, provided they recommend operational options with short- to medium-term payback that can also refund the audit cost. Complementary tools, such as carbon trading (EU Emission Trading Scheme) and the development of ESCOs, should enhance energy efficiency investments in viable industries.

The building sector is challenging on several fronts due to the high level of energy consumption of the existing building stock, the inertia of multiple stakeholders (*e.g.* developers, architects, owners and tenants) and the need to adopt the EU *acquis communautaire*. The KUEN programme should reinforce consultation with developers and building owners to adopt a more vigorous approach and ensure that building codes also apply to renovations. The measures and means to enforce appliance labelling should be strengthened to comply with EU standards. Significant energy efficiency potential in services, particularly in heating systems in public administrations, could be tapped by ESCO schemes, provided adequate heat regulation is in place (*e.g.* price caps instead of cost-plus fees). The dynamism of the tourism industry, which faces fierce competition from other destinations, should generate sustainable energy projects as a competitive and commercial tool. KOGEN and DH programmes could be extended to energy supply, transmission and distribution to tap into economic energy efficiency potential, particularly within the electricity distribution network (which has 10% losses).

141. A UNDP pilot project for a local energy agency in Zadar proved successful. New local agencies would be eligible for co-funding from the EU Energy Intelligent Europe programme.

Energy and environment

Key issues

- ***Urban pollution***
- ***Fuel quality standards***
- ***Increasing road transport***

Over the transition period, Croatia has significantly reduced pollutant emissions, largely through the combination of structural reforms across the economy (and the energy sector in particular) and a voluntary environmental policy. CO2 emissions in 2005 (20.6 Mt) were 5% lower than in 1990 despite average annual economic growth of 5%, reflecting a decoupling of growth in CO_2 emissions and GDP. Other emissions dropped significantly, in particular SO_2 (-65%) (Table 22).

Table 22 ....Annual emissions of pollutants (in kt) in Croatia, 1990 and 2005

	1990	2005	Decrease over the period 1990-2005
CO_2	20 900.0*	20 600.0	5.2%
SO2 [i]	172.4	60.3	65.0%
NOX [i ii]	86.4	68.9	20.3%
CO	503.0	311.0	38.2%
NMVOC [iii]	114.8	92.0	19.9%
PM10 [iv]	12.4	8.5	31.5%

* IEA data is 21 680. The discrepancy is due to different methodological assumptions.
[i] Sulphur oxide contributes to acidification of soils and atmosphere.
[ii] Nitrogen oxide generates eutrophication of soils and ground-level ozone.
[iii] Non-Matter Volatile Organic Compounds.
[iv] Particulate matter.
Sources: Ministry of the Environment; IEA statistics.

Carbon intensity in Croatia has decreased by 12% from 1995 to 2005, and stood at 0.40 kg of CO_2 per thousand USD of GDP (PPP year 2000) compared to an OECD Europe average of 0.33 kg of CO_2 per thousand USD of GDP. In 2005, the energy sector accounted for the largest share (34% or 20.8 Mt) of total CO_2 emissions, followed by TPPs (24%), transport (27%), industry (20%)[142] and residential (12%).

Policies and institutions

The MPPPC adopted (in 2002) the *National Environmental Strategy* and the *National Environmental Action Plan*. The main objectives of these two national documents are to:

- Decrease pollutant emissions to levels "not harmful for human health and the environment."
- Comply with international obligations.
- Align domestic legislation with the EU *acquis communautaire*.

The MPPPC gave EKONERG a mandate to establish an inventory of GHG emissions, monitor the environmental situation and evaluate policies.

142. The largest emitting sub-sectors are the cement (1.4 Mt) and fertiliser (0.4 Mt) industries.

In 1992, Croatia ratified the Convention on Long-Range Trans-boundary Air Pollution (CLRTAP) and the Protocol on Further Reduction of Sulphur Emissions, which prescribes a limit to Croatia's SO_2 emissions to below 117 kt by 2010 (32% below the 1990 level). In 2004, SO_2 levels in Croatia were at 60.3 kt or more than 65% below 1990 levels. Croatia has signed, but not yet ratified, the Protocol to Abate Acidification, Eutrophication and Ground-level Ozone (MPME Protocol), which mandates emission reductions by 2010 (compared to 1990 levels) of 61% for SO_2, 14% for non-matter volatile organic compounds (NMVOCs) and 19% for NH_3.

Croatia signed the Kyoto Protocol in 1999 (as an Annex B country) and ratified it in April 2007. The initial objective was to reduce CO_2 emissions by 5% over the commitment period of 2008-12 (compared to 1990 levels). In October 2006, Croatia submitted its *National Inventory Report on Greenhouse Gas Emissions* (for the period 1990-2004) to the United Nations Framework Convention on Climate Change (UNFCCC) Secretariat. In February 2007, Croatia submitted its Fourth National Communication. If no specific measures are taken, this document projects a 2.8% annual increase of CO_2 emissions by 2020 (at 35 Mt CO_2). However, it identifies 39 measures for reducing CO_2 emissions, which would lead to a total reduction of 5.6 Mt and enable the country to meet its Kyoto Protocol target. In January 2007, the National System for Monitoring and Reporting on Greenhouse Gas Emissions was established within EKONERG.

Tools and measures

The *Environmental Protection Act* (adopted in 1994 and revised in 1999) is the core environmental regulation in Croatia. It will be revised by 2008 to conform with EU legislation – particularly the EU Directive on large combustion plants, which will apply to 150 plants.[143]

The *Air Protection Act* (adopted in 2004) set limits for key pollutants (SO_2, NO_x, PM) and also mandated the development (every four years) of a *National Air Quality Protection and Improvement Plan*. The first plan is due to be adopted in 2008. The City of Zagreb and Croatia's 20 counties must adopt (by 2008) their own air protection plans, including tools to reinforce monitoring stations (4 to 6 units) and measures to be taken if pollution limits are exceeded.

The *National Environmental Action Plan* and the *National Air Quality Protection and Improvement Plan* include the following main priority measures:

- Enhance energy efficiency in both energy and end-use sectors, notably through regulation and financing to be covered by an action plan for energy efficiency.
- Promote co-generation (as of 2003, a new gas unit of 200 MW was in operation; another 100 MW was planned).
- Monitor emissions of large combustion plants; enforce compulsory annual technical tests of exhaust gases of motor vehicles (ECO TEST; since October 2004).
- Favour international systems for quality (ISO 9000) and environmental protection (ISO 14000).
- Promote waste (*e.g.* motor oil and tyre) combustion and recycling under acceptable environmental conditions.

143. To be registered under the European Pollutant Emission Register (EPER).

- Develop fuel substitution, particularly in favour of natural gas to take advantage of the extension of the gas network.
- Develop the use of renewable resources in industry, the public sector and agriculture.
- Develop an integrated waste management system with monitoring of municipal waste landfills and use of biogas to generate energy (a first 2 MW project in Prudinec).
- Prepare large emitters to participate in the EU Emission Trading Scheme, notably by creating a registry and allocation plan (in 2008).
- Draft regulations for the implementation of Kyoto Protocol flexibility mechanisms.

An important objective of the government is to progressively align motor fuel quality with EU standards (EURO V). As a derogation, the government sets the annual volumes of fuels that can be traded (including those fuels that do not comply with the existing fuel quality standards).

In 2004, Croatia introduced several environmental taxes and levies, including charges imposed on emissions of sulphur and nitrogen oxide, on waste disposal and motor vehicle registration. A specific charge on CO_2 emissions will be introduced in 2008.[144] These charges are allocated to the EPEEF, and have generated steadily increasing revenue to support its efforts. Total charges collected increased from EUR 23 million in 2004 to EUR 89.5 million in 2006; they are projected to reach EUR 138 million between 2007 and 2009, reflecting an increase in fees. In 2007, the EPEEF priorities were waste management (50%), environmental protection (33%) and energy projects (15%).

Discussion

Croatia has significantly reduced its levels of air pollutant emissions, largely decoupling them from economic growth. Nevertheless, its carbon intensity remains 21% higher than the average for OECD Europe. CO_2 emissions are driven largely by the road transport sector, and recently rose above the Kyoto Protocol target.

Croatia's SO_2 emission levels have dropped by two-thirds and are below the 70 kt objective set out in the Protocol on Further Reduction of Sulphur Emissions for Croatia. Other pollutants (NO_x, CO, PM) have declined less significantly. The energy sector, in particular power generation, remains the largest emitter of CO_2 and SO_2, despite having reduced its pollutant emissions as a result of switching to natural gas and combined cycle. Road transport is the largest emitter of NO_x and particulate matter, and the major source of urban pollution. The transport sector continues to increase its share of emissions despite improvements in fuel quality standards. Cement and chemical producers remain the largest emitters in the industrial sector, even though they have managed to reduce their emissions somewhat.

Croatia set a quantitative objective for SO_2 emissions in line with international agreements; this helped focus policies and measures to achieve a two-thirds reduction between 1990 and 2004. Similarly, ratification of the Kyoto and MPME Protocols

144. As stipulated in the 2007 ordinances on fees for CO_2 emissions.

should also strengthen policies to reduce CO_2 and other GHG emissions. In order to control and reduce GHG emissions, the government will need to effectively implement the measures outlined in Croatia's Fourth National Communication to the UNFCCC. This objective will be further supported by convergence with EU policies and efforts to improve energy efficiency, raise fuel standard qualities, increase use of renewable energy and expand the use of public transport.

The government has established a solid institutional and policy framework to reduce air pollution, and has progressively extended it to climate change issues. To achieve harmonisation with EU policies and regulation, in particular the EU Directive on large combustion plants and EU Emission Trading Scheme, it will be necessary to consolidate and integrate this framework with other policies (*e.g.* energy efficiency, transport and housing). This integration should contribute to improved environmental performance, as illustrated by the national waste management plan, which includes the development of a pilot biogas project to generate electricity.

The emission limits for large stationary emitters and the levies on emissions, to be complemented by a levy on CO_2 emissions, provide economic incentives for emitters to reduce emissions. Levies are collected into the EPEEF, which funds emission reduction investments. However, these levies and the taxation of energy products do not yet fully reflect all environmental externalities.

THE ENERGY SECTOR

Coal and oil products

Key issues

- ***Refining upgrade***
- ***Product quality***
- ***Effective retail competition***
- ***Emissions from increased coal consumption***

Croatia's estimated coal reserves of 45 Mt are primarily lignite, and are considered non-commercial since domestic production stopped in 2000. In 2005, Croatia imported 1.1 Mt (0.6 Mtoe) of coal (mostly steam coal) from international markets; a smaller amount of brown coal and lignite was imported from Bosnia and Herzegovina. About 80% of imported hard coal is consumed at the Plomin TPP, which accounts for 12% of Croatia's total installed electricity generation capacity. The cement (construction) industry accounted for another 15% of coal consumption.

Croatia's crude oil reserves are estimated at 9 Mt.[145] In 2005, production reached 1 Mt of oil from 46 fields. The *1991 Mining Act* (including revisions in 2003) regulates natural resource exploration (3 to 5 year licenses) and development (maximum 40-year licenses). It also determines the royalties paid by oil and gas producers with rates normally at 2.6%[146] of gross revenues.

145. Proven reserves as of 31 December 2005.

146. The royalty rate increases to 5% in areas of strategic importance to the state.

Domestic crude oil production is transported by rail or pipeline. The Jadranski Naftovod (JANAF) oil pipeline is 617 km long with an annual capacity of 20 Mt. It starts at the Omišalj oil terminal on the island of Krk, supplies the two INA refineries at Rijeka and Sisak, and continues on to Hungary and Serbia. JANAF is owned by INA (16%) and the state (62%) through the Pension Fund. CERA determines the regulated access tariff to crude oil and oil product pipelines, as well as to oil storage facilities.

For downstream activities, the 2006 *Oil and Oil Products Market Act* regulates oil refining, pipeline transport, storage and trading of crude and oil products, and oil product sales (wholesale and retail).

INA, the sole licensee for oil refining, owns and operates the refineries of Rijeka on the Adriatic Sea (3-3.5 Mt/y) and Sisak (2.0-2.2 Mt/y) in central Croatia. In 2005, the Rijeka plant processed 3.2 Mt of seaborne crude oil to produce 2.9 Mt of oil products, mostly automotive fuels (60%), fuel oil (20%) and LPG (7%). At the Sisak refinery, 1.7 Mt of crude oil (50% supplied domestically, 50% from Russia) was refined into 1.5 Mt of oil products as follows: automotive fuels (70%), fuel oil (12%) and heavy products (7%). In 2005, the two refineries started a broad modernisation plan to 2012,[147] focused on increasing capacity (to 4.5 Mt/y at Rijeka and 3.2 Mt/y at Sisak), desulphurisation and enhancing energy efficiency. The objective is to meet the low-sulphur EURO V quality standard by 2012.[148] The overall investment is EUR 900 million. INA exports almost 40% of its 4.7 Mt of oil product production, mainly to Bosnia and Herzegovina, Italy and Slovenia. It plans to introduce (by 2011) biofuels into automotive fuels, eventually reaching a level of at least 5.75%.

In 2005, INA controlled 80% of total domestic sales of oil products: it is the main wholesaler (50% market share), owns storage facilities and operates the largest retail network (318 of Croatia's 731 filling stations). It should be noted that the number of filling stations increased by 40% since 1996. INA also owns stations abroad, notably 50 in Bosnia and Herzegovina. Maximum selling prices of automotive fuels, fuel oil and LPG are determined by the government every fortnight (see section on Market Reforms and Regulation). In early 2007, prices for unleaded motor gasoline (RON 95) and Eurodiesel were about EUR 1.01/L and EUR 0.91/L, respectively, which is largely in line with EU prices.

Ownership and privatisation

In 2006, the INA Group realised a turnover of EUR 3.1 billion and employed almost 16 000 people, making it one of the largest companies in Croatia. It has proven reserves of 261 Mb of oil equivalent. In addition to its domestic operations, INA has oil and gas exploration and development operations in Egypt, Namibia and Syria. It also holds crude production blocks in Angola and Egypt, accounting for 20% of its proven reserves.

147. This includes new isomerisation units, hydro-desulphurisation of FCC gasoline and a sulphur recovery plant at Sisak, as well as the construction of a hydro-cracking complex (MHC) at Rijeka. A second stage will include construction of residue processing facilities at Rijeka and several projects at Sisak, including renovation of a coking unit and construction of a MHC and a DS diesel fuel unit.

148. INA began producing EURO IV in 2006. Croatia's liquid fuel oil quality standards are based on those of the European Union.

INA became a joint-stock company with full state ownership in 1993. Following an international tender in 2003, the government sold a 25+1% share of its INA holdings to MOL (Hungary) for EUR 390 million. The government retained 51.8% shareholding; the rest is owned by public/small shareholders (12.5%), war veterans (7%) and two banks (4%). The *2002 Privatisation Law* and its *2006 Amendment* call for the state to further devolve its remaining interests by selling shares (on the stock exchange) to strategic investors (20%) and to INA employees (7%). This would leave a state ownership of 25+1% share.

Discussion

Croatia's demand for hard coal is concentrated in coastal power plants. It is now fully met through imports under flexible conditions. Use of hard coal will increase with the commissioning of a new power plant. At the same time, it will face increasing regulatory constraints, notably with the application of the EU Directive on large combustion plants and the EU Emission Trading Scheme.

Croatia has structured and developed a comprehensive hydrocarbon system, providing oil and gas supply, transport, refining and retail services. The level of domestic production is significant for natural gas (80%) and supported by additional investments. However, increasing energy demand will reduce the share of domestic production, which has fallen to as low as 18% for crude oil in 2005.

Croatia's oil pipelines may be upgraded and developed in the context of regional transit projects. Its two refineries face multiple challenges. They need to modernise equipment and processes to adapt to market trends and remain competitive. At the same time, they need to comply with EU standards for oil products, the environment (*e.g.* the EU Directive on large combustion plants and the EU Emission Trading Scheme), and safety. Privatisation has been justified by two factors: significant investment needs (upstream and downstream), which cannot be financed by the state budget; and the trends that make the sector increasingly commercial and international. INA's chosen strategic partner, MOL of Hungary, already has significant regional and international experience. MOL successfully upgraded and modernised the equipment of Slovnaft (the Slovak oil company), bringing its output to international standards.

Calls to reduce state-ownership and control of INA aim to enable the company to comply with regulation (notably for fuel quality standards) and ensure effective competition on the oil product market. Reaching and applying EURO V quality standards is a condition for integrating into the EU oil market (in which INA will be better positioned) and will also reduce emissions, notably in urban areas. Given INA's current domination of the domestic market, CERA needs to take three strong actions: enforce effective third-party access to oil facilities for all licensees; prevent binding contracts between INA and retailers; and impose the sale of part of INA's retail network in order to balance the sector.

Regulated prices of some oil products provide a certain protection to consumers; however, they may also limit competition and subsidise consumption. Once conditions for effective competition are met, the government should progressively raise regulated prices and lift controls on oil product prices. This should be done prior to EU membership.

Natural gas

Key issues

- ***Incumbent market power***
- ***Network extension***
- ***Distribution fragmentation***
- ***Effective market opening***

Croatia's natural gas reserves are estimated at 30 bcm. In 2005, production reached 2.3 bcm of natural gas from 22 fields, which are located in the central region of Pannonian Plain and offshore in the north Adriatic. INA is the sole onshore operator and co-operates on two offshore gas fields with the Italian companies ENI and Edison. INA's main development projects include the Northern Adriatic Project and the onshore Međimurje field.

In 2005, total natural gas consumption reached 2.9 bcm, a slight increase (+1.5%) from 2000. The main consuming sectors are industry (40% - of which fertiliser plants account for 17%), households (24%), co-generation plants (20%) and services (6%). Domestic production covers almost 80% of supply. Since 2001, Croatia has exported (annually) about 0.45 bcm of production to Italy while importing 1.1 bcm from Russia. Import capacity through Slovenia was recently doubled to 2 bcm per year with an additional 0.5 bcm expected by 2010. Three additional projects are being considered by 2012:

- A connection to the Hungarian transmission system (1.5 bcm per year).
- Construction of additional storage capacities.
- Construction of a regional LNG terminal on the island of Krk[149] (initial 10 bcm capacity).

Other plans include the possibility to build a gas line parallel to the Pan-European Oil Pipeline (PEOP) between Romania (Constanta) and Italy (Trieste). In addition, there is the initiative for an Ionian-Adriatic Gas Pipeline (Albania to Croatia, via Montenegro), with an annual capacity of up to 5 bcm per year; this would run up the Adriatic coastline from the Trans-Adriatic Pipeline (TAP).

Croatia's gas transmission network is 1 657 km long and links INA's gas fields, gas storage of Okoli (0.5 bcm) and import intakes to the gas distribution network. The distribution network has more than doubled – to 16 220 km – between 1995 and 2004. The northern part of the country is now largely gasified, covering around 40% of the population. By 2011, Croatia plans to extend gasification to the southern part (Lika and Dalmatia) along the coast (including Split). Initial investment needed for this is in the order of EUR 280 million, to be partly financed by the European Investment Bank (EIB). There are also plans to extend the gas distribution network to Bosnia and Herzegovina and Montenegro.

INA is the sole operator of upstream activities, and of imports and storage of natural gas; it also acts as the single natural gas supplier. In 2001, INA's transport division was separated to create a fully state-owned company, PLINACRO, which now acts as the TSO, dispatcher and market operator for the gas sector. The distribution network is

149. See Oil and Gas Transportation chapter, gas section.

operated by 36 local distribution companies; the two largest companies handle about half of the total distribution volumes (Zagreb – 36%; Osijek – 14%). Distribution companies are owned mainly by municipalities, private investors and HEP (Osijek).

Gas market

The government regulates end-use natural gas prices for non-eligible or regulated customers (households). INA's wholesale prices to distribution companies are capped at EUR 0.20/m^3, which is below production costs according to INA. At present, the basic gas price elements include the natural gas supply price and the natural gas transportation price, as well as the distribution margin defined by CERA. The government plans to adjust this price cap and phase out remaining cross-subsidies to households by 2011.

In line with the EU Directive on the internal energy market (for gas), the *2007 Gas Market Act* (replacing the *2001 Gas Act*) allowed large and medium customers (*i.e.* eligible customers) to choose their gas suppliers at negotiated supply prices and conditions. In August 2007, this policy was extended to all customers, except households (planned for August 2008).

The *Gas Market Act* provides the legal basis for the gradual development of the gas market, which is expected to be operational by the end of 2011. In order to control INA's current natural gas supply monopoly, the *Act* prescribes that the government will continue to set the maximum gas price until 1 August 2011. This price regulation by government is stipulated primarily to provide consumer protection, particularly in the household sector. The *Act* also sets the conditions for new gas suppliers to access the transport and distribution system, underground gas storage and planned LNG terminal, which would be done under regulated third-party access with INA and distribution companies. Negotiated third-party access applies only for access to the upstream pipeline network. As yet, no alternative gas supplier operates in Croatia.

A potential area for development is the use of natural gas in the transport sector, through the introduction of natural gas vehicles (NGV). This would help to reduce the country's growing dependence on distant oil fields and volatile international oil markets, and also create synergy between the gas sector and policies on energy efficiency, environment and transport.

Discussion

Domestic natural gas production covers more than 20% of Croatia's TPES. The transmission and distribution networks have been solidly and progressively developed, and are backed by one underground storage facility. The creation of PLINACRO, as a separate company, has favoured a transparent and effective extension of the network and conditions for third-party access. Natural gas is most valued in high efficiency uses (*e.g.* co-generation). The government and the gas sector have set five ambitious objectives:

- Maintain a high share of domestic gas in the energy mix.
- Extend the network in the southern part of the country.
- Diversify imports, notably through LNG.
- Increase storage capacities by 2.5 bcm, for a total of 3 bcm.
- Open the market to competition.

Despite this clear vision, some difficulties may lie ahead. Projections show that the combined increase in natural gas and electricity demand will surpass the increase in domestic natural gas production, leading to an increase in the share of natural gas needing to be imported.

There is also the risk that regulated wholesale and retail prices (under government control) will be maintained below production and import costs. This will harm the gas industry's viability and investment capacity.

The diversification of import sources and routes, as well as investment in an additional underground gas storage facility, will enhance security of gas supplies but at a high cost that will have to be passed on to Croatian consumers. Moreover, despite some diversification of supplies, the anticipated increase in gas imports could give the current main external supplier (Gazprom) additional influence on the market.

An additional challenge is that effective market opening will be limited by INA's market power, even if regulated third-party access applies to most facilities. The Croatian gas market remains small despite expansion plans and will not be attractive for alternative suppliers.

Under these conditions, CERA will play a crucial role, particularly in setting cost-reflective regulated tariffs for access to the network, the LNG terminal and storage facilities. It will also be key in establishing final gas prices for non-eligible customers. Thus, it is critical that CERA be given the authority and capacities to closely monitor the market, ensuring transparent and fair third-party access to keep INA from abusing its market power. CERA will also need to gradually phase out the remaining cross-subsidies between customer categories, including those to the fertiliser industry.

Electricity

Key issues

- ***Demand increase***
- ***Cross-subsidies***
- ***Unbundling***

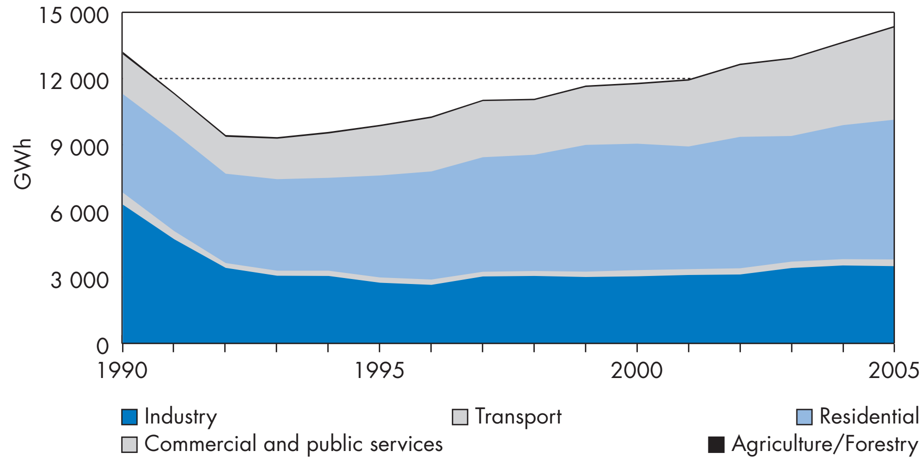
In 2005, Croatia's total electricity supplied was 17.5 TWh (1.5 Mtoe), an increase of 3.6% since 2000. The largest consuming sectors are households (36%), services (24%), industry (19%) and the energy sector (6%) (Figure 16). In 2006, peak demand was 3 036 MW.

Power generation and supply

In 2005, Croatia's total installed capacity of 3.6 GW generated 12.5 TWh of electricity. The country's electricity mix relies heavily on hydropower (55% of installed capacity; 51% of total generation).[150] The other 49% is generated by fossil fuels, including coal (19%), oil products (15%) and gas (15%). Co-generation accounts for 20%, of which 5% is by industrial plants.

150. About 85% of Croatia's hydropower capacity is from water storage plants; it provides peak surplus, which is mostly exported.

Figure 16 ....Electricity consumption by sector in Croatia, 1990-2005 (Gwh)



Source: IEA statistics.

The state-owned utility, *Hrvatska elektroprivreda d.d.* (HEP), accounts for 95% of the country's total installed capacity and generation. In 2003, HEP commissioned a gas-fired co-generation plant (200 MWe and 150 MWt) and started building an additional unit (100 MWe and 80 MWt) in Zagreb. A few other plants are in an advanced stage of preparation or construction including: a 250 MW CCGT power plant at Sisak; a 250 MW CCGT power plant at Osijek; and a third, coal-fired power plant at Plomin (Unit C of 500 MW).

There is one semi-IPP: Plomin II is a coal-fired power plant (190 MW). It is jointly owned by HEP and RWE (of Germany). There are a few small privately owned power plants (wind power and small HPPs, accounting for about 10 MW).

In addition to domestic capacities, HEP holds a 50% share in the neighbouring nuclear power plant of Krško (680 MW) in Slovenia. HEP is expected to cover half of the future decommissioning costs of Krško,[151] which still need to be estimated. The company also has a share-ownership arrangement in two lignite plants in neighbouring countries: 33% of Gacko (300 MW) in Bosnia and Herzegovina; and 100% of Nikola Tesla/Obrenovac (305 MW) in Serbia.[152]

HEP has also signed a purchase agreement for electricity with Bosnia and Herzegovina, covering the period 2003-08. Croatia's electricity trade experienced rapid development between 2000 and 2005: imports doubled to 8.8 TWh (including HEP's share in Krško) and exports increased nine-fold to reach 3.6 TWh.

Electricity network

Croatia's electricity transmission capacity relies on a grid of 400 kV to 110 kV lines and sub-stations, all of which are owned and operated by *HEP-Operator prijenosnog sustava d.o.o.* (HEP TSO). Since being separated from HEP in 2005, HEP TSO has acted as the TSO

151. Regulation (OG 50/06) on the funding of the decommissioning and disposal of radioactive waste and spent nuclear fuel of Krško NPP.

152. The two agreements are under dispute. Thus, the capacities of these plants are not available to HEP.

and is, therefore, responsible for operation, maintenance, development and construction of the transmission grid and for control of the electricity system. It also provides grid access to third parties and provides system services. HEP TSO also oversees procurement of electricity required for balancing the system. However, each supplier is responsible to the TSO for imbalances of its customers, producers are responsible for imbalances with regard to their production, and traders are accountable for the realisation of notified contractual schedules. The TSO controls the electricity system in real-time, taking into account the market plan that CEMO delivers one day ahead.

HEP TSO plans to invest EUR 270 million by 2015 to reinforce the distribution network, particularly along Croatia's southern coast. Electricity distribution is ensured by HEP Distribution, which has 21 local branches; its highest consuming branches include Zagreb (23% of total consumption), Split (13%) and Rijeka (10%). A separate operator was established for the distribution system, *HEP-Operator distribucijskog sustava d.o.o* (HEP DSO). The DSO has the same function in distribution as the TSO has in transmission. It supplies electricity to regulated customers and, as a public service, acts as the "last resort" supply in case of a supplier failure.

In 2005, Croatia had moderate losses in transmission (4%) and distribution (10%)[153] in relation to total electricity consumed. Cross-border capacity, based on net transmission capacity (NTC), is 3.2 GW for imports (of which 1 GW is needed for domestic customers) or 105% of peak demand. NTC for exports is 2.3 GW.

Electricity market

The *2004 Electricity Market Act is* the key legislation for this sector. It enables the government to set final regulated electricity prices and tariffs for third-party access to the networks, based on CERA proposals. As with natural gas, the government's objective is to eliminate the remaining cross-subsidies to households by 2011.

Market opening to competition, which allowed eligible customers to choose their suppliers, was initiated in 2005 using a model of bilateral supply contracts in which the contractual parties are the eligible customer and the supplier. By contrast, bilateral electricity sales contracts are concluded between suppliers and traders or producers. In addition to the supply contract, the customer and the producer must also conclude the grid usage contract with the TSO or the DSO, depending on the grid to which they are connected. All market participants must conclude an energy balancing contract with the TSO. Supply of electricity to regulated customers and "last resort" supply is performed by the DSO.

CEMO has enacted the *Electricity Market Rules*, which establish the procedures for market participants and the relationships between participants. Each licensed producer (above 1 MW), supplier and trader must conclude an agreement with CEMO. In turn, CEMO concludes agreements with the TSO and the DSO, thereby setting mutual obligations. CEMO drafts market plans on the basis of contractual schedules, which market participants are obliged to submit. Based on the schedules and the generation or electricity delivery, CEMO calculates the energy balancing and forwards it to the TSO, which then charges for the imbalances.

153. 2006 preliminary data: 3.5% and 9.5%.

The re-structuring and unbundling of HEP has created the HEP Group as a 100% state-owned holding, with subsidiaries in each segment of the electricity sector (HEP Production, HEP Transmission, HEP Distribution, HEP Supply, HEP Trading) and beyond (HEP Gas, HEP District Heating, HEP ESCO). As in the case of INA, the *2002 Privatisation Act* calls for a progressive sale of HEP to a strategic investor. This initial plan has been announced for 2008 and will need to take into account the creation of HEP subsidiaries.

In addition to HEP Trading, CERA has licensed 11 traders. To date, none of these traders have made their offers available. Thus, effective supplier switching by eligible customers has not yet materialised.

Discussion

Over the past decade, Croatia has achieved important and broad reforms in the electricity sector, particularly in establishing a market-based regulatory framework that is largely in line with EU and Energy Community Treaty requirements. The framework also provides the conditions for investment and re-structuring the incumbent company, HEP. At the same time, HEP has continued to supply a rapidly increasing demand, largely by modernising and expanding its generating plants and network. It has also played a significant role in regional trade, notably through its significant peak generation capacity (hydropower and co-generation gas) and large cross-border transmission capacity.

The electricity sector has overcome several challenges and obstacles. However, additional challenges remain, which will influence investment and operation decisions. In terms of electricity generation, Croatia needs to replace ageing and less efficient plants, and to implement EU legislation on pollutant emissions (*e.g.* the EU Directive on large combustion plants and the EU Emission Trading Scheme). It also needs to increase fuel oil prices and reduce fuel oil output in upgraded INA refineries. These improvements may translate into a more diversified power mix, moving away from coal and fuel oil to more natural gas and non-hydropower renewables (which are currently negligible).

Significant investments have been made to restore the transmission network, permitting re-interconnection with the UCTE in 2003. More investments are planned to reinforce Croatia's capacity and strength, in particular along the Adriatic coast. Electricity distribution is also an important element of the value chain, but still suffers from a relatively high level of technical losses. Because the state shareholder has no resources to invest on commercial activities, funding for new investments will have to come from network tariffs.

The biggest challenge is the finalisation of the electricity sector re-structuring process and market opening. HEP has been successfully re-structured into a commercial company with several subsidiaries, but remains a vertically integrated structure that maintains control of the network. Fair and transparent third-party access is a prerequisite to support effective market opening, but cannot be guaranteed under the current circumstances. HEP has a dominant position in generation that is being reinforced by new investments; it is a single buyer from the few independent power producers (IPPs); it is also a wholesaler and trader, and a sole distributor with relatively high connection charges. Considering the small size of the Croatian electricity market, potential investors will be deterred by the remaining cross-subsidies and the government's ongoing control of price setting.

The creation of PLINACRO has proved a valuable undertaking, bringing credibility and strength to the gas regulatory framework and to corporate performance. Creating an independent TSO for electricity would allow HEP to focus on its core commercial activities: generation and trade. Another crucial reform would be to establish CERA's central role in enforcing regulation (particularly price and tariff setting) and in monitoring markets and operators. This would improve economic regulation and pave the way for an effective and fair market opening, relying on one or several market mechanisms (*e.g.* direct contract, wholesale and power exchange) in the framework of EU and regional electricity markets.

The stated objective of the government to phase out electricity imports by 2020 is questionable from many perspectives, perhaps most importantly from an energy security perspective. The government cites the apparent high share of imports, which is due to HEP's share in the Slovenian NPP and the fact that Croatia imports cheaper baseload electricity while exporting higher value peak load. Once the Krško NPP starts to be decommissioned after 2020, its share in imports will decrease. In reality, the combination of high import capacities and UCTE interconnection will provide a high degree of security of supply and flexibility for the Croatian electricity system. Furthermore, imports play a clear role in providing a competitive stimulus in a market dominated by a single generator – *i.e.* preparing operators to participate actively in regional and EU electricity markets.

Heat

Key issues

- ***Non-cost reflective heat prices***
- ***Fuel competition***
- ***Environmental regulation***

The vast majority of Croatia's population (90%) use individual heating systems. Natural gas and oil products (LPG) are estimated to meet 40% of the population's heating needs, followed by fuelwood (20%), electricity (15%), coal (5%) and heat pumps (5%).[154] Electricity and fuelwood (accounting for 17% and 5% of TFC, respectively) are used to a much lesser extent than in other parts of the Western Balkan region.

In 2005, district heating accounted for only 3.5% of Croatia's TFC but covered 15% of household (space and water) heating needs. Almost 10% of the population (400 000 people) is connected to DH systems, including 30% of the population in the capital city of Zagreb. Total installed capacity of district heating is 2.4 GW (Zagreb - 1.3 GW;

154. These are estimations only. Statistics on heat are not comprehensive, which raises questions of reliability.

Osijek – 315 MW; and Sisak – 110 MW), of which 75% is co-generation. Together with industrial plants, co-generation accounts for almost 14% of total electricity generated. Natural gas is the dominant fuel in the heat mix, generating 65% of heat supplied. Oil products, mainly fuel oil, account for 34%. Energy efficiency of co-generation systems is high (85%) compared to heat-only boilers (35%).

In 2005, average heat generation costs were EUR 60/MWh whereas final prices were EUR 48/MWh. This gap led to losses for almost all of the 16 heat generation companies, most of which are owned by HEP (80% of total capacity).[155] Thus, the main policy objective for heat systems in the densely populated areas of Croatia is to ensure their economic viability. Particular attention is devoted to efficiency of heat generation and distribution through the NEP KUEN, which focuses on energy efficiency in centralised heating systems.

The *2005 Heat Law* provided a new regulatory framework, notably for heat prices which are now set by the government according to CERA tariff methodology (*i.e.* cost-plus fees). However, this methodology does not include all costs; those due to network losses are noticeably absent from the equations. Thus, heat prices are not cost-reflective and still reflect cross-subsidies from industry to households.

Discussion

Croatia operates DH systems in densely populated areas of its continental cities. The systems typically use co-generation with high efficiency and provide electricity revenues. However, several structural factors have reduced the profitability of DH companies including the relatively short heating season, low efficiency in energy use and increased competition from natural gas. Increases in oil and gas prices also have an effect – leading to higher costs and lower demand.

The fact that heat prices in Croatia are not cost-reflective puts additional financial pressure on companies and city administrations. The situation is even more difficult for smaller DH companies and heat-only boilers. Despite a specific law for heat, the regulatory situation remains unclear with respect to the role of municipalities and to CERA's role as a regulator. Furthermore, cross-subsidies accelerate and deepen the system's financial losses.

Heat generated by DH systems is fuelled almost entirely by hydrocarbons, which creates problems related to price volatility. The application of EU regulations, particularly the EU Directive on large combustion plants and the EU Emission Trading Scheme, to most DH systems will further constrain oil product use and economics. Studies and pilot projects have indicated niche markets for CHP biomass and biogas; these need to be confirmed by least-cost studies on heat supply. The diversification and efficiency of heat co-generation and distribution need to be combined with enhanced end-use energy efficiency, notably effective building insulation and regulation. Only such an integrated approach can provide affordable heating services to customers in Croatia.

155. The 11 local distribution companies operate under municipal concessions or individuals service contracts.

In Croatia, the issues of the overuse of fuelwood and of electricity for space and water heating are much less acute than in other parts of the Western Balkan region. There is already extensive experience with heat pumps (both air and geothermal), which are gaining market share in both cooling and heating applications. As it brings domestic natural gas prices to cost-recovery levels, Croatia is likely to face further competition of heat pumps against conventional gas heating applications and DH systems. This is likely to emerge as an important policy challenge.

Renewable energy

Key issues

- ***Fragmentation of advice and equipment providers***
- ***High investment costs***
- ***Regulatory uncertainties***
- ***Low energy prices***

In 2005, renewable energies contributed just above 10% (0.9 Mtoe) to Croatia's TPES, with the largest shares coming from hydropower (6%) and fuelwood (4%). Non-hydropower (*e.g.* solar, wind and geothermal) provided only marginal input (180 GWh of electricity and 15 ktoe of heat). That said, Croatia's 16 hydropower plants accounted for 51% of total electricity generated, and played a particularly important role in peak supply. The four largest hydropower plants are located along the Adriatic coastline and represent 54% of total installed hydropower capacity (2 GW). Fuelwood covered about 20% of Croatia's household heat needs. Forests cover 44% of Croatia, providing annually 1.4 Mcm of fuelwood (350 ktoe of heat).

The remaining economic potential for large hydropower is relatively limited; a new unit at Lešće (42 MW or 90 GWh per year) is planned to be commissioned in 2010.[156] By contrast, the economic potential of small hydropower (SHP) is largely untapped and estimated at around 180 MW of capacity (almost 20% of installed SHP capacity).

Other renewable energy sources also show strong potential. Wind is of particular interest with an estimated potential of 400 MW,[157] mostly located on the islands and the coast. Two wind units of 6 MW and 11 MW have been installed since 2004 and several larger projects are under development. Croatia also has a geothermal potential estimated at 850 MW for heating and cooling of buildings, and for heating of greenhouses and spas. Installed geothermal capacity is already in the order of 115 MW but utilisation rates are low at 10 to 15%.

There is significant potential, estimated at 0.8 Mtoe, for agriculture and wood biomass resources, notably through the development of packaged fuels (*e.g.* wood pellets and

156. This project has been challenged by environmental NGOs. The site is on the IUCN protection list and included in the Bern Convention (on the Conservation of European Wildlife and Natural Habitats). The project's environmental impact assessment was prepared (1985) according to SFR Yugoslavia standards. It is available online at: www.coe.int/t/dg4/cultureheritage/Conventions/Bern/T-PVS/sc27_files28_en.pdf.

157. In 2007, HEP DSO estimated that a maximum of 360 MW of wind capacity could be connected to the grid.

briquettes from wood waste). This could be complemented by biogas from landfills and agriculture waste. A CHP biogas plant (2 MW) installed on one landfill site has captured some attention. Biofuel production recently began at two biodiesel units (one with an annual capacity of 20 kt).

In 2005, the total installed capacity of solar collectors was 6 MW, most of which supply hot water to households and tourist facilities. Its potential is estimated at 2.4 Mtoe (economic potential of 0.5 Mtoe). Croatia's first significant photovoltaic system (35 kWp) was installed by a factory in 2005.

Overall, the additional economic potential of renewable energy can be estimated at around 1.5 Mtoe (or 17% of current TPES), with an outlook to increase renewable energy's share in the energy mix to 12% by 2020. Additional use of renewable energy is estimated to reduce emissions by 3.1 Mt of CO_2 by 2020, with the reductions deriving from biomass (1 Mt), wind (0.7 Mt), geothermal (0.5 Mt), solar (0.45 Mt) and biodiesel (0.3 Mt).

Croatia's energy policy has a special focus on the role and potential of renewable energy, recognising its potential to diversify the energy mix, enhance environmental protection and facilitate integration into European energy markets. An objective of the *ESDS 2002* was to increase the annual output of non-large hydropower renewables to 1 140 GWh by 2010, boosting their share of total produced electricity to 5.8% – up from 180 GWh or 1.4% in 2005. Croatia also aims to comply with the EU Directive on biofuels, which calls for biofuels to cover 5.75% of automotive fuels by 2011. Since 1997, MELE has developed several NEPs focused on renewable energy, which are implemented by EIHP.

The legislative framework for production of electricity from renewable energy sources has been aligned with the EU *acquis communautaire*. The *Energy Law* and *Electricity Market Act*, along with specific regulation passed in 2007,[158] provide regulatory incentives for renewable energy sources and co-generation supplied by small units (below 10 MW capacity). The three main incentives include:

- Guaranteed incentive purchase tariffs ("feed-in tariffs") for the production of electricity from renewable energy sources[159] and co-generation.
- A minimum share (5.8%) of electricity produced from renewable energy sources and 2% high efficiency co-generation to be purchased by electricity distributors.
- The status of privileged producer for those plants generating electricity or heat from renewable energy or through co-generation, enabling access to the grid at a regulated tariff.

The EPEEF provides grants and "soft" loans for renewable energy investments. International donors have also supported projects to disseminate renewable energy. Two forthcoming international projects will focus on the development of renewable energy sources: the GEF Renewable Energy Project focuses on biomass, wind energy

158. The *Tariff system for the production of electricity from renewable energy sources and co-generation (OG 33/07)* and the *Regulation on fees for promoting electricity production from renewable energy sources and co-generation (OG 33/07)* provide price-based mechanisms for collecting funds and stimulating renewable-based electricity producers.

159. With a cap of 1 MW of total installed capacity for photovoltaic until 2010.

and small hydropower (budget: EUR 4 million); and the EU CARDS project on Renewable Energy Legislation and Energy Efficiency Labelling (RELEEL) targets the strategic, regulatory and institutional framework for renewable energy.

Discussion

The *ESDS 2002* recognises the value of renewable energy in Croatia, which is currently based on large hydropower and fuelwood. It sets ambitious objectives, aiming to increase the share of non-large hydropower renewable resources to 5.8% of electricity generated in 2010 (from a level of 0.2% in 2005) and to 12% of the energy mix by 2020 (from 4% in 2005). Croatia has implemented support programmes for renewable energy sources, in part to better identify both potential (*e.g.* wind atlas) and barriers. It is encouraging to note the adoption of an incentive-based regulatory framework that supports small units using renewable energy sources through minimum purchase volumes (5.8%) and guaranteed incentive purchase tariffs. The EPEEF also offers attractive financial conditions to investors.

Despite these policies, measures and pilot projects (*e.g.* in wind and biogas), Croatia has yet to attract significant private investments to this sector. This raises doubts as to the country's ability to meet its ambitious targets by 2010. The penetration of de-centralised renewable energy (*e.g.* solar water heaters, efficient wood stoves and boilers) in households has remained marginal despite their large estimated potential. This is can be attributed to several factors including the low domestic price of fossil fuels and electricity, a lack of awareness on the part of energy consumers, and administrative barriers (*e.g.* authorisations and grid connection). There is also a lack of project development expertise and of equipment suppliers offering guarantees on products and after sales services.

The Croatian government is considering additional measures to support renewable energy within the existing structured policy and regulatory framework. The first priority is EU harmonisation to establish a comprehensive and stable regulation, which will further improve investment conditions. Croatia may also focus on generalised feed-in tariffs for a set period of time, which has proven to be an effective tool for attracting wind investment in several Western European countries. Such a measure would require a sectoral target (*e.g.* 400 MW for wind), as well as regular and independent assessments of grid absorption capacities. It would also need to be supported through additional market tools such as green certificates and Kyoto Protocol flexibility mechanisms.

Croatia also needs to reinforce another policy component: the institutional organisation. As in the case of energy efficiency, Croatia's framework for renewable energy sources is relatively weak. Thus, a national agency backed by a network of local energy centres and experts is essential to support renewable energy for large-to-medium grid-connected projects, and for the tourist and household sectors (*e.g.* solar collectors and efficient wood stoves). Austria built up its use of biomass through a dense institutional network and project-based support schemes. This may provide a good model for Croatia.

A solid action plan for renewable energy – built on Croatia's extensive experience and integrated with energy efficiency – can sustainably increase the share of renewable energy in Croatia's energy mix, beyond the current objective of 12% by 2020. Also, the action plan will bring additional benefits of increased investment, boost renewable domestic production, enhance energy security and diversification, and lead to improved environmental performance.

OVERALL RECOMMENDATIONS

In addition to the recommendations and key findings included in the Overview and in the regional chapters, the government of Croatia may consider the following recommendations useful:

Institutions and overall strategy

- Continue to prioritise the energy policy development process, with particular focus on the new energy strategy; reinforce the independence and openness of the consultation and monitoring process.
- Complete the process of separating government functions (*e.g.* policy making, regulation enforcement and ownership of state companies) as the energy sector is liberalised by transferring the role of regulated energy price setting to the regulator; continue to unbundle electricity transmission from commercial generation and distribution activities.
- Adopt international corporate standards in energy companies.
- Continue to balance the policy objectives of energy security, economic development and environmental protection in line with EU policy and legislation; reinforce the implementation of action plans with clear timelines and responsibilities.
- Ensure effective co-ordination and synergies, possibly through intergovernmental bodies, between energy and other state policies (*e.g.* environment, housing, transport, social and regional development and R&D).
- Provide adequate staff and resources to ensure that ministries and agencies can fulfil their tasks.
- Continue to ensure the adequate dissemination of independent and high quality energy statistics and forecasts as key tools for policy decision making.

Market regulation and reforms

- Complete the transfer of regulatory enforcement powers (*e.g.* price and tariff setting, and facility authorisation) from the government to CERA; ensure CERA's independence.
- Complete reforms in end-use pricing to make prices cost-reflective (including all external costs); phase out cross-subsidies.
- Study the feasibility of introducing interruptible electricity and gas contracts for large customers to enhance flexibility.
- Enforce EU regulations and the Energy Community Treaty (particularly for third-party access, new entrants and customer choice) to enable market opening and trade.

- Ensure effective unbundling of state-owned monopoly activities as a means of enabling fair third-party access and competition (notably through separation of electricity transmission and distribution, and of gas storage).
- Privatise state energy companies, taking into account energy security and competition.

Energy security

- Continue to enhance diversification of energy sources and imports; develop domestic/regional gas storage projects; integrate energy efficiency and use of renewable energy sources as tools for energy security.
- Enforce the regulation on oil stocks; build the stock level as scheduled and in compliance with EU regulation; provide sufficient resources and support to the oil stockholding agency SAMOOP.
- Develop a robust energy security system and institutions in line with EU standards, in particular for emergency and crisis management.
- Reconsider the objective of phasing out electricity imports; seek instead to integrate imports as an element for security of supply and competition.

Energy efficiency

- Continue to prioritise energy efficiency policy and develop synergies with other sectoral policies (*e.g.* security and environment); better integrate energy efficiency in public policies, in particular transport and buildings.
- Adopt a robust action plan on energy efficiency to focus on policy implementation; establish ambitious quantitative and sectoral objectives, backed by a national energy agency and a network of local agencies.
- Develop a system to monitor implementation of NEPs and to assess their cost effectiveness (notably with energy efficiency indicators) to facilitate the adjustment of priorities and measures.
- Accelerate the harmonisation of regulation with the EU *acquis communautaire* and ensure effective implementation (notably of building codes and labelling of appliances, facilities and vehicles).
- Strengthen financing schemes, providing full autonomy and broad scope of interventions under cost-effective conditions.
- Adopt the most energy efficient standards for public buildings; use ESCO financing to refurbish buildings and purchase more energy efficient equipment, appliances and vehicles.

Energy and environment

- Ensure the implementation of the *National Environmental Action Plan*; adopt a robust and multi-sector *National Air Quality Protection and Improvement Plan* with quantitative targets and adequate monitoring.
- Ratify the MPME Protocol and other relevant regional and international agreements.

- Ensure that EU regulation is effectively enforced, in particular the EU Directive on large combustion plants, as well as limits on urban pollutant emissions.
- Ensure adequate funding of EPEEF through direct levies, including a carbon tax; monitor the cost effectiveness and impacts of funded projects.
- Adopt a strategy and action plan for climate change, including cost-effective measures to reduce CO_2 emissions; ensure adequate financial resources; prepare for effective participation in the EU Emission Trading Scheme and in projects using the Kyoto Protocol flexibility mechanisms.

Coal and oil

- Ensure that coal use complies with EU standards and that imports are diversified.
- Ensure that EU fuel standards become effective prior to refinery upgrades; ensure that the oil sector complies with EU requirements for safety and the environment.
- Continue to transfer regulatory power to CERA; phase out price control of fuels once competition conditions are met; finalise the privatisation of INA.

Natural gas

- Continue to implement a natural gas policy, balancing the objectives of security of supply, economic performance and competition.
- Progressively open the natural gas market, notably through regulated third-party access to facilities.
- Monitor the market structure and prevent abuses by dominant suppliers.
- Ensure that new infrastructure investments contribute to regional gas development; ensure investment costs are covered by the tariffs.
- Optimise the use of natural gas, notably through co-generation and cost-effective development of its use in road transport.

Electricity

- Pursue the modernisation of electricity infrastructure to enhance its reliability, efficiency and diversification; ensure operational cross-border capacities.
- Ensure that access tariffs to the grid and electricity prices cover all costs, including investment, external costs and decommissioning of facilities (notably the Krško NPP).
- Enforce legislation in line with EU regulations and the Energy Community Treaty, enabling fair and open third-party access, cross-border trade and effective customer choice under the new market system.
- Reconsider the objective to abolish electricity imports as such a policy direction would reduce energy security.
- Consider the transformation of HEP TSO into an independent TSO under state ownership.
- Consider innovative ways to attract new players in generation, notably by divesting existing assets, and attracting new IPPs and traders.

Heat

- Ensure the economic and technological performance of district heating, based on least-cost supply.
- Empower CERA to assume the government's role on price setting; ensure price setting is based on incentives for energy efficiency investments.
- Favour demand-side management programmes in customer facilities, focused on building rehabilitation.
- Consider market incentives and project studies for CHP (using natural gas or biomass) in line with the EU Directive on co-generation.
- Consider policy initiatives to facilitate further market penetration of efficient heat pumps.

Renewable energy

- Adopt an action plan for renewable energy, with sufficient resources and supported by solid national and local implementing agencies.
- Consider temporary tax incentives for renewable energy investments, projects and studies.
- Enforce the renewable purchase obligation for electricity and heat distributors; extend the feed-in tariff application to medium-to-large projects.
- Prioritise market tools such as green certificates and Kyoto Protocol flexibility mechanisms.

Map 8..................FYR Macedonia's energy infrastructure

The boundaries and names shown and the designations used on maps included in this publication do not imply official endorsement or acceptance by the IEA.

VII. FORMER YUGOSLAV REPUBLIC OF MACEDONIA[160]

FYR MACEDONIA'S ENERGY HIGHLIGHTS

Table 23 ....Energy snapshot of FYR Macedonia, 2005

	FYR Macedonia	Western Balkan Region	OECD Europe
Total primary energy supply (Mtoe)	2.7	38.7	1 875.0
Total final energy consumption (Mtoe)	1.7	25.4	1 340.0
Energy consumption (toe) per capita	1.35	1.62	3.50
Electricity consumption (kWh) per capita	3 415	2 970	6 145
Energy intensity of GDP*	0.21	0.25	0.15
Carbon intensity (kg CO2/GDP*)	0.64	0.69	0.33
Net imports as % of TPES (Dependence)	45%	**	44%

* In terms of purchasing power parity; in toe per thousand USD (in year 2000 US dollars).
** Not calculated to avoid double counting due to intra-regional trade.
Sources: IEA statistics (with additional data from administrations in Montenegro and Kosovo used for calculation of averages for the Western Balkan region).

The Former Yugoslav Republic of (FYR) Macedonia prepared a comprehensive energy strategy in 2000, which is now under revision. FYR Macedonia's *Energy Law of 1997*, enforced by an independent regulator, has provided a basis for the re-structuring of the country's energy sector and the opening of energy markets. This was further enhanced by the more recently adopted *Energy Law of 2006*.

FYR Macedonia inherited its energy system from the Socialist Federal Republic (SFR) of Yugoslavia, much of which was developed during the 1980s. This concentration in age and type of technology is creating serious policy challenges in FYR Macedonia: there is an urgent need for major replacement and/or overhaul, and meanwhile the risks of technical failures increase.

FYR Macedonia's overall energy import dependence is 45%; however the country is 100% dependent on imports for crude oil and natural gas. Its entire natural gas supply is provided by Russia. There are no gas storage facilities in the country or in nearby countries.

The country has made major efforts to attract foreign investments in the energy sector. At present, private investors (both domestic and foreign) are majority owners of major infrastructure including the only oil refinery, the electricity distribution system, the oil product distribution system and the natural gas infrastructure.

160. Admitted to membership of the United Nations under General Assembly Resolution 47/225 as the Former Yugoslav Republic of Macedonia. It is referred to as FYR Macedonia in this Survey.

Regional energy integration is a priority, and is considered a critical tool to ensure energy security in the future. As such, FYR Macedonia is channelling a large share of its scarce human and institutional capacity to this effort. Financial resources are also being focused on the development of oil, gas and electricity interconnections with the country's neighbours and the strengthening of the transmission grid.

FYR MACEDONIA'S ENERGY CHALLENGES

FYR Macedonia's electricity consumption is characterised by excessive demand peaks in winter, which are largely due to the use of electric heating to supplement fuelwood heating in the residential sector during very cold periods. Another critical problem facing FYR Macedonia's energy sector is the depletion of lignite reserves in the proximity of Bitola, a key thermal power plant (TPP). Recent developments reflect a decision to ensure ongoing lignite-based electricity generation despite the outlook for higher input costs. The government needs to undertake a least-cost investment plan to fully assess all options.

Emerging energy security policy in FYR Macedonia is based on regional market integration and implemented through regional agreements and international best practices, market reforms and regulation. With the depletion of domestic energy resources and only minor improvements in energy efficiency, this could lead to higher levels of import dependence.

The *Energy Efficiency Strategy* of FYR Macedonia contains detailed implementation plans and technical programmes, including establishing an Energy Agency. The investment climate in FYR Macedonia is among the best in the region with a well-established legal framework. However, real investment actions, notably by energy service companies (ESCOs), to tap the country's huge energy efficiency potential have yet to be seen.

Inefficient use of fuelwood is a key factor driving energy poverty and deforestation across FYR Macedonia. Fuelwood is a key source of heat for the majority of the population, but not properly included in the country's energy policy and not fully reflected in statistics.

FYR Macedonia's economy is carbon intensive, mainly due to the use of domestic lignite in the electricity mix. Having ratified the Kyoto Protocol in 2004, FYR Macedonia is eligible to use its flexibility mechanisms to further enhance investments in clean energy and energy efficiency improvements. There is an opportunity for better integration between energy efficiency policy and other environmental protection mechanisms.

INTRODUCTION

The Former Yugoslav Republic of Macedonia (FYR Macedonia) emerged from the dissolution of the former Socialist Federal Republic (SFR) of Yugoslavia in 1991. It is a mountainous, landlocked country that follows the Vardar River in the southern part of the Balkan Peninsula and has an area of 25 713 km^2. The total population is 2.1 million according to the latest census (2002); almost one-third live in the capital city of Skopje.

In 2005, gross domestic product (GDP) in FYR Macedonia grew by 3.6% – almost recovering to the 1990 level. In recent years, industrial production has grown by more than 5% per year, largely as a result of considerable improvements in the investment climate (since 2002) and increased political stability throughout the region. GDP per capita in 2005 was estimated at EUR 1 455. The country has a net inflow of foreign direct investment (FDI) with its energy sector being a main recipient. Cyprus, Greece, Hungary and the Netherlands are the largest foreign investors, together accounting for more than 70% of total FDI. In 2004, FYR Macedonia's external debt was more than 35% of GDP.

FYR Macedonia maintains conservative monetary and fiscal policies that provide little room for credit expansion, which is common to other countries in the region. The current account deficit is stable at around 2% of GDP. However, imports have grown faster than exports, leading to a foreign trade deficit of about 10% of GDP.

FYR Macedonia's main exports are clothing and textiles (30%), iron and steel (15%), non-ferrous metals such as zinc and lead (5%), and footwear and leather products (4%). Oil products comprise only about 4% of total exports. Crude oil and oil products are the country's largest single import item, accounting for about 12% of imports. Various types of machinery, equipment, tools and automotive parts make up about 10% of imports.

High unemployment – at 37% – remains a critical problem in the country (Vienna Institute for International Economic Studies, 2006); limited development opportunities contribute to the relatively high incidence and persistence of poverty. These factors, in turn, limit policy choices in the energy sector.

ENERGY DEMAND AND SUPPLY

Sources and methodology

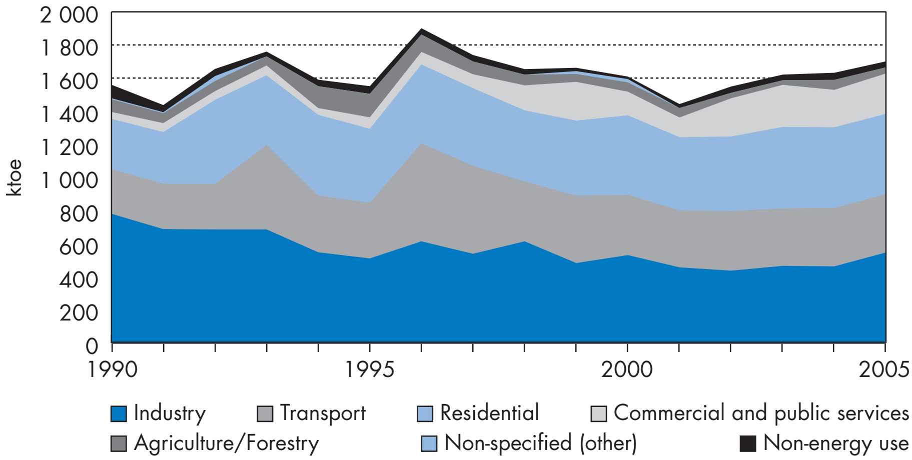
FYR Macedonia reformed its statistical system in 1999/2000, with the support of Eurostat. Part of the process involved harmonising energy statistics with international standards and methodologies developed by Eurostat/IEA/UNECE. The country complies fully with the Annual Energy Questionnaires of these institutions. Data on energy consumption by sub-sector is grouped according to Eurostat's energy balance.

FYR Macedonia produces annual energy statistics and balances on a regular basis and supports energy policy making. The State Statistics Office intends to respond fully to EU requests for information regarding the country's energy sub-sectors. This Survey is based on these statistics and the annual statistics submissions to the IEA.

Demand

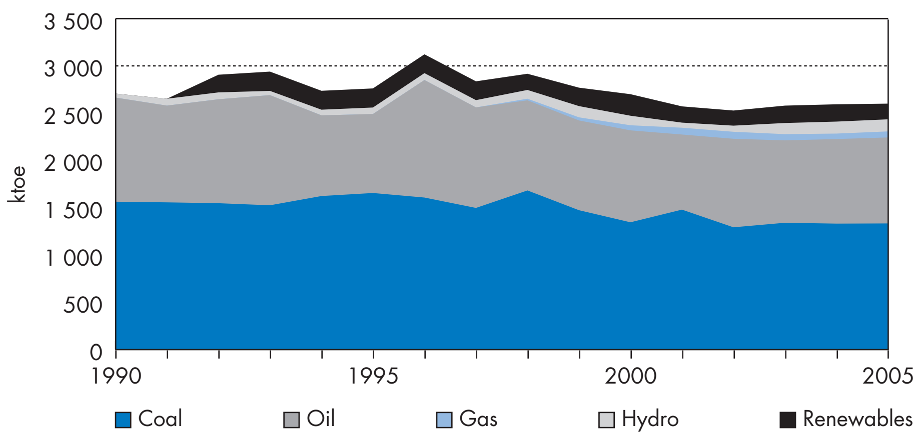
In 2005, FYR Macedonia's total final energy consumption (TFC) was 1.7 Mtoe, with the major sources being oil (0.7 Mtoe), electricity (0.5 Mtoe) and fuelwood (0.2 Mtoe). Heat and coal each accounted for about 0.1 Mtoe. Industry accounts for the largest share (32%) of TFC, followed by residential (28%), transport (21%), services (14%) and agriculture (2%). Residential is the largest electricity consuming sector (48%) followed by industry (34%), services (17%) and agriculture (1%).

Figure 17 ....FYR Macedonia's total final consumption by sector, 1990-2005



Source: IEA statistics.

Figure 18 ....FYR Macedonia's total primary energy supply by fuel, 1990-2005



Note: TPES excludes electricity trade.
Source: IEA statistics.

Supply

In 2005, FYR Macedonia's total primary energy supply (TPES) was 2.7 Mtoe, with coal having a share of 49% (1.33 Mtoe) and oil having a share of 33% (1 Mtoe). The remaining 18% (0.4 Mtoe) derived from both domestic and imported sources including: net imports of electricity (5%), fuelwood (6%), hydropower (4.5%), natural gas imports (2%) and geothermal energy (less than 0.5%).

Energy intensity

FYR Macedonia's energy balance reflects a relatively low rate of efficiency in energy transformation. The bulk of electricity is generated from lignite in ageing and inefficient plants. As a consequence, energy intensity in 2005 was 0.71 toe per thousand USD of GDP (in year 2000 USD), more than three times the average for OECD Europe. Measured using purchasing power parity (PPP), FYR Macedonia's TPES/GDP falls to 0.21 toe per thousand USD (PPP year 2000), around 40% higher than the average for OECD Europe.

ENERGY POLICY AND INSTITUTIONS

Institutions and overall strategy

Institutions

Several bodies within the ***Ministry of Economy*** play vital roles in energy policy in FYR Macedonia (Figure 19). The most important is the Sector for Energy and Mineral Raw Materials (SEMRM), which has a Unit for the Electric Power System and Investments, and a Unit for Fossil Fuels and Energy Efficiency. Two other relevant bodies within the Ministry of Economy are the State Inspectorate for Technical Inspection and the State Market Inspectorate. According to the Law on the Organisation and Performance of State Administrative Bodies, the SEMRM monitors governance of the energy sector and is responsible for nine key functions:

- Preparation of laws, secondary legislation and related regulations; monitoring the enforcement of legislation and regulation.
- Preparation and adoption of the energy strategy.
- Authorisation of new energy facilities and other investment activities.
- Reform of the public (state) energy sector.
- Participation in, and co-ordination of, international projects.
- Preparation of energy balances.
- Monitoring energy prices and operating conditions of public utilities.
- Co-operation with state administration bodies, other organisations and institutions.
- Implementation of the EU Stabilisation and Association Agreement, as well as other bilateral and multilateral areas of co-operation.

The ***Ministry of Finance*** is a majority shareholder of public energy companies. It oversees company management and performance.

The ***Energy Regulatory Commission (ERC)*** was established in June 2003 as stipulated in the Energy Law of 1997,[161] and reinforced by the Energy Law of 2006. The ERC is independent in its operations and decision making; however, Parliament appoints (and relieves of duty) its five members, based on a government proposal. The ERC is self-financed, primarily through levies on the gross income of energy operators and license charges. According to the Energy Law of 2006, the ERC has the following responsibilities:

- Ensure reliable, continued and high quality supply of energy.
- Promote competition in the energy market.
- Set the conditions of supply for individual types of energy.
- Establish pricing methodologies and tariff systems for individual types of energy.
- Issue, modify and withdraws licences; monitor licence execution, including approval of the investment plans of transmission system operators (TSOs).
- Prescribe rules for connection to energy networks.
- Promote protection of the rights of energy consumers.
- Initiate the adoption and enforcement of energy laws and related regulations.
- Participate in the resolution of disputes.

The ***Commission for the Protection of Competition (CPC)*** is a new body, established in early 2005 through a re-structuring of the Monopoly Department of the Ministry of Economy. The CPC is an independent body, with commissioners appointed by Parliament. It is responsible for the following activities:

- Facilitate development of a competitive, safe and efficient energy market.[162]
- Monitor cross-subsidies.
- Track the allocation of interconnection and system load management practices.
- Ensure non-discriminatory, third-party access to the energy system, including transparency of tariff methodologies and access rules.
- Ensure non-discriminatory electricity balancing and dispatch.
- Co-ordinate separate accounting systems for each energy sector activity.
- Enable energy consumers and systems to change suppliers.

Various professional organisations in the energy sector date back to the period of the SFR Yugoslavia. Within the ***Chamber of Commerce of FYR Macedonia***, an Energy Board organises public debates on legal and development issues related to energy.

Energy policy and strategy

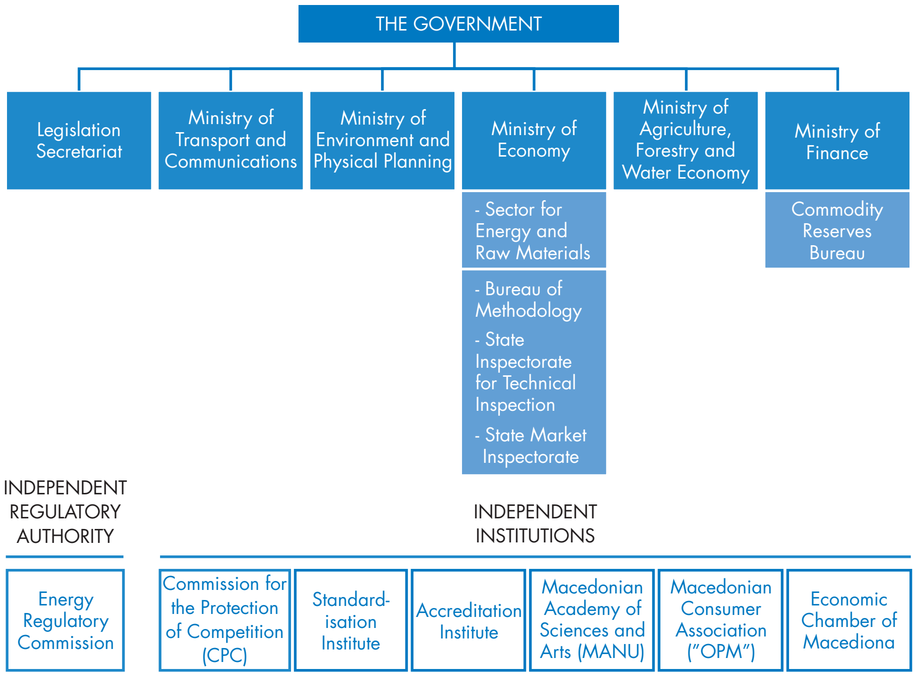
Key issues

- ***Energy policy coherence***
- ***Privatisation***
- ***Relations with foreign investors***
- ***Transparency***
- ***Institutional capacity***

161. The *Energy Law* was adopted in 1997 and amended in 1999, 2000, 2002, 2003 and 2005. An entirely new law was adopted in 2006. Amendments from 2002 (*Official Gazette 94/2002*) prescribed the establishment of the Energy Regulatory Commission (ERC).

162. The ERC and the CPC co-operate and exchange information on a regular basis.

Figure 19 ....Institutional organisation for energy in FYR Macedonia



The *1997 National Economic Development Strategy* outlines the overall direction of development opportunities in FYR Macedonia's energy sector over the near term. It is complemented by a number of other relevant studies, analyses and development plans that focus on the electricity sector.

In 2000, with the support of USAID, FYR Macedonia prepared a comprehensive *Strategy on Development of the Energy Sector*, which was accepted as a potential plan. The 2000 strategy described the existing electricity infrastructure, potential sites for new plants, and the potential of fuels and hydropower. It also included estimates of growth rates for electricity consumption and various development scenarios. However, as of early 2008, FYR Macedonia had not yet finalised its new energy policy: the *Energy Sector Development Strategy*.

In 2004, the World Bank prepared an energy policy paper for FYR Macedonia that forecasted electricity needs and proposed ways to meet projected demand growth to 2009. The paper analysed the investment needs and energy efficiency potential of the electricity sector. It also examined the potential for use of renewable energy sources and the development of the electricity market. The final report included a plan for the re-structuring of the electricity gas, oil and district heating (DH) sectors.

Discussion

FYR Macedonia's policy of maximising the utilisation of available energy assets served the country well during the years of regional conflict, insecurity and political turmoil. However, it came at a high cost. In particular, publicly owned energy companies became overburdened with financial difficulties. More recently, the government tried to solve the problem by privatising public assets rather than developing a more coherent energy policy.

Market reforms and privatisation are among the most important policy tools to enhance FDI and regional integration in FYR Macedonia. Privatisation policy is co-ordinated with the formulation of energy policy to adopt incentives to facilitate FDI. Some of the country's energy companies have been partially privatised to domestic investors. The government has also made major efforts to attract foreign investments in its energy and industrial sectors. At present, private investors (both domestic and foreign) own FYR Macedonia's only oil refinery as well as its electricity distribution system, its oil product distribution system and its natural gas infrastructure.

In most cases, privatisation and investment arrangements have involved a complex mix of commercial interests of investors and public policy goals (*e.g.* privatisation of the OKTA refinery[163]). Although appearing well documented and transparent, not all aspects of dealings with foreign investors are available in the public domain. This has led to complex situations – and even some long-standing disputes – between private energy companies and regulators, and has slowed further investments into infrastructure and energy assets.

Given the need for regional integration, it is increasingly important that domestic energy policy in FYR Macedonia aims to meet international requirements while considering the capabilities of domestic investors. As the process advances and contractual arrangements become more complex, public institutions often lack the human resources capacity needed to realise ambitious goals for energy security, energy efficiency and renewable energy. The situation is exacerbated by the recruitment of skilled labour from public institutions to higher paying jobs in private industry.

FYR Macedonia's government is striving to adopt and apply international standards in terms of energy policy development and transparency, as well as in establishing a sound regulatory environment. However, lack of institutional capacity and available personnel in the SEMRM leads to delays in the development of important policies. Despite these challenges, SEMRM officials have demonstrated openness and interest in public participation in policy making, as well as a strong commitment to co-operating with professional associations and NGOs. Enhanced institutional capacity is needed to broaden the public involvement in the policy-making process, including greater transparency and better information dissemination in compliance with the Aarhus Convention.[164]

163. The development of the oil pipeline from Thessaloniki to Skopje was part of the government agreement with Hellenic Petroleum (the investor in the OKTA refinery). The agreement includes arrangements on transport price (which changes over time according to an agreed schedule) along the pipeline. The ERC now uses this pricing agreement to determine the price of oil products for the domestic market.

164. FYR Macedonia signed and ratified (in 1999) the Aarhus Convention, which is an UNECE Convention on *Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters*- www.unece.org/env/. The application of the Convention's main principles is reinforced by the Energy Community Treaty.

Market reforms and regulation

Key issues

- ***Market opening***
- ***Competition***
- ***Affordability***
- ***Low electricity prices***

The *Energy Law of 1997,* and subsequent annual amendments to 2005, provided a basis for re-structuring the energy sector and opening energy markets, which was further enhanced by the new *Energy Law of 2006*. An independent energy regulator, the Energy Regulatory Commission (ERC)[165] began operating in 2003 alongside the independent Commission for the Protection of Competition (CPC).

Privatisation of the oil sector was completed in 1998/99 and competitive markets now exist. In July 1999, ELPET Balkaniki SA (a 67% subsidiary of Hellenic Petroleum SA) acquired 54.5% of the state-owned refinery JSC OKTA AD (in Skopje) for EUR 25 million. As of 2007, ELPET holds 81.5% of the refinery; the remainder is held by the Privatisation Agency (8.3%), the employees (6.1%), the employees' funds (1.4%) and the pension fund (2.5%).

The gas sector was re-structured in 2002/03 and its privatisation is envisaged. FYR Macedonia's new regulatory framework has also facilitated reform of the electricity sector (initiated in 2004), particularly by separating the activities and assets (power generation and distribution) of the state-owned Electric Power Company of Macedonia (JSC-EPCM) from the management of transmission and grid assets. EPCM was re-structured in 2005/06 into a generation company (JSC-ELEM) and a distribution company (ESM). ESM was subsequently privatised and is now jointly owned by EVN of Austria (90%) and the Macedonian transmission system operator (MEPSO).

FYR Macedonia is currently drafting a new model for the electricity market, which will serve as the basis for the *Law on the Electricity Market* and for meeting the requirements of the Energy Community Treaty. This law will clarify relations within the electricity sector (which are currently set out by the *Energy Law of 2006*). For example, the new law will define the methods of participation and the functions of various participants, while also outlining provisions and criteria for fulfilling these various functions. For example, the new law will set out the role and mandate of the ERC. New legislation will also cover issues related to operational safety and tariff conditions (*e.g.* the scope of their application).

The *Law on the Electricity Market* will also set out matters concerning specific aspects of the electricity sector, such as:

- Liberalisation of the market.
- The role and protection of competition.
- International electricity trade.

165. See section on Institutions (above) for more details.

- Criteria for investment eligibility.
- Relations and obligations in regulated areas of the market.
- Principles of sustainable development.

According to the 2005 Amendments to the *Energy Law of 1997*, the electricity generator and wholesale supplier are to conclude purchasing agreements for regulated (non-eligible) customers at regulated prices approved and published by the ERC. Eligible customers (*i.e.* those free to choose their supplier) may conclude electricity supply contracts at unregulated prices with electricity generators and traders, but are obliged to register such contracts with the electricity market operator. Since 2005, the ERC has determined the prices of generation, use of the transmission network and distribution of electricity. In 2007, these prices (per kWh) were as follows: generation – EUR 0.02; use of transmission network – EUR 0.015; and distribution EUR 0.014.

Oil product prices are capped according to a methodology agreed to between the government and the strategic investor (Hellenic Petroleum) involved in the OKTA refinery and the oil pipeline from Thessaloniki to Skopje. Gas prices are determined according to methodologies set by the ERC.

FYR Macedonia has improved the legal framework for FDI, with the support of international donors and organisations. However, there is still a lack of domestic capacity to manage complex arrangements with private investors. Although major energy facilities have already been privatised, to date FYR Macedonia's energy policies have failed to attract increased investment into its facilities. Future privatisation efforts are likely to focus on lignite extraction operations and associated power plants. This will entail complex corporate governance issues both during the privatisation process and after, at which point the government will regulate privately owned and operated extraction companies. These complex negotiations and final roles will demand greater institutional capacity than is currently available.

Discussion

FYR Macedonia has made major efforts to improve market openness in terms of both infrastructure and legal framework. Key independent institutions have been established to enforce and monitor this new framework. For example, the ERC co-ordinates with the CPC in an effective way, although both are limited by the privatisation arrangements made with strategic investors, as well as by physical limitations (import capacities, availability of independent electricity generators, etc.).

A weakness still evident in FYR Macedonia's energy market reforms is that the ERC continues to set prices based on affordability of energy prices. This inevitably draws the ERC into negotiations with energy providers because electricity prices for regulated customers do not fully cover all generation costs – particularly in that current price calculations do not account for environmental costs. Higher input prices[166] will put upward pressure on electricity prices, causing them to become more cost-reflective. This will stimulate more efficient solutions for security of supply and for energy use.

166. The Bitola TPP will soon be supplied with lignite from a more distant mine (Brod-Gneotino). In addition, more electricity will be generated from imported fuels, thereby increasing input prices.

FYR Macedonia has made some progress in terms of liberalising electricity prices for eligible customers. However, the fact that ESM, the country's electricity distribution company, is also the main retailer of electricity creates a situation in which this company has a great deal of influence over prices and the market. Similarly, in the gas sector, gas prices are set in accordance with import prices based on contracts with one exclusive supplier – the Russian state-monopoly gas exporter, Gazprom. Prices for oil products are set by the market but capped according to a methodology agreed to between the government and investors in the OKTA refinery. There is still much progress to be made before FYR Macedonia's energy prices are truly liberalised and determined by supply and demand.

Energy security

Key issues

- ***Regional integration***
- ***Energy efficiency as tool for security of supply***
- ***Import dependence***

FYR Macedonia's overall energy import dependence is 45%; however, the country is 100% dependent on imports for crude oil and natural gas. Its entire natural gas supply is provided by Russia via Bulgaria, Moldova, Romania and Ukraine. There are no gas storage facilities in FYR Macedonia or in nearby Western Balkan countries.

Regional energy integration is a critical tool to ensure energy security and is considered a priority for FYR Macedonia. As such, FYR Macedonia is channelling a large share of its scarce human, institutional capacity and financial resources to develop oil, gas and electricity interconnections with its neighbours, and to strengthen the transmission grid. There is a long way to go in implementing this policy, but three important steps have been taken toward establishing the basic structure:

- Construction of high-voltage interconnection lines to Bulgaria, Greece and Serbia.
- Construction (in 2001) of an oil pipeline from Skopje to the port of Thessaloniki (Greece).
- Construction (in 1996) of a natural gas pipeline from Bulgaria.

To date, FYR Macedonia has been able to generate almost all the electricity needed to be self-sufficient.[167] It meets domestic electricity consumption by achieving very high utilisation rates on a relatively small amount of installed thermal capacity. Given the available capacity, remaining self-sufficient will require adjustments on the demand side, considering the relatively high per capita electricity consumption (3 416 kWh in 2005 compared to the OECD Europe at 6 145 kWh). The electricity network lacks flexibility and security; the situation is particularly acute in distribution to some parts of the country.

167. Electricity imports in 2004 were about 20% of total consumption. This reflects more competitive import prices compared to domestic generators, which depend on heavy fuel oil at prices pre-determined by the only domestic refinery.

To maintain its self-sufficiency in electricity, FYR Macedonia would need to increase considerably imports of natural gas and, potentially, of hard coal. A new policy to balance import dependence across various imported fuels is emerging, in part through recent privatisation arrangements. FYR Macedonia is also trying to attract additional electricity transit flows by engaging in various regional initiatives. The country is an important corridor for electricity transit between Greece and the rest of the Western Balkans. Import capacity (more than 800 MW) is almost equal to FYR Macedonia's average demand; however, it cannot cover peak demand (1.4 GW in December 2004).

There is no entity in FYR Macedonia with dedicated authority and an exclusive mandate to oversee strategic oil stocks; rather, oil products fall under material reserves and are managed by the Commodity Reserves Bureau. The *Law on Commodity Reserves* stipulates the mandatory stocking of oil products, placing responsibility on producers and traders to maintain and renew appropriate stock levels. As of early 2007, reserves of oil products covered 43 days of consumption, based on average daily consumption in the previous calendar year. This conforms to EU methodology. The *Energy Law of 2006* considers all types of motor fuels, aircraft fuels, LPG and fuel oil as commodity reserves, and requires mandatory stockholding according to consumption during the previous year.[168] These ambitious stockholding targets could raise financial problems in the future, particularly if the general budget does not provide funds to support the increase in oil product reserves.

Discussion

A key goal of FYR Macedonia's energy policy is to ensure energy security at the lowest possible investment cost. Policy makers are focused on how to make the best use of the country's limited capabilities to cover its energy needs, in the face of limited domestic energy resources (both in volume and quality) and the lack of reliable energy infrastructure.

Recent pledges by FYR Macedonia policy makers to support a number of regional projects demonstrate their understanding of the need to enhance security of supply, and to further develop and strengthen infrastructures for oil, gas and electricity, as well as oil stocks and the emergency system. Policy makers also understand the inter-relations between security of supply and energy efficiency, and consider energy efficiency as an important tool for energy security.

Emerging energy security policy has a strong focus on integrating the regional energy market through the Energy Community Treaty, and on pursuing international best practices, market reforms and regulation. FYR Macedonia is taking steps to develop the necessary physical infrastructure to support integration and security of supply. In recent years, FYR Macedonia has established interconnections with Bulgaria and Serbia (400 kV line) and strengthened its connection to Greece with additional high-voltage lines. Various gas connections are also envisaged.

168. Total reserves of a given oil derivative in the current year cannot be lower than its average consumption for a period of 90 days (or at least 25% of total consumption) in the previous year.

If energy efficiency improvements are minor in scale, promoting regional integration could contribute to the depletion of domestic energy resources and lead to increased import dependence. This is especially true for natural gas: it is fully imported and its share in overall energy supply is expected to increase rapidly.[169] FYR Macedonia's import dependence (which could include imports of steam coal for electricity generation) is projected to increase from 45% to about 50%.[170] Strong institutional capacity and robust regional frameworks will be required to address this.

FYR Macedonia needs to pursue a strategy of strong economic development and employment. This will likely increase electricity demand. Thus, there is a need for more flexible electricity production capability, as well as for viable alternatives to limit the inefficient use of electricity in residential space and water heating. Such efforts would serve to decouple electricity consumption from the population's basic energy needs, thereby enhancing the prospects of instigating more commercial electricity pricing.

Energy efficiency

Key issues

- ***Enforcement of energy efficiency strategy***
- ***Taxation***
- ***EU acquis communautaire***

FYR Macedonia's high level of energy intensity can be attributed to three factors: the energy-intensive nature of its industrial sector, which represents a large share of GDP; the inefficient technology used by industry; and poor insulation in residential and commercial sectors.

In 1999, the government adopted a *Programme on Efficient Energy Use to 2020*, the development of which was stipulated in the *Energy Law of 1997*. In 2004, national experts prepared the *Energy Efficiency Strategy to 2020* (with financial support and co-operation of USAID), which the government adopted in October 2004. The *Strategy* includes an implementation plan and timeline, outlining activities to be undertaken by 2020, and has four main goals:

- Define potential energy savings by category of consumer, type of energy and use.
- Create financial and legal conditions for increased investment in energy efficiency.
- Enhance services for energy efficiency (*e.g.* energy audits).
- Enhance the focus on environmental aspects of energy use.

169. Current annual natural gas consumption is about 100 Mcm. Planned investments in gas-fired electricity generation in Skopje (up to 200 MW) and Negotino TPP (up to 350 MW) could increase consumption by as much as to 500 Mcm per year.

170. This increase will depend on three factors: utilisation rates of the Bitola TPP; the development and utilisation rates of new coal-fired facilities; and the functional integration of FYR Macedonia into the regional electricity market.

A special chapter in the *Energy Law of 2006* focuses on energy efficiency.[171] Several important instruments for energy efficiency are also found in secondary legislation. Plans for implementing EU Directives are covered in two rule books: the *Rule book for energy efficiency of new buildings and reconstruction of existing ones;* and the *Rule book for energy efficient labelling of household appliances. Technical specifications and standards for efficient exploitation of fossil fuels* sets the criteria for energy efficiency in motor vehicles, thermal power plants, DH plants and other energy-intensive industrial sectors. The government also uses energy efficiency targets[172] set out in the *Energy Strategy* and energy efficiency financing.[173]

FYR Macedonia is currently developing an institutional framework for energy efficiency (Energy Charter Secretariat, 2006 and 2007). The SEMRM is responsible for the design and formulation of energy efficiency policy, working in collaboration with three other ministries: the Ministry of the Environment and Physical Planning; the Ministry of Agriculture, Forestry and Water Economy; and the Ministry of Transport and Communications. FYR Macedonia is also in the process of establishing an Energy Agency, which will have the following responsibilities:

- Co-operate with the SEMRM to implement the *Energy Efficiency Strategy*.
- Develop initiatives for energy efficiency.
- Propose and co-ordinate studies and projects for energy efficiency and renewable energy sources.
- Issue guarantees of origin for electricity produced from renewable energy sources.
- Propose and incorporate measures for environmental protection in energy projects.

In the context of an ongoing World Bank/Global Environmental Fund (GEF) project (approved in 2006), FYR Macedonia received a grant of EUR 4 million to establish a separate Sustainable Energy Unit within the future Energy Agency. Three other FYR Macedonia institutions are involved in energy efficiency issues:

- The research centre ICEIM-MANU (Macedonian Academy of Sciences and Arts) has already undertaken a number of projects, the majority of which were funded by multilateral and bilateral donors.
- The Macedonian Centre for Energy Efficiency (MACEE) focuses on implementing measures and building capacity at the state and local level. It also promotes energy efficiency and provides expert counselling.
- The ESCO set up by MEPSO, the national electricity TSO.

In 2005, the European Bank for Reconstruction and Development (EBRD) provided a loan of EUR 25 million to the Skopje Mittal Steel factory for energy efficiency

171. The *Energy Law of 2006* contains provisions for developing the national strategy for improvement in energy efficiency for a period of ten years, as well as a five-year programme for the implementation of the *Strategy*. It also obliges municipalities (including the city of Skopje) to adopt and implement local five-year energy efficiency programmes and action plans.

172. Targets are set for residential, commercial, institutional and industrial electricity consumption and for street lighting. The high scenario is 3.6% of final consumption.

173. The World Bank/GEF grant of EUR 4.5 million is used to fund three initiatives: market transformation activities; development of a utility-based ESCO, with MEPSO to implement third-party financing of energy efficiency projects; and investment in energy efficiency and renewable energy through a Sustainable Energy Financing Facility.

improvements. In 2007, the EBRD and the International Finance Corporation (IFC) jointly provided a loan of EUR 100 million to the ESM, which will be used to finance the Distribution Grid Efficiency Investment Project. Foreign investors and development agencies are launching a variety of projects: to install solar water heaters (Austrian Development Agency); to replace and add condenser batteries in the electricity distribution system; to install digital metering; and to conduct a household survey (Switzerland's Economic Co-operation Office or SECO).

Discussion

A well-developed regulatory and institutional framework for energy efficiency is taking shape in FYR Macedonia, largely due to the adoption of the *Energy Efficiency Strategy to 2016* and with the assistance of international/bilateral organisations and donors. However, the implementation process has been slow. The *Energy Efficiency Strategy* contains detailed implementation plans and technical programmes. However, it estimates potential cost-effective reductions in the country's current energy use at only 6%. This is far below actual needs. The future energy efficiency strategy, in accordance with the *Energy Law of 2006,* is expected to provide implementation plans for much more ambitious undertakings in relation to energy efficiency.

To date, the government has focused enhancing energy efficiency through measures and tools that support physical improvements within the energy production and end-use sectors. It has not yet considered other powerful instruments such as energy pricing, regulations (*e.g.* including labelling and enforcement of technical standards) and taxation (*e.g.* custom duties on inefficient products). Nor has the government considered the successful separation of electricity network services from supply within the framework of energy efficiency policy, despite the efficiency incentives such a separation can bring to network operators and the ways in which it supports energy efficiency of end-use consumers.

The proposed Energy Agency is expected to have primary responsibility for energy efficiency in FYR Macedonia. As per the *Energy Law of 2006*, this Agency will co-ordinate energy efficiency policy between various ministries. Relations still need to be clarified between the Energy Agency and the ERC (particularly regarding energy prices). The Agency would need adequate funding to be effective.

FYR Macedonia has introduced domestic regulations (via secondary legislation) in relation to important EU Directives on energy-efficient appliances and efficiency of buildings. However, it has not yet considered the EU Directive on co-generation (CHP), reflecting a lack of support for development of CHP even though some commercial players are considering CHP investments in Skopje.

Industrial activity and international competitiveness can be important drivers for energy efficiency. Both remain relatively low in FYR Macedonia, which undermines commercial motivation for energy efficiency improvements. In the residential sector, low incomes often cause individuals to extend the use of home appliances beyond the rated technical life. This slows the turnover or upgrade of housing stock, and limits the impact of improvements in energy efficiency.

FYR Macedonia's investment climate for energy efficiency is among the best in the region. Studies have shown that energy efficiency investments can be highly effective in tapping the country's huge potential for energy savings. However, ESCOs or other investors are currently showing little interest in this market. To date, the domestic financial sector has not engaged in providing credits and investments to support energy efficiency improvements.[174] The Ministry of Finance is only marginally involved in promoting energy efficiency, primarily through tax adjustments or the provision of direct financial incentives from the budget.

Given the widespread incidence of poverty and energy poverty in FYR Macedonia, one would expect the poverty reduction strategy to include a major focus on improving energy efficiency of low-income households and public buildings. Unfortunately, there has been little co-ordination between bodies responsible for these areas.

Energy and environment

Key issues

- *Lignite emissions*
- *Enforcement of policy and regulations*
- *Investment funding*

FYR Macedonia experienced a 50% decline in pollutant emissions between 1990 and 1995, primarily due to the overall economic recession and the consequent decline in industrial production. Since 1995, the trend has slowly reversed; there is a modest but steady increase in the level of industrial activity and in emissions.

Table 24 .... Air pollution emissions in FYR Macedonia by sector, 2003 (kt)

Sectors	SO_2	NO_x	CO	Dust
Electricity generation plants	91.9	13.4	1.6	2.0
Non-industrial combustion plants	6.3	1.1	1.8	0.3
Manufacturing industry	5.4	1.5	1.9	1.8
Production processes	30.9	6.2	5.3	24.3
Solvent and other product use	4.0	1.4	16.6	0.1
Road transport and other mobile sources, and machinery	0.5	11.3	49.3	0.7
Total emissions	**139**	**34.9**	**76.5**	**29.2**

Source: Ministry of Environment and Physical Planning (MEPP).

Air pollution

Air quality problems are particularly pronounced in major cities and densely populated areas, thus affecting 60% of the total population. Lignite accounts for the dominant share of TPES in FYR Macedonia. However, the use of lignite for electricity production leads to high emission levels (Table 24) and has serious environmental impacts.[175] Improved environmental management of emissions from lignite-fired power plants is needed, particularly with regard to SO_2, NO_x and particulate matter.

174. The World Bank/GEF grant includes a component of loan guarantee facility, as well as a revolving loan fund to support activities undertaken by commercial banks and by the Macedonian Bank for Development Promotion (MBDP).

175. Soil and groundwater pollution also occur during the lignite extraction process.

Due to its very high utilisation rates, the Bitola TPP is the country's largest source of SO_2 emissions, producing about 73 000 t of SO_2 or 80% of the energy sector's total. Sulphur dioxide emissions from the Bitola and Oslomej TPPs are about 2 000 mg/m^3 of exhaust, a level several times beyond EU standards (*i.e.* less than 300 mg/m^3). It must be noted that emissions from the Negotino TPP are currently unknown but expected to be even higher than those of the Bitola TPP.

The Negotino TPP uses heavy fuel oil, which has relatively high sulphur content (more than 2%). Heavy fuel oil is also used at some DH plants, in industry and at various lignite-fired TPPs. Liquid fuel standards, in place since the SFR Yugoslavia period, allow a maximum sulphur content of 2% in heavy fuel oil. Leaded gasoline is still being produced and consumed, although a phase-out is being negotiated with the OKTA refinery. Hellenic Petroleum and other companies import EURO standard gasoline, and are slowly introducing EURO IV and V fuels into FYR Macedonia's domestic market.

Particulates produced from open-pit lignite mines and combustion of fuelwood are not considered in Table 24, largely because of insufficient data. Despite the lack of statistics, it is well known that special attention is needed to address issues of indoor air pollution from fuelwood and from combustion of coal/lignite in low-efficiency, light heating stoves.

In 2005, FYR Macedonia produced 0.64 kg CO_2 per thousand USD of GDP (in year 2000 USD). This is almost three times higher than the world average and more than five times the average for OECD Europe. At 3.02 t CO_2/toe, FYR Macedonia's CO_2 emissions per unit of TPES (measured using PPP) is twice the average for OECD Europe.

Industrial pollution

In autumn 2000, national authorities collaborated with UNEP to undertake an environmental assessment of FYR Macedonia. They identified five industrial sites that require urgent attention to address serious risks to public health and the environment: the Jugohrom ferro-alloy factory; the OHIS AD chemical complex; the Zletovo lead and zinc mine and smelter; and the Bitola TPP.

ESM, the electricity distribution company, currently uses more than 6 000 capacitors (condenser batteries) in its distribution network. Half of these capacitors are defective and the average age of those in use is 20 years, despite a recommended operating life of only 7 to 10 years. These capacitors pose a significant environmental hazard as their cooling fluids contain polychlorinated biphenyls (PCBs).[176]

Environmental policies and institutions

The Ministry of Environment and Physical Planning (MEPP) was established in 1998 and has the following main responsibilities:

- Monitoring the state of the environment.
- Proposing measures and activities aimed at water resources, air and ozone layer protection, radiation protection and conservation of biological diversity.
- Remediation of polluted regions and areas.

176. This problem is now being addressed through assistance from the Swiss SECO, as described in the Energy Efficiency section.

- Developing standards and regulations for environmental protection.
- Supervising environmental inspections.

Another objective of MEPP is to develop self-financing systems from independent sources. FYR Macedonia has established an Environment Fund to support activities directly aimed at protection of the environment. The MEPP co-ordinates these projects. The *Law on Environment and Nature Protection and Promotion* stipulates that one source of funding should derive from a levy on motor vehicle registrations, amounting to 4%[177] of basic insurance. Assets of the Environmental Fund are intended to fund projects. The Second National Environmental Action Plan, adopted in 2005, recommended other fiscal measures including a pollution tax.[178]

The new *Draft Law on the Environment* complies with EU Directives [179] by stating that "The polluter is obliged to compensate the costs of pollution, to bear the costs for remediation to a condition similar to before the damage and to pay proper compensation." The draft law also provides the basis for determining future fiscal measures that will apply to energy investment and production. The *Law on Air Quality* establishes emission limits, margins of tolerance and target values for individual pollutants, all in line with EU Directives.[180]

FYR Macedonia is party to the Convention on Long-range Trans-boundary Air Pollution (CLRTAP) and to the Protocol of the European Monitoring of Environment Programme (EMEP). However, thorough analysis is needed to assess the resources required to implement the Convention and Protocol. FYR Macedonia is also party to the Aarhus Convention and ratified the Kyoto Protocol to the UNFCCC (as a Non-Annex I country) in July 2004. The MEPP is pursuing the process of establishing a Designated National Authority (DNA) to implement projects using the clean development mechanism (CDM) under the Kyoto Protocol. With UNDP support, the MEPP produced a mid-term *National Strategy for Implementation of the Kyoto Protocol*. The First National Communication on Climate Change (2006) contains a national inventory and projections of greenhouse gas (GHG) emissions and sinks for CO_2, CH_4, N_2O (the report covers the period 1990-98, with 1994 as a baseline year).

Discussion

Developing new energy facilities in conformity with the EU *acquis communautaire* on environment will be challenging for FYR Macedonia. Enforcement of the EU Directive on large combustion plants is particularly problematic because of the country's extensive use of lignite in the energy sector. A workable plan is needed to integrate

177. The charge is only 2% for vehicles with catalytic exhaust gas purification systems.

178. The economic instruments were subject to detailed analysis in the EU CARDS technical assistance project (2004) *Further Enhancement of the Environmental Management*.

179. The law is drafted in compliance with the following EU Directives: 2003/4/EC on public access to environmental information; 85/337/EEC, 97/11/EC and 2003/35/EC on the assessment of the effect of certain public and private projects to the environment; 96/61/EC on integrated prevention and control of pollution; 2001/42/EC on the assessment of the effect of certain plans and programmes on the environment; 96/82/EC on the control of major-accident hazards involving dangerous substances; 2003/35/EC on public participation in respect of the drawing up of certain plans and programmes relating to environment and amendments regarding public participation and access to justice.

180. EU Directive on air quality framework 96/62/EC.

this dimension in the development of new generation capacity. Otherwise, it will be impossible for new facilities (even those with the highest possible utilisation rate) to compete against existing facilities, which are characterised by lower environmental standards during periods of low energy demand.

With the legal framework now in place, FYR Macedonia could use mechanisms contained in the Kyoto Protocol to facilitate investments in clean energy and energy efficiency improvements. However, to date, the country has seen no real investment action. High emission levels (0.916 t CO_2/MWh, largely from coal electricity and heat generation) create an attractive opportunity – from the CDM perspective – for replacing components of the electricity grid. This opportunity could also be used to better integrate energy efficiency policy and the CDM mechanism and/or other mandatory environmental protection mechanisms.

There are a number of low-tech, affordable measures and policy solutions to help reduce the environmental impact of lignite extraction[181] and use.[182] To date, these are not envisaged in available policy documents. Application of such measures could improve dramatically the current situation in FYR Macedonia, and ease future remediation costs.[183]

THE ENERGY SECTOR

Lignite

Key issues

- ***Environmental impacts***
- ***Mining productivity***
- ***Resource access***

Lignite is the primary fuel for electricity generation in FYR Macedonia, accounting for 98.5% of total generation from the Bitola and Oslomej TPPs. The economically exploitable lignite reserves in the two open-cast mines – Suvodol and Brod-Gneotino, located in the Pelagonia area (near Bitola) – are estimated at more than 60 Mt with a sulphur content at 0.6 to 1.5%. Since 2000, annual production of lignite has ranged between 7.5 and 8.0 Mt. Productivity at lignite mines has increased by 14% since the mid-1990s. This increased productivity is significant for low quality lignite with calorific value below 8.3 MJ/kg.

181. Land calcification is a compulsory measure in countries with considerable coal/lignite-based energy industry. The process involves mixing fertilisers with limestone to provide calcium, which is then introduced to the land on regular basis. Regular soil sampling needs to be undertaken by a competent public institution, and should be provided without additional costs for the landowners. Calcification eradicates acidification and limits the impact of heavy metals, which require much more expensive and demanding restoration procedures.

182. The impact of lignite combustion can be decreased through co-firing (with biomass or hard coal) or by introducing limestone in boilers.

183. Many areas of FYR Macedonia are environmentally devastated due to decades of lignite extraction, heavy particulate emissions and acidification.

Mining and transport of lignite is the responsibility of the state-owned joint stock Electric Power Company of Macedonia[184] (JSC-ELEM). In response to the depletion of mines, the previous JSC-EPCM[185] commissioned a study (in 2000) to examine ways of avoiding a lignite supply shortage. The study concluded that it is possible to maintain production levels to meet consumption needs by exploiting the lower seam of the Suvodol mine (reserves of 36 Mt) and opening a new mine, the Brod-Gneotino mine (estimated reserves of 108 Mt).

Since 2000, FYR Macedonia has carried out further feasibility studies. In 2004, the government commissioned the *Bitola Fuel Supply Feasibility Study* and began preparations for opening the Brod-Gneotino mine (with a goal to have it be fully operational in 2008). ESM and various IFIs provided commercial loans of EUR 95 million to support this project.[186]

About one-third of the estimated 108 Mt of lignite reserves at the Brod-Gneotino mine are expected to be exploited, with an annual production rate of 2 Mt. Coupled with the remaining production at the Suvodol mine, this is expected to prolong the operational life of the Bitola TPP to 2025. Continued exploitation of lignite resources is important to FYR Macedonia, as are the necessary investments. Otherwise, the country may have to identify alternative sources of power generation.

Discussion

The environmental and economic impacts of lignite extraction are a serious concern. Extraction of domestic energy resources is attractive in terms of security of energy supply; however, it carries costs in terms of competitiveness and overall employment. Whether or not FYR Macedonia decides to privatise the lignite extraction industry (the first such initiative in the resource extraction sector), the government will need to ensure that regulatory frameworks are sufficiently strong to protect against monopoly activities and ensure high standards for health, safety and the environment.

Even though lignite extraction and use have dominated FYR Macedonia's energy sector for decades, there is a lack of publicly available information about these activities and virtually no comprehensive analysis of environmental damages and remediation costs. FYR Macedonia has made significant progress in improving governance of lignite extraction operations, yet more needs to be done. Social and environmental costs need to be examined fully in the context of least-cost investment planning for the energy sector. Unbundling of the accounts of the state-owned ELEM would facilitate such analysis. To complement ex-post data that the MEPP provides on major polluters, it is necessary to broaden public information on this industry's major impacts on population health, energy and poverty. Improved access to information will also help promote public awareness and participation in the decision-making process, in line with the Aarhus Convention.

184. Two small private companies produce a negligible volume of coal for industry.

185. JSC-EPCM (Electric Power Company of Macedonia) was re-structured in 2005/06 into a generation company (JSC-ELEM) and a distribution company (ESM).

186. These loans include EUR 62 million for equipment and EUR 33 million for infrastructure development and opening of the seam.

Oil products

Key issues

- ***Demand for heavy fuel oil***
- ***External competition***
- ***Security of supply***
- ***Fuel standards***

The key oil refining facility in FYR Macedonia is the OKTA refinery in Skopje, which was privatised in 1999 to Hellenic Petroleum for EUR 25 million.[187] The refinery can produce approximately 2.5 Mt of oil products per year.[188]

The OKTA refinery was commissioned in 1982, and was built using relatively old (even for the time) technology. It runs with high operating costs and low efficiency (due to high internal energy consumption), and produces a high share (almost 40%) of residuals in its product mix. The refinery continues to produce leaded gasoline and diesel fuel with high sulphur content; however, lead and sulphur contents were reduced following adoption of new regulation in 2004. Energy authorities are working to upgrade the OKTA refinery to EURO IV and V standards, a move prompted by the fact that major traders are now importing some volumes of EURO IV and V standard fuels.

The construction of the Thessaloniki-Skopje oil pipeline (2001) created possibilities for the OKTA refinery to accelerate development and improvement of oil product trade and distribution to markets in Kosovo and southern Serbia. In 2007, Kosovo announced new fuel standards and set up effective import controls to enforce these standards. Taking into account transport limitations and competition of more efficient refineries in the region, the OKTA refinery will have to improve its product quality to meet EU standards.

Domestic consumption of heavy oil products was 1.1 Mtoe in 2005, broken down as follows: power and heat generation (34%), transport (32%), industry (15%), services (10%), and residential and others (9%). Overall, heavy oil consumption is decreasing due to growing market penetration of natural gas and, to a lesser extent, increased focus on energy efficiency. In addition, two major consumers of heavy fuel oil are lowering their demand. The Negotino TPP is being privatised and converted to natural gas and hard coal. The Skopje DH system is pursuing a policy to shift entirely to natural gas and modern co-generation systems.

FYR Macedonia's fuel imports are limited by a lack of transport capacity and the long distances to major refineries in the region. These factors have allowed the OKTA refinery to maintain its dominant position despite its low energy efficiency, high operating costs, low domestic fuel standards and idle periods. However, Hellenic

187. OKTA was also granted custom duties on crude oil reduced at 1% instead of the normal rate – which was 20% at that time.

188. The structure of refining product output is as follows: motor gasoline (17%), diesel (34%), fuel oil (24%), naphtha (21%), LPG (2.0%) and other (2.0%).

Petroleum, acting as a regional company, is now able to supply the domestic market[189] with adequate volumes of fuels that meet EU standards.

Makpetrol (established in 1947) is FYR Macedonia's largest distributor of oil products and gas. Since 1998, Makpetrol has been a private joint-stock company with 1 900 employees. It owns 114 gas stations and 12 oil product warehouses, and has a 60% share of the retail oil market (410 000 t in 2002). The other main player on the domestic market is Lukoil, which owns three gas stations and a modern wholesale facility, and supplies about 12% of the market.[190] Private retailers provide the remaining share (about 30%).

FYR Macedonia supports free trade of oil products, which are taxed in line with the regional Central European Free Trade Agreement (CEFTA). The ERC sets prices for all oil products, in accordance with Mediterranean oil product prices; the final price includes pipeline transport costs, excise tax and environmental tax. Imports cover slightly less than 30% of domestic market demand.

Discussion

FYR Macedonia's oil product sector has been significantly altered by the construction of the Thessaloniki-Skopje oil pipeline and by the privatisation of the OKTA refinery and retail activities. The domestic oil product market is supplied by a private refinery and a number of traders and retailers. However, competition remains limited due to the lack of transport infrastructure (especially railway lines to Bulgaria and Serbia) and the lack of transparency in the operations of the crude oil pipeline and OKTA refinery. This lack of transparency has led to legal disputes between the government and Hellenic Petroleum, the private operator of the pipeline and refinery.

A dramatic decline in demand for heavy fuel oil, coupled with demand for higher product quality, has put pressure on the OKTA refinery to consider technological upgrades. This pressure could increase further if private investors convert the Negotino TPP to natural gas and coal (away from fuel oil) and if DH operators in Skopje succeed in their efforts to shift entirely to natural gas. Such changes in market demand may prompt the government to reconsider its policy on strategic oil reserves and re-structure its stocks.[191]

189. In 2002, with the expiration of its exclusive right to supply the domestic market, JSC OKTA established a trading subsidiary (JSC OKTA Trading) and a small network of 20 retail gas stations. Wholesale activities to other retailers still dominate JSC OKTA's activities; its products cover more than 70% of the domestic market.

190. LukOil is now developing a network of another 15 petrol stations.

191. See Energy Security section above.

Natural gas

Key issues

- ***Regional integration***
- ***Extension of the distribution network***
- ***Power plant conversion to natural gas***
- ***Security of supply***
- ***Market opening***

Natural gas was supplied to FYR Macedonia for the first time in 1996 through a 98-km pipeline from the Bulgarian border to Skopje. The FYR Macedonia gas distribution network is underdeveloped: it covers 32 km (mainly in the Skopje area) and connects only a few industries. Furthermore, the capacity of the transmission system (800 Mcm per year) is under-utilised; consumption is only 100 Mcm per year. To make better use of this excess capacity, FYR Macedonia is considering several options to expand domestic use of natural gas and to broaden transmission interconnections with networks of neighbouring countries. Three options warrant specific mention:

- Construction of a regional gas pipeline system (8 bcm per year) from Bulgaria through FYR Macedonia and on toward Albania and Italy.
- Construction of a major gas transmission pipeline from Turkey through FYR Macedonia to Croatia.
- Refurbishment of a local major gas pipeline or the construction of a new pipeline for connection to Kosovo.

FYR Macedonia's natural gas network is owned and operated by the public company GA-MA (established in 1996); in turn, GA-MA is majority owned by the government with Makpetrol owning a much smaller share.[192] Since 2003, GA-MA has acted as the gas transmission operator; Makpetrol remains the importer of natural gas. An ongoing legal procedure has yet to determine the ownership rights (between the government and Makpetrol) of the domestic gas pipeline.

FYR Macedonia has adopted an institutional and legislative framework for operation of the natural gas system, in accordance with the EU requirements on gas markets. This was driven partly by the government's interest to participate in the future regional energy market of Southeast Europe. In support of this effort, FYR Macedonia plans to transpose and implement relevant articles and provisions from primary and secondary EU legislation.

Investors are considering a number of initiatives to expand the natural gas distribution network, including plans to extend the existing natural gas network to the Negotino TPP and to suburbs of Skopje that are not served by district heating.

Gas prices are set by the ERC, according to a cost-plus principle and based on import prices and transmission tariffs. The ECR also oversees preparations for market opening (*e.g.* regulations for third-party access, customer eligibility to choose its supplier), ensuring that the process is structured in line with the appropriate EU Directives.

192. Makpetrol has financed part of the gas pipeline since 1989.

Discussion

FYR Macedonia has shown itself to be a reliable and willing partner in processes to integrate the regional energy infrastructure, recognising that enhanced integration and transit of energy create an opportunity to improve domestic security of supply. The plan to convert the Negotino TPP to a gas-fired, combined-cycle gas turbine (CCGT) plant has focused attention on the need to construct a gas pipeline from Skopje (Kumanovo) to the Negotino site. In turn, this has prompted FYR Macedonia to consider plans for a gas link to Greece, which could lead to diversification of supply and further transit options. Eventual extensions to Kosovo and to Montenegro and/or Serbia could provide additional diversification opportunities.

The proposed CHP (Skopje) and CCGT plants (Negotino), as well as the extension of the distribution network, would increase domestic annual demand for natural gas by around 500 Mcm, thus having a dramatic effect on FYR Macedonia's security of natural gas supply and diversification options.

Electricity

Key issues

- ***Security of supply***
- ***Competition***
- ***Lignite resources and pollution***
- ***EU Directive on large combustion plants***
- ***Real prices for market opening***

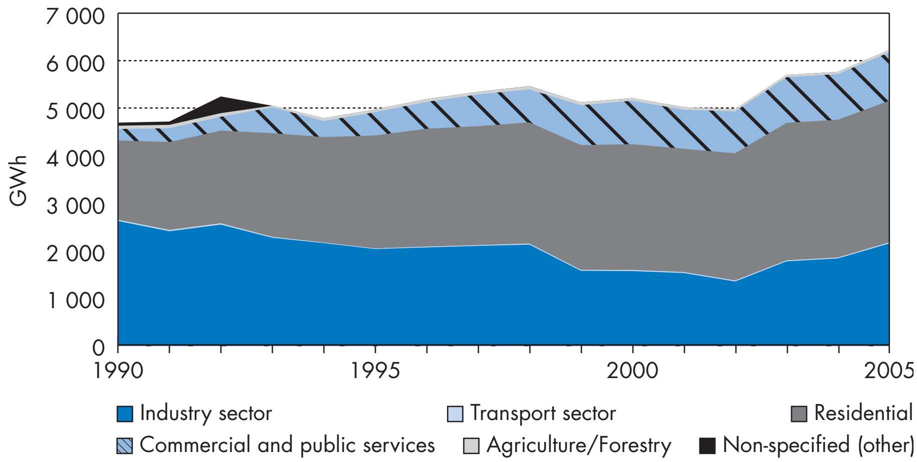
In 2004, FYR Macedonia's total installed electricity generation capacity was 1.5 GW; total domestic production was 6.2 TWh and peak load was 1.4 GW.[193] Thermal-based electricity generation accounts for the largest share of production (76 to 87% depending on the year),[194] with hydropower making up the remainder (13 to 24%). FYR Macedonia is a large electricity transit hub: it also imports electricity from the entire region (including Bosnia, Bulgaria, Greece, Romania and Serbia). In 2005, it imported 1.6 TWh to supplement domestic production in order to meet a total demand of 7.4 TWh.

Total electricity consumption by sector in 2005 was divided between residential (48%), industry (34%), and services and others (18%) (Figure 20). Because of its importance as a transit route for regional network stability, FYR Macedonia always has more than 400 MW of transit capacity. In contrast, FYR Macedonia has very little available reserve margins due to its policy of adjusting demand to base-load production. Furthermore, available reserve margins are temporary, depending on the availability of water in accumulation units of hydropower plants.

193. This peak load is exceptionally high compared to available generation capacity. It demonstrates the magnitude of adjustments and efforts made in FYR Macedonia's electricity sector to optimise available assets.

194. Negotino TPP consumes heavy fuel oil, depending on its price.

Figure 20 ....Electricity consumption by sector in FYR Macedonia, 1990-2005 (GWh)



Source: IEA statistics.

In 2005, FYR Macedonia unbundled the EPCM, initially to create a transmission company (MEPSO) and a generation and distribution company (ESM). The government subsequently separated the ESM into two companies: one for generation (ELEM) and for distribution (ESM). Both were then scheduled for privatisation. In early 2006, a total of 90% of ESM was successfully privatised to EVN of Austria.

Power generation

About 85% of total generation capacity in FYR Macedonia is owned and controlled by the state company ELEM.[195] The remaining capacity, *i.e.* the Negotino TPP (210 MW), was separated from ELEM and privatised.[196] A private development company has been established in Skopje to construct a new CHP plant.

FYR Macedonia's largest TPP, Bitola, was originally built (1975-88) as a 3 x 210 MW plant using Soviet LMZ turbine technology. During the 1990s, the plant was successfully upgraded by the original equipment manufacturer (OEM) to a capacity of 3 x 225 MW. This was done by increasing the steam parameters without significant fuel efficiency improvements. The Bitola TPP has had an extraordinary operation record since 1990, with very few outages and very high utilisation rates.

Bitola TPP's operation record has led to a higher than expected consumption of lignite, which has become a key issue in maintaining FYR Macedonia's electricity balance. The Bitola TPP currently consumes 6.5 Mt of lignite per year, primarily from the Suvodol mine. However, only about 55 Mt of reserves remain in the upper seam of the Suvodol mine. At current consumption levels, this could supply the Bitola TPP until 2016, which is also the end of the design life of the plant's first unit.

195. ESM owns 11 small hydropower plants with total capacity of 35 MW.

196. The plant (1 x 210 MW) was privatised to a foreign consortium, which offered to convert the plant from heavy fuel oil to natural gas. Their proposal also included the development of an additional 500 MW TPP unit based on hard coal imported by rail via the Port of Thessaloniki. There are plans to add a 140 MW gas turbine in order to convert the plant into a sort of CCGT arrangement. Altogether, an additional 850 MW of installed capacity is expected to be developed by 2011.

In 2007, a large share of Suvodol's mining machinery was transferred to the Brod-Gneotino mine. This would seem to reflect a decision to begin lignite extraction at the latter mine in order to ensure ongoing lignite-based electricity generation. However, the Brod-Gneotino mine is farther away from the Bitola TPP and its lignite resources are more expensive to extract. This will mean higher input costs in the future.

With inputs from a number of separate studies and consultants, EPCM prepared a least-cost development study (to 2020) on the electricity system. The study includes three key components: comparison of three scenarios for growth of electricity consumption; analysis of existing and potential electricity generation facilities; and research on the optimal development plan for electricity generation (using both least operating and investment costs).

Based on the study results, EPCM prepared (in 2001) a development plan to 2015. The plan included projections of electricity needs and of generation capacities of existing facilities. It also outlined details regarding the construction of new generation and mining facilities, the rehabilitation and modernisation of existing generation facilities and electricity networks, and the development of the energy management system. The study also outlined options and possible sources of finance to support development to 2015, including ways to facilitate the deployment of international assistance. This study served as the basis for all FYR Macedonia's arrangements with donors and for all improvements made to the system since 2001.

Hydropower accounts for almost 30% of installed capacity in FYR Macedonia, but only 13 to 24% of electricity generation. The low level of contribution is due to low water levels and the irregular nature of water inflow. Many of FYR Macedonia's hydropower plants are among the very best examples of civil and hydro engineering from the period of the SFR Yugoslavia. However, they operate with relatively low utilisation rates.

Power transmission and distribution

State-owned MEPSO manages electricity transmission in FYR Macedonia; distribution and electricity supply are managed by the ESM. Transmission and distribution losses are estimated at slightly more than 20%, which exceeds actual consumption by the industrial sector. Transmission losses account for about 2%, pointing to major losses in distribution. The city of Skopje accounts for 37% of the country's electricity consumption; no other region accounts for more than 10%.

Electricity market

FYR Macedonia's electricity market has been liberalised; the ERC and the CPC share responsibility for monitoring the sector to ensure competitive market behaviour. The ERC also sets the regulated prices for transmission and distribution, as well as electricity prices for the remaining regulated customers. Third-party access to the grid is regulated by the ERC, with a large volume of electricity trade across FYR Macedonia.

Since 1999, electricity pricing has, in theory, been set in accordance with the ERC's Pricing Methodology for Different Types of Energy. This is a cost-plus type tariff, composed of three main components: allowed normalised costs (*e.g.* energy, maintenance, salaries, equipment insurance, etc.); corporate taxes; and a profit element of 8%. Tariff revisions can be triggered by a +/-5% change in these supervised (normalised) costs over any three-month period. The ESM can request upward price revisions. However, electricity price setting is actually more a negotiated mixture of operational pragmatism and public acceptability. For example, in order to boost FYR Macedonia's budgetary inflows, the IMF encouraged the ESM to increase the VAT on electricity sales from 5% to match the general VAT of 18%. This 13% increase was passed through to industrial and commercial consumers but not to residential consumers, as it was deemed to be too much of a shock for this sector. As a compromise, residential tariffs were increased by 7% in July 2003 and then to 18% in 2006, at which time VAT became consistent across all consumers.

Discussion

Despite moves toward liberalisation, FYR Macedonia's electricity market shows shortcomings in its wholesale and retail electricity sectors. Activities in these areas are performed by companies that have natural monopolies in electricity transmission and distribution. For instance, FYR Macedonia has not yet unbundled the electricity distribution and retail activities of the ESM. Establishing an independent company for electricity distribution would create the incentive to promote both fair access to the network and end-use energy efficiency. Greater independence could provide incentive to develop higher quality distribution networks as a means of providing better services to some rural or remote areas – services that are important for poverty reduction and employment. Effective competition may be enhanced by the construction of the CHP plant in Skopje, which to date has been delayed.

Electricity prices are set below costs, especially if environmental costs are considered. This poses a significant barrier for new companies hoping to enter the market and also strains the finances of existing companies. Public investments are already needed to maintain operations of existing plants.

FYR Macedonia has pledged considerable public investments to prolong the operational life of the Bitola TPP to 2025 and beyond. The plant boasts an extraordinary performance record, but its fuel efficiency is low – estimated at no more than 32%, compared to Western European averages of 40%. This low efficiency is a particular concern in light of predicted increases in FYR Macedonia's fuel supply costs. The Bitola TPP is likely to face increasing competition, both domestically (from planned plants that are more modern and efficient, such as the CHP in Skopje and the conversion of the Negotino TPP to CCGT) and regionally (from existing and planned plants throughout the Western Balkans). The IEA would question whether these recent developments at Brod-Gneotino mine and Bitola TPP are backed by a least-cost investment plan and if other options for electricity generation – including more efficient fuels or electricity imports – would be more sustainable in the longer term.

Environmental costs at the Bitola TPP's are expected to rise as the plant is upgraded to conform (by 2017)[197] to the EU Directive on large combustion plants. By that date, the Bitola TPP's operational life will have reached 35 years, raising questions as to the viability of installing the necessary equipment. Despite the potential costs

197. In line with the Energy Community Treaty.

and valid questions, a decline in the use of the Bitola TPP could dramatically change FYR Macedonia's electricity supply situation.

The possible conversion of the Negotino TPP to CCGT and the construction of new generation units in FYR Macedonia are expected to be fuelled exclusively by imported natural gas and coal. This will lead to higher efficiency, higher economic yields and lower environmental impacts. However, it will increase FYR Macedonia's dependence on energy imports. A least-cost investment plan for the electricity sector should be reconsidered in light of the recent privatisation arrangement (at the Negotino TPP) and technology advancements.[198]

Hydropower accounts for almost 30% of FYR Macedonia's total installed capacity but delivers a relatively small share of electricity generation. FYR Macedonia's hydropower plants could play an important role in regional electricity markets; however, this would require additional interconnection capacity, as well as more flexible and more technically advanced transmission networks. MEPSO is taking steps in the right direction, but needs institutional and financial support to achieve its goals.

FYR Macedonia's electricity consumption is characterised by excessive demand peaks in winter, which are largely due to the use of electric heating to supplement fuelwood heating in the residential sector. These demand peaks could be alleviated through the introduction of more efficient wood stoves, and through information and awareness campaigns (targeting residential customers) to promote more efficient use of both electricity and fuelwood. Higher and more cost-reflective electricity tariffs could also play a role but would take some time to stimulate more efficient behaviour. In the longer term – and in a context of privatised electricity distribution – installation of smart digital meters (that can differentiate electricity tariffs by the time of day and need) would be the most effective means of limiting growth in demand.

Heat

Key issues

- ***Use of electricity for heating***
- ***Efficient heat pumps***
- ***Energy efficiency***
- ***Competitiveness of district heating***

Heat accounts for 7.5% of TFC in FYR Macedonia. Industry consumes about one-half of heat energy and residential customers consume about one-third. The rest goes to other customers, mainly in the service sector. Heat production and distribution companies are privately owned. The owner of the distribution network, the Privatisation Agency, leases network space to private operators.

198. Development at Negotino TPP was planned within the context of the privatisation process, and has not been considered within the least-cost investment plan. The plan should consider a number of new, commercially available technologies using heavy fuel oil or improving efficiency of LMZ generation units (which have been successfully used at Bitola TPP).

FYR Macedonia has five DH systems: three in Skopje, one in Bitola and one in Makedonska Kamenica.[199] The largest system (in Skopje) has a boiler capacity of 480 MW; its network connections serves some 35% of households[200] (40 000 households). The system is owned by Toplifikacija AD, a private company owned by a Slovenian group. Skopje's largest system is fuelled mainly by heavy fuel oil (80% or 70 000 t per year); natural gas is used to fuel the remaining 20%. Utilisation of Skopje's DH system is about 1 300 hours (compared with the 7 000 hours or more for Bitola TPP); network losses are about 14%, which is below the regional average. Extensive use of heavy fuel oil for district heating, particularly in the winter, leads to significant air pollution in Skopje.

The other two DH systems in Skopje are much smaller: one operates on natural gas and services some 6 000 households; the other operates on heavy fuel oil and services some 2 000 households. Their total annual production is 850 GWh of heat equivalent.[201]

At present, all DH systems in FYR Macedonia are heat-only boiler plants, which are quite inefficient. The same volume of fuel could deliver products (*e.g.* electricity or high grade steam) that are many times more valuable and at efficiencies of about 50%, with another 40% used for hot water generation. Toplifikacija AD is interested in developing the first CHP plant, which it hopes to do with the participation of foreign investors.

Meters are installed at the building level. Payment collection for heating bills is high (90 to 94%) in Skopje. The ERC sets prices for heat delivered by DH systems, including energy and capacity payment for various categories of consumers (commercial, schools, residential, etc.). In 2007, heat tariffs were set at EUR 32 to 37/MWh. The ERC also sets prices for electricity distributed to low-voltage retail customers, which were about EUR 38/MWh in 2007. Overnight tariffs are roughly half this level; thus, electric overnight heating by thermal accumulation heaters is cheaper than district heating.

Standard heat pumps available in Skopje shops produce 3 to 4 MWh of heat from 1 MWh of electricity. Assuming that the ERC sets prices according to actual production costs, heat-only boiler technology produces heat at roughly the same cost as electricity produced from similar devices. Therefore, the DH system in Skopje faces increasing competition from heat pumps. Heat produced by natural gas has similar cost and efficiency issues: CHP plants with waste heat utilisation provide 2.2 times more heat per unit of natural gas than is derived through direct combustion of natural gas in the best available residential boiler.

Discussion

FYR Macedonia's DH network has been legally separated from heat generating sources; however, the network is currently leased to the main heat provider. Thus,

199. The Makedonska Kamenica system is reportedly not operating for financial reasons. There are plans to build new district heating systems based on heavy fuel oil in Ohrid, Kavadarci, Kicevo and Stumica.

200. In Skopje, 63% are block buildings (about 2.6 million m^2 or about 41 500 apartments), 27% are commercial, 5% are individual houses and another 5% are public buildings and schools.

201. Boiler capacity: 710 MW (including 75 MW of geothermal facilities).

DH companies have an obvious commercial interest in decreasing network losses, but limited interest in enhancing end-use efficiency.

The viability of electric space and water heating is not addressed in publicly available policy documents. However, the significant use of electrical thermal accumulation heaters reflects the need to attain high utilisation rates at major power generation plants and to maintain modest import dependency. At the residential level, households could adopt other means to improve the ambient indoor temperatures, given the increasing availability of better insulation and efficient appliances, as well as efficient heating options such as heat pumps.[202] Air source heat pumps are starting to be available on the market but without appropriate standards, dissemination of technical information or regulation. There are still significant barriers to entry for efficient heat pump technologies, including low energy prices and lack of information, standards and incentives.

The increasing accessibility of natural gas and heat pumps in FYR Macedonia cities raises questions about the competitiveness of the DH system. Some consumers may shift away from DH systems, which could lead to a decrease in load densities and, thus, higher unit costs for remaining DH users. Higher costs could, in turn, stimulate additional disconnections. Entry barriers also exist for ESCO investments, which are not envisaged in the energy efficiency strategy.

Renewable energy

Key issues

- ***Implementation of the Strategy to 2016***
- ***Economies of scale and of mass production/standardisation***
- ***Energy poverty***
- ***Forest quality and degradation***

Fuelwood plays an important role in meeting the energy and heating needs of the FYR Macedonia population. Other renewable energy sources are much less developed, despite many studies estimating the significant potential for solar, wind[203] and small hydropower.

Fuelwood represents about 11-13% of TFC[204] in FYR Macedonia, a share that has remained stable since 1997 and, according to energy policy documents, is not expected to increase. The average fuelwood production (800 000 m^3 per year) generates about

202. FYR Macedonia is experiencing a significant and unregulated penetration of non-efficient heat pumps, which are used mainly for summer cooling as is reflected in the increase in summer electricity demand. The climate in FYR Macedonia favours the use of heat pumps for space heating/cooling and for water heating; the coldest winter temperatures are within the range of efficient operation of air-to-air or air-to-water heat pumps.

203. No information is available on wind energy potential in FYR Macedonia. In neighbouring regions of Greece, licences have been granted for 337 MW of wind development; some studies of the region near Dorian Lake showed average wind speeds up to 7 m per second.

204. Or 0.2 Mtoe. Official fuelwood consumption includes fuelwood from registered public and private forests only. Fuelwood harvested from small private forests and other sources (orchards, etc.) is not registered.

0.2 Mtoe of energy, which is used primarily for residential heating. For financial reasons, many households continue to use fuelwood for heating despite being connected to the DH system. It is generally admitted that the use of illegal fuelwood (*i.e.* fuelwood in excess of regulated levels and cut without appropriate licensing) is prevalent throughout the country.

FYR Macedonia's forestry reserves lag considerably in comparison to other countries in Central and Northern Europe, particularly in terms of quality (density of wood mass per hectare) and growth rates. FYR Macedonia forests have a high quantity of short-trunked, offspring trees (many of which are highly degraded) and a small quantity of conifers. This combination results in relatively low timber reserves, low timber mass and low annual growth per unit of land.

In addition, FYR Macedonia has many privately owned forests (220 000 plots owned by 65 000 households),[205] most of which are scattered on small plots (average size of 0.4 hectares). These forests are largely defoliated and degraded, and are marginal in terms of productivity of timber mass. There is a lack of clarity on many issues related to legal and proprietary aspects of these private forests. This complicates the government's ability to monitor forests, promote forest fire prevention and co-ordinate re-forestation efforts

Deforestation in FYR Macedonia can be attributed to three major factors: excessive harvesting of fuelwood in public and privately owned forests; acidification of land and air; and regular harvesting of low quality forests for fuelwood for residential heating.

The situation is exacerbated by the fact that fuelwood use in households is inefficient; most fuelwood is fed into light heating stoves that have a fuel efficiency of about 22%. By contrast, masonry or down-burning stoves[206] or modern pellet boilers could achieve efficiencies in the order of 60 to 80%. Clearly, use of more efficient stoves and boilers could improve the quality of residential energy services while also helping to reduce the risks of deforestation and improve the quality of forests.

In 1998, the World Bank provided a grant to prepare a study on small hydro plants in FYR Macedonia. The study considered the development of 70 new small hydro plants with a total installed capacity of 183 MW and annual electricity generation of 700 GWh. It also calculated that total hydropower potential (both large and small hydro) was about 4 TWh (0.35 Mtoe).

In 2005, geothermal energy provided about 0.012 Mtoe for space heating. This is less than 10% of the country's annual estimated potential of 0.166 Mtoe. At present, geothermal energy is provided by privately owned companies and used mainly to heat greenhouses in Vinica, Kočani, Gevgelija and Strumica. In Kočani, geothermal energy

205. Households in FYR Macedonia usually own two, three or four scattered pieces of land with low quality forests, which are harvested in rotation. Trees are harvested at a relatively young age and small size to reduce the work required for cutting and transport.

206. These stoves combine better combustion chambers with thermal mass, thereby facilitating more complete combustion and doubling the efficiency of fuelwood. They could provide considerable fuelwood savings at the same level of comfort.

is also used for district heating; the municipal company manages its exploitation, distribution and supply.

Tapping FYR Macedonia's renewable energy potential

The potential of renewable energy sources in FYR Macedonia[207] has been the subject of many foreign and domestic studies, particularly those that also examine related gains in energy efficiency. Five studies have assessed the potential of renewable energy sources in recent years, each with foreign financial support:

- *Potential of renewable energy sources in the Republic of Macedonia,* was conducted by Electrotek Concepts and the Macedonian Academy of Science and Art, and funded by USAID (1999).
- *Energy-related policies in the EU member states regarding protection of the environment and energy efficiency: Possibilities of their implementation in Macedonia,* was prepared for EU SYNERGY Programme (2001).
- *Investment options in the energy sector*, was part of an EU project.
- FYR Macedonia country profile of the EBRD Renewable Development Initiative.
- Swiss Counterpart Fund on renewable energy sources.

In 2004 and 2005, a project was carried out under the auspices of the World Bank/GEF. Its main objective was to attract investments in energy efficiency and use of renewable energies by removing institutional and financial barriers. The report recommended the establishment of a fund for sustainable energy, which would support projects on energy efficiency and renewables. It also proposed to give the Energy Agency the mandate to provide support to renewable energy development, to manage the fund and to issue certificates of origin for energy from renewable energy sources.[208]

Within its section on energy efficiency and exploitation of renewable energy sources, the *Energy Law of 2006* gives the government a mandate to adopt a *Strategy for Renewable Energy Sources to 2016*. The *Strategy* has the following objectives:

- Define clear goals in relation to the use of renewable energy sources.
- Assess the potential of renewable energy resources, as well as the feasibility of exploiting this potential.
- Establish target volumes and set timelines for renewable electricity.
- Adopt transitional measures and other support mechanisms to support the use of renewable resources (*e.g.* preferential tariffs for producers of electricity).[209]

The proposed Energy Agency is to support the government in preparing the Strategy and in implementing its programmes.

In 1998/99, the Austrian government, within the framework of its bilateral co-operation with FYR Macedonia, provided grants for implementation of the projects *Geothermal system - Kočani* (EUR 400 000) and *Geothermal system - Vinica* (EUR 420 000). A third grant (EUR 300 000) supported a programme (carried out in 2005-07) to install solar

207. Large hydropower generation, which accounts for 13 to 24% of electricity generation in FYR Macedonia, is not included.

208. See section on Energy Efficiency.

209. In May 2007, the ERC introduced a feed-in tariff for wind energy (EUR 0.089/kWh).

water heaters, specifically by improving the technology and production of solar energy equipment and systems, and providing training for solar energy experts.

Other studies have identified potential for energy from agriculture biomass and biofuels. In August 2007, Makpetrol announced the commissioning of a biodiesel refinery with capacity of 30 000 t per year.

Discussion

Increased use of renewable energy sources could improve FYR Macedonia's security of energy supply and reduce energy import dependence. There is an implicit expectation that these sources could also improve energy efficiency and affordability.

Significant efforts to utilise international sources of knowledge and funding to exploit renewable sources have resulted in little tangible progress. The *Strategy for Renewable Energy Sources to 2016* does not envisage large-scale use of renewable energy, nor does it provide fiscal mechanisms to facilitate broader use of small-scale solutions. In this respect, FYR Macedonia's approach to renewable energy fails to realise the benefits of economies of scale. The lack of progress on site-specific small hydro projects reflects a lack of focus on practical, cheap and efficient solutions, which are more appropriate for a country with such a high level of poverty.

The ERC has shown its support for development of renewable sources by introducing a feed-in tariff for wind energy. However, the proposed Energy Agency has yet to assume its role as the facilitator of renewable energy use. Some indirect incentive derives from the rising costs of conventional energy inputs and the wider availability of technologies that use renewable sources. Commercial players are already exploiting opportunities in biodiesel production. Considering the low density of population and the available renewable energy sources, the most suitable approach for FYR Macedonia could be the mass production of small, de-centralised energy devices (*e.g.* efficient stoves, efficient heat pumps and solar water heating). The ERC and the Energy Agency have important roles to play in terms of developing regulations to ensure standardisation and mass application.

Considering its importance as a residential heat source, fuelwood is not properly included in FYR Macedonia's energy policy or tools, nor is it adequately reflected in energy statistics. Inefficient use of fuelwood is a key factor affecting energy poverty (and poverty in general) and environmental degradation. It also limits market reforms by affecting the purchasing power of the majority of the country's population.

OVERALL RECOMMENDATIONS

In addition to the recommendations and key findings included in the Overview and in the regional chapters, the government of the Former Yugoslav Republic of Macedonia may consider the following recommendations useful:

Institutions and overall strategy

- Adopt a formal energy policy paper to provide guidance and coherence to public decisions, including future investment arrangements.
- Enhance human resource and institutional capacity within the energy administration, backed by attractive salaries for public servants.
- Assess the consequences of existing and potential contracts with private entities (including foreign investors) in light of public policy objectives.
- Ensure public participation in preparing and realising the privatisation of public assets.
- Strengthen public participation in the development and enforcement of energy policy, in line with the Aarhus Convention.

Market reforms and regulation

- Develop and implement pricing policy to ensure that final electricity prices reflect actual costs.
- Clarify the timetable for legal unbundling of ESM's distribution and supply activities.
- Improve (both physical and nominal) openness of the oil product market; introduce viable wholesale and retail competition.
- Ensure diversification of gas supply through further development of the gas infrastructure and by introducing more players to the domestic gas market.

Energy security

- Integrate energy security goals with policies that address energy efficiency and energy poverty.
- Allocate additional resources to institutions and programmes to make energy security policy more coherent and strengthen emergency co-ordination.
- Consider options to create a strategic reserve of oil products.

Energy efficiency

- Enforce and monitor the *Energy Efficiency Strategy of 2004* and adopt a more ambitious energy efficiency framework in accordance with the *Energy Law of 2006*.
- Establish the Energy Agency, backed by adequate financial and human resources.
- Consider further unbundling to separate network services from energy supply, as a means of stimulating network operators and consumers to improve energy efficiency.
- Improve integration of energy efficiency objectives and public policies, especially in relation to the poverty reduction strategy, spatial planning systems and the fiscal system.

- Encourage ESCOs and other investors to enter the market; consider establishing a specific energy efficiency fund.
- Improve energy efficiency in the electricity and heat generation sectors.
- Develop and implement a comprehensive national strategy to address low efficiency of space heating and residential water heating while also supporting poverty reduction objectives.

Energy and environment

- Ensure the enforcement of targets outlined in the *Second National Environmental Action Plan*; allocate sufficient resources to institutions and programmes.
- Adopt a strategy to meet environmental requirements of the EU acquis communautaire, including the EU Directive on large combustion plants in line with the Energy Community Treaty.
- Strengthen the application of existing tax instruments (*e.g.* emission fees) and use the Environmental Fund to reduce environmental impacts of major energy facilities.
- Improve integration of the *Energy Efficiency Strategy* and existing mechanisms and instruments for environmental protection (*e.g.* Kyoto Protocol CDMs).
- Consider short-term measures to decrease environmental impacts of the Bitola TPP, including co-firing of biomass and hard coal, and the introduction of limestone.
- Develop a workable mechanism to enforce environmental standards through privatisation procedures and contracts.
- Assess remediation costs of polluted land near major energy infrastructure in order to facilitate future remediation measures.

Lignite

- Enhance access to public information on lignite extraction, transport and use.
- Assess the economics and competitiveness of lignite mining and use in the context of its social and environmental costs, as well as in relation to national employment levels.
- Apply low-cost, low-tech measures to reduce the environmental impacts of the lignite industry.

Oil products

- Enhance administrative institutional capacity and co-ordination to support the necessary repositioning and transparency of the oil product market.
- Implement measures to eliminate leaded gasoline and meet EU standards for liquid fuels.
- Improve regional transport links to enhance competition in fuel markets.
- Consider (based on a least-cost investment plan) using the latest technologies to achieve more efficient use of fuel oil for electricity generation.

Natural gas

- Assess options to enhance security of gas supply through diversification of imports and increased storage.
- Use a least-cost investment plan to assess options to expand the domestic gas distribution system.
- Enhance institutional capacity and co-ordination between administrations, commercial players and professional associations to develop a regional natural gas infrastructure.

Electricity

- Adopt an electricity strategy with clear goals in key areas (security, economic, environment, market, quality of distribution services, etc.) and apply a least-cost supply plan to its development and implementation.
- Ensure the viability of the electricity sector through end-use prices that are cost-reflective and through appropriate tariffs for network access.
- Address the issue of the affordability of electricity for low-income homes by improving end-use efficiency within the scope of the *Poverty Reduction Strategy Paper* (PRSP).
- Consider the feasibility of installing smart digital meters for larger consumers.
- Ensure appropriate unbundling of electricity distribution and electricity sales, and prepare the legal framework to introduce effective competition in the market.
- Examine the competitiveness of the Bitola TPP on the regional baseload market and in the context of current and future environmental costs; improve its efficiency (through the use of proven technologies including waste heat utilisation and lignite drying) and reduce its environmental impact (through co-firing of biomass and the use of hard coal).
- Ensure the timely reinforcement of transmission and interconnection capacities to support regional electricity trade and transit, and to reduce losses and improve supply reliability of domestic electricity distribution systems.

Heat

- Consider establishing appropriate regulatory measures (legal and fiscal) to stimulate reduced use of direct electric space and water heating; introduce more efficient heating options with heat accumulation systems.
- Ensure the sustainability of new and existing DH systems, including their competitiveness in relation to other available technologies (*e.g.* CHP).
- Remove barriers to use of CHP in urban and industrial applications; provide support in line with the EU Directive on co-generation.
- Encourage the development of ESCOs in urban areas to offer alternative heating solutions and energy efficiency improvements in buildings, notably to tenant associations.

Renewable energy

- Adopt and implement the *Renewable Energy Strategy to 2016* with a realistic share of renewable energy, supported by an adequate action plan, institutional set-up and resources.
- Promote efficient and clean use of fuelwood; provide appropriate resources to support this objective; ensure efforts are undertaken in the context of policies directed toward poverty reduction.
- Enhance forestry management to reduce uncontrolled logging.
- Improve the quality of statistics on renewable energy sources.
- Consider the implementation of specific regulations to promote investment in renewables (*e.g.* feed-in tariffs, purchase obligations, green certificates and tax exemptions)
- Consider upgrades of existing HPPs as well as ambitious use of inexpensive renewable energy sources (*e.g.* co-firing of biomass and lignite/coal).
- Consider standardisation as a way to maximise market penetration of renewable energy technologies that are proven to be effective and affordable.

Map 9..................Montenegro's energy infrastructure

The boundaries and names shown and the designations used on maps included in this publication do not imply official endorsement or acceptance by the IEA.

VIII. MONTENEGRO

MONTENEGRO'S ENERGY HIGHLIGHTS

Table 25 ....Energy snapshot of Montenegro, 2005

	Montenegro[i]	Western Balkan region	OECD Europe
Total primary energy supply (Mtoe)	1.0	38.7	1 875.0
Total final energy consumption (Mtoe)	0.7	25.4	1 340.0
Energy consumption (toe) per capita	1.59	1.62	3.50
Electricity consumption (kWh) per capita	6 030	2 970	6 145
Energy intensity of GDP*	0.26	0.25	0.15
Carbon intensity (kg CO_2/GDP*)	0.66	0.69	0.33
Net imports as % of TPES (Dependence)	40	**	44%

* In terms of purchasing power parity; in toe per thousand USD (in year 2000 US dollars).
** Not calculated to avoid double counting due to intra-regional trade.
[i] Sources: Ministry of Economy of Montenegro; MONSTAT; UNECE; IEA statistics (with additional data from Kosovo used for calculation of averages for the Western Balkan region).

Montenegro adopted a new *Energy Development Strategy to 2025 (EDS 2025)* in December 2007, its first as an independent state. Compared to other countries in the region, Montenegro's *Strategy* is exceptional in its co-ordination with the *Poverty Reduction Strategy* and the *National Strategy for Sustainable Development*. It is also aligned with other strategies for the environment and spatial planning, and with international obligations.

Montenegro's energy intensity is 40% higher than the average for OECD Europe. This is due largely to a large aluminium smelter. The country's energy efficiency potential is estimated in the order of 20% of current consumption, with large shares of potential savings in energy production, transmission and distribution.

Montenegro recently ratified the Kyoto Protocol. This could provide a useful vehicle to attract investments for initiatives that focus on reducing the environmental impacts of the country's carbon-intensive economy.

MONTENEGRO'S ENERGY CHALLENGES

Montenegro's energy market is considered too heavily regulated – to the extent that regulations often act as a specific barrier to entry for new participants. The small size of Montenegro's energy market acts as another barrier. Unfortunately, the *Energy Development Strategy* does not consider the benefits of making Montenegro's participation in the regional electricity market more comprehensive, which would allow the country to use export of peak hydropower as a competitive advantage.

Continued reliance on lignite will create challenges related to both security of energy supply and difficult social issues. Extraction in the Pljevlja lignite basin is carried out under dismal conditions. In addition, the Pljevlja thermal power plant (TPP) has a low level of technology and low utilisation rates. These factors have significant economic, social and environmental impacts on the region.

Reducing Montenegro's energy intensity, through increased focus on energy efficiency, will be crucial to ensuring that the country develops in a sustainable manner. Improved efficiency could also provide additional opportunities for energy exports. However, the mechanisms to support this – increasing energy efficiency, controlling domestic demand, or decreasing seasonal fluctuations and peak demand – are not indicated as policy priorities.

An implicit outcome of Montenegro's *Energy Development Strategy to 2025* is a further increase in carbon intensity, due primarily to increased use of lignite in Pljevlja TPP and a "business as usual" scenario in industry. The use of natural gas, de-centralised energy options and renewable energy, all of which could help to reduce carbon intensity, are included in the *EDS 2025* but only in limited ways.

INTRODUCTION

Following a referendum on 21 May 2006, Montenegro separated from the State Union of Serbia and Montenegro and became an independent state. The government of Montenegro adopted a new Constitution in October 2007.

The population of Montenegro is roughly 620 000; the capital city, Podgorica, has about 170 000 inhabitants and is the most densely populated area. Montenegro's land mass is 13 812 km^2. Geographically, the country has four distinct regions: a narrow coastal zone, which has a Mediterranean climate; a ring of mountains along the Adriatic Sea, which has the highest rainfall in Europe; a flat region known as the Zeta plain; and a second mountainous area in northern Montenegro, which has a continental climate.

Waterways in Montenegro are separated into three catchments areas: the Danube River via the Drina and Sava Rivers; the Southern Adriatic along the Moraca and Bojana Rivers; and the Skadar Lake and the Western Adriatic, which are fed by waters crossing through Bosnia and Herzegovina and Croatia. Montenegro has broad biodiversity and a sensitive ecosystem; about 15% of its territory is deemed national parks or natural reserve zones.

Montenegro's GDP in 2005 was EUR 1.8 billion; its average GDP per capita more than doubled between 2000 and 2005. Montenegro's main industries are bauxite extraction, aluminium production[210] and steel works. Industry's share of GDP declined to 25% in 2005, compared to 34% in 2000. By contrast, the shares of services, particularly tourism, have increased to almost 60% (from 49% in 2000). Agriculture has remained stable at 16%. Inflation stabilised during the same period, declining from a peak of 25% per year in 2000 to a low of only 2% in 2005. Montenegro's external debt as a share of GDP diminished from 70% to slightly more than 40%. Despite otherwise good economic performance, the country's unemployment rate remains high at 28% (UNECE, 2007).

ENERGY DEMAND AND SUPPLY

Sources and methodology

Montenegro is in the process of establishing its data system, with the aim of converging to international standards[211] based on methodologies developed by Eurostat, the International Energy Agency (IEA) and the United Nations Economic Commission for Europe (UNECE). Montenegro's national statistical office – MONSTAT – has established an Energy Statistics Unit (three staff members) within its economic statistics sector. The Unit is participating in a regional capacity building project[212] with the Swedish International Development Agency (SIDA). Energy balances for 2004 are available in background documents of the *Draft Energy Development Strategy to 2025*. As of end of 2007, MONSTAT published partial statistics on coal and electricity for 2006.[213]

Demand

According to Montenegro's official energy balances for 2004, total final energy consumption (TFC) was 0.75 Mtoe, made up of oil products (48%), electricity (45%) and fuelwood (7%). Almost half of this energy was consumed by industry (47%);[214] the other main consumers were transport (20%), and residential and agriculture (31%). In 2006, TFC was estimated at 0.76 Mtoe, with a similar breakdown by sector. However, other estimates that more accurately account for fuelwood consumption calculate that TFC in 2004 was 23% higher at 0.91 Mtoe, with fuelwood making up 24% of TFC.

210. Bauxite mines in Niksic and an aluminium smelter in Podgorica are majority owned by the Rusal Group of Russia. This industrial complex accounts for most of Montenegro exports, consumes roughly 40% of electricity and is the largest employer in the country.

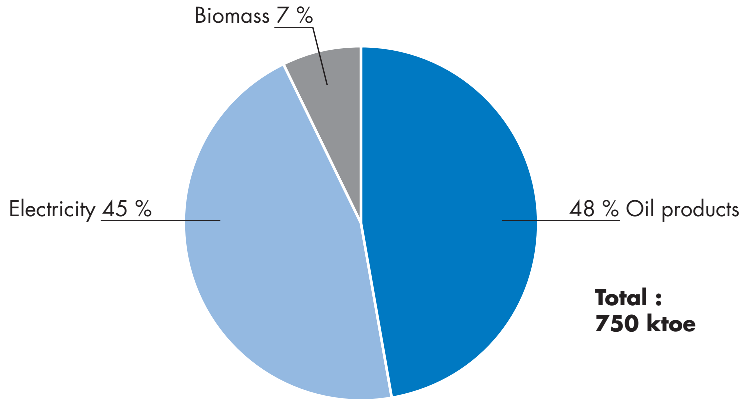
211. Montenegro energy data are included in IEA statistical publications as a part of the SFR Yugoslavia until 2003, and as a part of Serbia and Montenegro from 2003-07.

212. The project aims to enhance co-ordination of national energy statistics across the region.

213. MONSTAT has acquired a clear understanding of the high use of fuelwood through regular household surveys. However, the *EDS 2025* is based on energy statistics that consider only fuelwood harvested in public forests.

214. This includes the KAP aluminium smelter, which accounts for 39% of TFC.

Figure 21 ....Montenegro's total final consumption by fuel, 2005



Source: Montenegro Statistical Office (MONSTAT).

Supply

In 2004, total primary energy supply (TPES) was 1.04 Mtoe – a level that has remained relatively constant since the 1990s. The main inputs are oil products (34%), lignite (44%), hydropower (15%) and others (2%). Fuelwood consumption, which is officially estimated based on reports from commercial suppliers and retailers, accounts for about 5%. According to household surveys, actual consumption of fuelwood is estimated at 0.22 Mtoe and accounts for 18% of a higher TPES of 1.21 Mtoe. In 2005, the breakdown of TPES reflected a decrease in lignite production[215] (below historical levels of 1.5 Mt), as well as a lower estimation of fuelwood consumption.

Energy intensity

Although accurate GDP data is lacking, Montenegro's energy intensity was estimated at 0.77 toe per thousand USD of GDP (in year 2000 USD) in 2002; it subsequently dropped to 0.48 in 2005. Despite this decrease, Montenegro's energy intensity is still 2.5 times higher than the average for OECD Europe. Measured with purchasing power parity (PPP), energy intensity is much lower at 0.26 toe per thousand USD of GDP (PPP year 2000), but is still 40% higher than the average for OECD Europe. This high level of energy intensity is driven by significant electricity consumption in the aluminium smelting process, which boosts the ratio of electricity consumption to GDP to 0.72 kWh per thousand USD of GDP and overall consumption to 6 200 kWh per capita. By contrast, regional averages for the Western Balkans are 0.51 kWh and 4 100 kWh. Montenegro's economy is also carbon intensive, estimated at 1.24 t CO_2 per thousand USD of GDP.[216] This is two times higher than the average for OECD Europe.

215. The decrease in production was caused mainly by low productivity and operational difficulties at key mines.

216. This estimation does not include emission of fluorinated gases from the KAP aluminium smelter.

ENERGY POLICY AND INSTITUTIONS

Institutions and overall strategy

Institutions

Responsibility for various aspects of Montenegro's energy sector is split amongst a number of different institutions:

The ***Ministry of Economic Development – Energy Sector (MED-ES)*** has broad responsibility in the energy and mining sectors, covering three main areas: drafting of policies for energy, energy efficiency and privatisation of energy companies; monitoring the energy sector and the public companies within it; and co-ordinating international co-operation. The MED-ES is also responsible for drafting energy laws and for enforcing energy and mining laws and regulations. The MED-ES is under the authority of an assistant minister and has four regular staff (staff is scheduled to increase to eight). The Ministry is also in charge of fuel quality and spatial planning.

The ***Energy Regulatory Agency of the Republic of Montenegro (ERA)*** was founded in 2004, according to the Energy Law. The ERA is a non-profit organisation with public authorisation and has 18 employees. ERA's budget is independent from the state budget, and derives mainly licensing revenues. The Agency monitors and controls the operations of participants within the energy sector. The ERA's main activities include: developing regulations and rules needed in the implementation of the country's Energy Law and implementing this law. In this context, the ERA also revises and approves market regulations, and prepares the code for the electricity transmission grid (including conditions and terms for connecting and accessing the grid). The ERA also issues licenses within the energy sector (*e.g.* production, generation, distribution and sale of electricity), and formulates tariffs and prices in accordance with the Energy Law.

The ***Ministry of Tourism and Environment (MTE)*** is the main institution responsible for environmental issues in Montenegro. Its Sector for Environmental Protection (staff of 15, expected to increase to 25) is responsible for drafting national strategies, policies, laws and standards. The Sector also performs administrative duties related to the protection of land, water and air, the sustainable use of natural resources and protection of biodiversity. Its mandate extends to regulations related to hazardous wastes, integrated pollution prevention and control, strategic environmental assessments (SEA) and environmental impact assessments (EIA), as well as co-ordination of water supply, protected areas, and standards and registers.

The ***Ministry of Agriculture, Forestry and Water Management*** is responsible for forestry, agricultural soils, water protection and use. In this respect, this ministry plays a special role on energy and environmental issues, including those related to fuelwood and deforestation.

The ***Ministry of Transport, Maritime Affairs and Telecommunications*** is responsible for the reduction of pollutant emissions from motor vehicles. As the vehicle fleet expands in Montenegro, the importance of this issue will magnify and require additional resources.

The ***National Council for Sustainable Development (NCSD)*** was founded in 2002. The Council is headed by the prime minister and comprises representatives from various ministries and scientific institutions, the business sector and non-governmental organisations (NGOs). The Council's main role is to implement the National Strategy for Sustainable Development (NSSD) and the Developmental Direction of Montenegro as an Ecological State.

The ***Office for Sustainable Development (OSD)*** was established by the government in January 2006, as a result of a joint project between the United Nations Development Programme (UNDP) and the Open Society Foundation Institute. Its mandate is to facilitate the functioning of the NCSD. To this end, the OSD also created an ***Inter-ministerial Working Group for Sustainable Development*** and the ***Forum of NGOs***.

Other bodies that have a role in shaping energy policy or contributing to various policy documents include: the Montenegro Chamber of Commerce; the Engineering Chamber; the Association of Civil Engineers; the Academy of Sciences; the Podgorica University; and a number of NGOs and business associations.

Energy policy and strategy

Key issues

- ***Demand projections***
- ***Policy priorities and capacity***
- ***Regulatory focus***
- ***Investment options***
- ***Governance capacity***
- ***Public participation***

The Energy Policy of Montenegro was drafted in 2005. It was the result of years of preparation of various policy documents and background analyses and benefited from the support of a Slovenian technical assistance project. This document has since been superseded by the *Draft Energy Development Strategy to 2025,*[217] the making of which reflects broader institutional and public engagement. In the summer of 2007, the MED-ES launched a public discussion of the draft, including contributions from various parties and international donors. Parliament adopted the *Energy Development Strategy* (hereinafter referred to as the *EDS 2025*) in December 2007.

The *EDS 2025* is well integrated with other key policies including the *Draft National Spatial Plan* (which is in the process of public discussion and adoption) and the *Poverty Reduction Strategy* (2003), as well as various environmental sector documents and strategies. The *EDS 2025* also reflects Montenegro's international obligations and aligns instruments to fulfil these obligations. It is also co-ordinated with the *Strategic Environmental Assessment,* which was prepared with the assistance of UNDP.

The *EDS 2025* does not identify any clearly defined policy priorities. However, it does list 25 "main strategic commitments" and general policy priorities that set out four primary objectives:

217. The *EDS 2025* is available at: www.sre.vlada.cg.yu/index.php.

- Implement international commitments and obligations in energy and environment (including the Energy Community Treaty, the EU *acquis communautaire*, and the EU Stabilisation and Association Agreement).
- Improve the efficiency of energy production and consumption to "the level of mid-developed EU member countries."
- Decrease import dependency and improve of security of supply.
- Improve the sustainability of the energy sector in line with national strategies for sustainable development and poverty reduction.

Box 6..................Montenegro's *Energy Development Strategy to 2025*

To support implementation of the *EDS 2025,* Montenegro also adopted the following policy tools:

- Establish and implement a data monitoring system in line with the Eurostat/IEA/UNECE methodology for the presentation of national energy data.
- Adopt measures to encourage scientific and technological development in the energy sector.
- Develop relevant secondary legislation for effective implementation of the *EDS 2025*; harmonise domestic and international legislation, including the Energy Community Treaty, EU Directives, the Kyoto Protocol, etc.
- Co-operate in international energy programmes.
- Review existing and develop/adopt new legal documents, technical standards and regulations related to the construction of electricity plants and other facilities, with the aim of increasing energy efficiency.
- Strengthen the Energy Efficiency Unit of the MED-ES to promote and implement the *Energy Efficiency Programme.*
- Establish rules and regulations defining simplified procedures for obtaining concessions and authorisations for construction of small HPPs and other renewable energy facilities, including permits for network access and licences for power generation and sale; also simplify the use of the Kyoto Protocol's clean development mechanism (CDM).
- Build the capacity of government bodies to monitor implementation of the *EDS 2025*.
- Re-structure Montenegro's electricity utility, *ElektroPrivreda Crne Gore* (EPCG) and other energy companies to be financially sustainable and capable of operating in a competitive market; finance its development; set up a corporate development strategy and privatisation strategy for EPCG.
- Establish tariff and pricing policy for fuels, taking into account market-based costs (including environmental protection costs) and profit, thereby encouraging efficient energy use and protecting the interests of consumers with respect to security and quality of energy services.
- Develop a targeted subsidy programme to enable vulnerable groups to satisfy minimum needs for electricity and heating.

The *EDS 2025* projects that TPES in Montenegro will grow by 5.5% per year to 2025, and proposes measures and energy investment projects to match this increase. It is important to note that this projection was made without any formal or comparative least-cost investment plan. According to the *EDS 2025*, the projected increase in electricity demand will be met by a number of new power plants: a new unit at the 225 MW Pljevlja TPP and other TPPs fuelled by municipal solid waste; a range of hydropower plants (HPPs) along the Moraca River, the Komarnica HPP and additional small HPPs.

Energy policy is also critical to the development of Montenegro's tourist industry, which has significant potential to support overall economic growth. Large amounts of private capital and public infrastructure, as well as natural and human resources, are engaged (or could be engaged) in the tourist industry, which is most active during the country's short summer season. Extending the tourism season to the entire year could bring considerable economic benefits. However, lack of adequate and reliable energy supply may be an obstacle to this development. The energy requirements of a modern tourism industry, combined with improved energy efficiency, could influence future energy demand as well as spatial distribution of energy facilities.

In addition, the *EDS 2025* highlights the need for further exploration of prospective oil and gas deposits in coastal areas, increased use of LPG in the energy mix and the development of natural gas infrastructure. It also envisages arrangements with neighbouring countries to support trans-border hydropower potential, cross-border energy interconnections and integrated water management.

Discussion

Considering the small size of Montenegro's energy system, it could be argued that small and flexible institutions are sufficient to manage the sector. However, more resources and more activities are required to fully develop the economic and social potential of Montenegro while providing sufficient, economic and secure energy supply. Montenegro will need to build sophisticated skills and administrative capacity to effectively pursue the complex array of development needs and opportunities (such as transport and tourism), and to manage existing and build new infrastructure while also protecting the country's environmental sensitivity.

Although a relatively small country, Montenegro needs additional administrative capacity to achieve various policy objectives related to international treaties and agreements. The MED-ES needs adequate financial resources to employ and retain qualified staff, and to build its own capacity for policy making.

The *EDS 2025* is the first strategy of its kind for Montenegro as an independent state. Despite this, its breadth and depth of coverage is remarkable. The *EDS 2025* tackles most of the development aspects and attempts to provide well co-ordinated development guidelines. It also has clear inter-relations with the *Poverty Reduction Strategy*, the *National Spatial Plan* and the *National Strategy for Sustainable Development*, as well as with other environmental strategies and obligations.

Review of the *EDS 2025* reveals a lack of full consideration of the various – and, indeed, attractive – options for energy production and diversification open to Montenegro. The *EDS 2025* also lacks any rigorous analysis of the feasibility and economic potential of such options within an integrated least-cost plan for supply and demand.

Montenegro's *EDS 2025* is, in many ways, exceptional in the regional context – particularly in terms of its high degree of alignment with other strategies. However, a more comprehensive foundation could have been created through more structured consultation with a wider range of stakeholders. Indeed, the *EDS 2025* may be too focused on energy supply and investment projects, and may fall short in adequately considering ways to limit energy demand or on identifying important medium-term policy priorities (such as energy security and climate change).

The government and energy stakeholders should continue to promote open discussions on the *EDS 2025*, and build mechanisms for more substantial public involvement when scheduling amendments. One shortcoming in the *EDS 2025* process has been the limited availability of data on Montenegro's energy potential and future development of the national economy. Another weakness is that public discussion has been, to a large extent, a reaction to proposed draft documents and does not adequately consider that Montenegro lacks independent research to provide constructive critique or questions. The government may find it useful to consider providing funding to support independent research and publications, as well as to strengthen the energy data system.

Market reforms and regulation

Key issues

- ***Privatisation***
- ***Barriers to entry***
- ***Energy price setting***

Over the past five years, Montenegro's regulatory framework has been progressively developed. It now includes the *Energy Law* (adopted in 2003) and regulation conforming to the Energy Community Treaty, as well as requirements on environmental protection, urban planning and other relevant areas.

The *Energy Law* lays the basis for a competitive energy market. It also defines the status and role of the government and of the Energy Regulatory Agency (ERA).

The opening of the electricity market to competition has been prepared and scheduled according to the requirements of the Energy Community Treaty. As of January 2008, industrial customers can choose their suppliers. KAP (the aluminium smelter) and Niksic steel works have already exercised the option to enter into agreements with foreign suppliers on the portion of their supply not covered by Montenegro's electric utility, *ElektroPrivreda Crne Gore* (EPCG). KAP is purchasing about one-third of its electricity needs from alternative suppliers; it is the largest and most advanced electricity consumer in the region, as well as the most actively engaged in the regional electricity market.

EPCG is functionally unbundled. The government recently launched a decision on legal unbundling of EPCG into five functional companies.[218] The lignite mines in Pljevlja (EPCG's sole supplier) are already a separate company and majority owned by private entities (only 31% of shares owned by the government).

Comprehensive re-structuring of the Pljevlja lignite mining, electricity generation and heating complex is a separate and critically important component of the *EDS 2025*. This has been attempted for a number of years. However, it faces significant remediation costs, which discourages private investors.

While regulated energy tariffs are now set by the ERA, as the competitive market is being progressively introduced, the ERA is expected only to monitor tariffs and no longer fix them. However, the government may still play a role by introducing taxes on energy, or on its carbon content.

The ERA exercises its control and regulates prices over electricity produced domestically and electricity imported from Serbia under long-term swaps for the Piva HPP; in total, this represents about 50% of electricity delivered to the domestic market. The ERA also sets electricity transmission and distribution tariffs and lignite prices. The Agency has wide responsibilities in approving commercial re-structuring and technical realisations across the entire energy sector. Ultimately, the ERA is responsible for protecting consumers. ERA decisions are final and binding; however, administrative acts of the ERA can be challenged at the Administrative Court, as was done in late 2007.[219]

Electricity prices for commercial consumers (EUR 0.13/kWh) are twice as high as residential prices, which remain below cost-recovery levels (at below EUR 0.07/kWh) (Table 26). Thus, electricity prices are influenced by the cross-subsidies from commercial consumers (at low voltage) towards residential and large industrial consumers. The government plans (by 2011) to increase household tariffs to almost EUR 0.11/kWh (from EUR 0.044 in 2006) in an effort to gradually eliminate these cross-subsidies.[220] Higher prices for the commercial sector should encourage competition – provided that licensed foreign suppliers have effective third-party access to the grid.

Electricity prices for large consumers (*e.g.* KAP aluminium smelter and Niksic steel works) are set through privatisation agreements, for a specified period of time. EPCG is obliged to provide specified volumes of electricity at determined prices to these consumers. In exchange for this relatively low electricity price, EPCG receives a subsidy from the government. The two largest consumers are expected to purchase all their electricity on the regional market by 2011. Until that time, ERA only monitors these pricing arrangements. Imported electricity is billed to regulated customers at the average import price.

218. Subsidiaries for transmission, distribution, generation, supply and procurement, and TPP Pljevlja.

219. In 2007, the electricity utility EPCG claimed that ERA tariffs were not in line with the existing regulation and challenged the ERA decision at the Administrative Court. The Court sided with EPCG; three relevant court decisions are published on the ERA website: http://regagen.cg.yu

220. Eliminating cross-subsidies will be difficult given the related issues of non-payments and the lack of meters for some consumer classes.

Table 26 .... Energy prices and taxes in Montenegro, 2005 (in EUR/unit)

	Residential	Services	Industry
Electricity/kWh	0.066*	0.131	0.044
Diesel (Eurodiesel)/L	0.950	0.950	0.950
Gasoline (RON 95)/L	1.090	1.090	1.090

* Due to the fixed "calculated capacity fee", price per kWh differs according to actual total consumption. Services/commercial and industry tariffs also include considerable fix charges. All prices included VAT (17%).
Note: Liquid fuel prices include import duties (2%), excise taxes (EUR 0.364/L of gasoline and EUR 0.270/L of diesel), road and development charges, and VAT (calculated on a sub-total that includes all other expenses and taxes).
Sources: EPCG; ERA; Jugopetrol-Kotor.

Oil product prices in Montenegro are set at cost-recovery levels and in accordance with import prices. However, they include high transport and handling costs, as well as excessive profits due to the relative lack of competition. The government has already made a number of arrangements to introduce or strengthen competition in the oil product market including:

- Privatisation of Jugopetrol Kotor (the largest oil products retailer in the country).
- Pursuing plans to privatise EPCG, the port of Bar (the main seaport) and MontenegroBonus (a state-owned trader in oil products, which is present in the retail market in co-operation with foreign strategic partners).
- Provision of import capacities to other market players.
- Extending the product terminal of the port of Bar in order to introduce more competition in import and retail of LPG.

Discussion

Montenegro is keen to build a modern, open and competitive energy market. However, it faces many challenges along the way. The ERA's primary role is to regulate natural monopolies. In the future, monopolistic structures will be affected by market opening and other instruments. It could be considered that the energy market in Montenegro is too heavily regulated – even to the extent that the regulation becomes a specific barrier to market entry.

The small size of Montenegro's market may also act as a barrier to entry. In the case of the oil product market, which has been liberalised with relatively low formal barriers to entry, its small size limits its attraction to investors. At the same time, high and growing demand incite monopolistic behaviour of incumbent players.

The ERA has demonstrated considerable independence from the government, ministries and commercial entities in the energy sector – in terms of professionalism, legal position, independent staff and budget, practice of public hearings and in its enforcement capacity. Its activities are also easily accessible to the public. However, the Agency needs more adequate financing, especially if its scope is to be broadened to cover natural monopolies beyond the electricity sector. For example, in addition to setting prices for regulated customers and regulating natural monopolies in transmission and distribution, the ERA was recently involved in price setting between two monopolies (*i.e.* lignite supply from the Pljevlja mines to EPCG).

International conventions, such as the Energy Charter Treaty, have not yet been introduced into Montenegro's legal system. These would contribute to realising the benefits of market reforms, notably market opening and privatisation.

Energy security

Key issues

- ***Integration of regional markets***
- ***Competitiveness***
- ***Energy efficiency***
- ***Productivity***

Montenegro imports about 40% of its energy, notably oil products and electricity. The country has sufficient transport and port capacity to import oil products from the Mediterranean market. It is also well supplied with electricity transmission capacity (at 400 kV and 220 kV) and construction of more capacity[221] is underway. However, electricity imports are scheduled to increase over the short term, which raises questions of security of supply.

Montenegro's *EDS 2025* does not state a specific position regarding energy security. However, it does emphasise diversification of energy supplies, broadening the spectrum of available fuels, use of renewable energy sources and increasing domestic production at conventional HPPs and TPPs.

Montenegro's diversification plans focus on increasing the share of LPG in the energy mix. LPG is considered a secure supply option due to its abundant supply in the Mediterranean market and the relatively modest demand envisaged in Montenegro's *EDS 2025*. The plan to increase domestic energy production will require construction of additional lignite-fired TPPs and a range of HPPs.

As an energy security instrument, the *EDS 2025* envisages the development (by 2025) of a public stock of oil products, equal to 90 days of consumption. According to the country's current consumption mix,[222] available oil product storage capacity is estimated to be sufficient for 45 days of strategic reserves.

Discussion

Despite its growing share of energy imports, Montenegro's *EDS 2025* does not focus directly on the issue of energy security. This is perhaps due to the wide range of sources of supply it has access to through the Mediterranean and its large capacity of electricity transmission.

221. Financial assistance from the KfW will be used to construct a double line (400 kV) from Montenegro (Podgorica) to Albania (Elbasan), thereby improving Montenegro's link to the entire area along the Adriatic coast, and to Albania and Greece. Montenegro entered into an arrangement with Italy regarding a joint feasibility study on an undersea high-voltage direct current (HVDC) cable from Podgorica across the Adriatic Sea to the Italian coast.

222. About 60 kt of existing storage capacity could be available for 45-days stock; increasing to 90-days stock would require construction of another 60 kt of storage capacity.

The government may find it worthwhile to consider expanding Montenegro's participation in the regional electricity market for two reasons. First, such expansion would enhance the security of the domestic network. Second, it would create opportunities to use hydropower exports to the country's competitive advantage – *i.e.* by exporting peak hydropower to cover summer peaks and importing base-load power during its own winter period peaks. The *EDS 2025* does not consider this as an option, nor does it envisage any further specialisation or better use of existing capacity.

Instead, the main objective of Montenegro's *EDS 2025* is to increase the share of domestic energy production to cover the country's growing energy demand. Construction of new competitive power generation capacity will be crucial to reducing the energy burden. Improvements in productivity and efficiency throughout the energy sector, in particular reducing network losses, should also play important roles.

At present, there is no policy priority for improving energy efficiency, controlling domestic demand or decreasing seasonal fluctuations and peak demand. This is unfortunate: tapping into economically viable sources of energy savings would facilitate increased export of Montenegro's high quality, peak hydropower and enhance the country's competitiveness in regional energy markets.

Energy efficiency

Key issues

- ***Energy efficiency policy and instruments***
- ***Energy subsidies***
- ***Tariff structure***

Montenegro's *Energy Efficiency Strategy* (adopted in 2005) highlights a large economic potential in the area of energy efficiency, estimating it to be in the order of 20% of current energy consumption (about 200 ktoe) (*Energy Development Strategy;* Vujosevic, 2007). This high potential reflects the lack of focus on energy efficiency in the past. A significant portion of this potential lies in the network losses that currently persist in energy production, transmission and distribution. Additional potential could be tapped in the industrial, tourism, public and residential sectors (particularly in electric heating and air conditioning).

To focus on this potential, the MED-ES established (in 2003) an Energy Efficiency Unit.[223] Unfortunately, the Unit is understaffed, having only one or two professionals. Still, the *Energy Efficiency Strategy* has made some positive, if small, steps forward, notably through a programme to reduce electricity network losses. According to the ERA, implementation of the first phase of the programme successfully reduced (by 20%) losses in the EPCG distribution network. However, other sources (UNDP, 2007)

223. Functions of this small administrative unit are mostly to draft, co-ordinate and monitor implementation of energy efficiency programmes (including reduction of network losses in electricity distribution) and to draft specialised energy efficiency legislation.

argue that network losses remain significant, accounting for up to 29% of electricity supplied to customers in the distribution grid – or nearly 12% of overall electricity throughput.

To phase out cross-subsidies, the *Energy Efficiency Strategy* envisages that residential electricity tariffs should rise by 200% in real terms between 2004 and 2009. This is considered a critical measure to facilitate energy efficiency in terms of consumer awareness and investment in more energy efficient appliances, in particular to replace electric space and water heating. Such a dramatic increase in residential electricity prices will be politically difficult to implement. However, if consumers are informed and aware of the plans, investments can be made to adapt to the price increases.

Discussion

The *Energy Law* establishes the government's responsibility in promoting energy efficiency. The *Energy Efficiency Strategy* identifies a large energy efficiency potential that is economically viable; however, it does not seem to suggest the need for public policy support. This is perhaps because the *Energy Efficiency Strategy* lacks significant focus on efficiency improvements in key areas such as fuelwood demand, the impacts of enhanced use of biomass, seasonal energy demand swings[224] and the need for co-ordination with transport policy. The *Energy Efficiency Strategy* also fails to identify instruments to improve the efficiency of energy use – even though these economically viable savings could allow for increased exports, thereby enhancing Montenegro's competitive advantage in regional electricity markets.

The policy to increase electricity prices to cover marginal costs is an encouraging first step toward improving energy efficiency. However, complementary policies are needed to overcome other obstacles such as lack of information, skills and technical expertise, as well as a lack of technological or building standards. The *Energy Efficiency Strategy* also fails to address the issue that some consumers (including residential customers) still have access to energy subsidies. Most troublesome in this respect is that the largest consumer in the country – the KAP aluminium smelter in Podgorica – has access to subsidies. As long as energy prices remain low, these consumers are unlikely to pursue energy efficiency investments. Another weakness is the lack of an appropriate instrument to improve the situation for consumer groups (the poor, public institutions, etc.) that do not have sufficient financial resources to actively pursue energy efficiency improvements.

Despite an apparent need to limit growth in transport fuel consumption, there is no national transport strategy or comprehensive plan to introduce better public transport along main corridors or in popular tourist areas.

Increases in energy prices will stimulate interest in energy efficiency solutions. Various tax levels could also be used to promote the use of more efficient fuels. However, tariff structures for commercial consumers include an exceptionally high fixed capacity

224. Network losses are concentrated in periods of winter and summer seasonal peak demand. Measures to improve the energy efficiency and insulation in the residential sector could be an effective way to improve quality of supply and decrease losses.

component. In addition, in many areas in Montenegro, the quality of electricity supply is insufficient to support the use of sophisticated and energy efficient equipment.

Energy and environment

Key issues

- ***Implementation capacity***
- ***Carbon intensity***
- ***Environmental impacts of lignite***
- ***Conflicting responsibilities***

According to its Constitution, Montenegro declared itself as an 'ecological state' in 1991; in 2002, it established an environmental agenda. Progress is being made on the basis of the European Partnership Agreement and relevant sections of appropriate *European Partnership Implementation* Plans. The 2003 *Agenda of Economic Reforms* (for the period 2002-06) includes a specific section that addresses environmental issues.

The 2003 *Poverty Reduction Strategy* defines priority measures to tackle the main environmental challenges in the context of poverty reduction, including prevention of human health risks caused by environmental pollution and further improvement of environmental management. The *National Spatial Plan* and the *National Environmental Action Plan* are under development; environmental strategies are already in place for a number of sectors (tourism, waste, sewage, coastal areas, etc.). In late 2007, the government approved the *National Spatial Plan* and sent it to Parliament for final adoption. The *Draft Law on Air Quality* sets the objective to establish a national air quality monitoring system.

Montenegro ratified the Kyoto Protocol in March 2007 and is preparing its First National Communication to UNFCCC. Montenegro is developing a greenhouse gas (GHG) inventory but has not yet published data on CO_2 emissions. Estimates indicate total CO_2 emissions at around 2.5 Mt in 2005. Total GHG emissions are likely to be higher, owing to the emissions of fluorinated gases from KAP.

Lignite burned in the Pljevlja TPP has high contents of sulphur (0.8 to 1.6%) and ash (29 to 35%), which cause significant local environmental and health impacts. The *EDS 2025* envisages the installation of flue gas desulphurisation (FGD) technology at existing units in the Pljevlja TPP and construction of a new unit with FGD.

Discussion

Despite high profile political declarations and strong aspirations toward sustainable development and environmentally friendly policies, Montenegro's progress in environmental policy in the energy field has been limited. The country lacks effective tools, solutions or resources to address environmental problems related to energy transformation and use. Pure technical solutions (*e.g.* installing FGD devices at existing and future TPPs) may prove prohibitive for economic investments in existing and new generation capacity.

Lignite mining and combustion have significant negative impacts on the city of Pljevlja, which are exacerbated by the area's relatively closed air-shed and low levels of wind. The situation requires urgent measures including the introduction and use of more efficient solid fuel stoves, the use of waste heat from the power plant to dry fuelwood, and the conversion of most heating boilers to dry wood combustion. The rapid replacement of lignite for heating in the City of Pljevlja seems to be feasible, economic and environmentally desirable, but does not address the need for a sustainable, longer term heating strategy. A comparative feasibility analysis of various options regarding the Pljevlja TPP (*e.g.* closure in the context of Kyoto Protocol mechanisms, reduced utilisation, replacement, FGD installation or co-firing of biomass) has not been completed.

Environmental governance in the energy sector is shared between ERA, MED-ES and environmental institutions headed by the Ministry of Tourism and Environment. However, there is no clear hierarchy of responsibilities. Moreover, in the face of looming electricity shortages during the winter heating season and the risk of growing import dependence, environmental problems in the energy sector rank low on the government's list of priorities and challenges.

Environmental NGOs in Montenegro are fairly well developed. Their concentrated action has influenced the Parliament to rule out (in 2006) the construction of new large HPPss on the Drina River, which would have flooded a UNESCO World Heritage Site in the Tara River Canyon. However, these organisations are failing to address environmental impacts arising from lignite and fuelwood combustion.

Montenegro has an advanced legal and strategic environmental framework; however, it lacks the institutional capacity to make substantial environmental improvements in the energy sector.

THE ENERGY SECTOR

Lignite

Key issues

- ***Local economic development***
- ***Sustainability of lignite mining***

Lignite is an important domestic energy source in Montenegro, accounting for 32% of TPES. It is produced in two mining areas in Pljevlja and Berane. The Pljevlja open-pit lignite mines are minority-owned by the government; the Berane underground mines are privately owned by foreign investors. The Plevlja lignite mines produce the largest volumes, delivering close to 1.5 Mt/y, more than 90% of which is directed to the

Pljevlja TPP. The mine employs a staff of 1 500. The Berane brown coal mines deliver less than 100 kt per year, primarily to domestic retail markets and minor volumes of exports. It employs a staff of 100 to 200.

The *EDS 2025* envisages a doubling of mining activities in the Pljevlja lignite basin to supply lignite to additional units of the Pljevlja TPP. However, current conditions in the Pljevlja mines are difficult due to the depletion of the most cost-effective resources. This has resulted in a decline in the average quality of lignite extracted from Pljevlja (9 162 KJ/kg) and increased extraction from the Potrolica open pit, in which the overburden-to-lignite ratio is high. A number of unresolved technical problems (nearby rivers, low productivity, land acquisition, etc.) prevent industrial scale mining. Lignite delivered to retail markets from Pljevlja and Berane mines are of significantly better quality (almost 14 000 KJ/kg). The SO_2 content of Pljevlja lignite varies from 0.8 to 1.6%, which is high in comparison to its calorific value.

The Pljevlja TPP is the country's largest consumer of lignite, with annual consumption of about 1.4 Mt. A small volume of lignite is supplied to residential and institutional consumers in the city of Pljevlja. The fact that the Pljevlja TPP's precipitators are below modern technical standards causes considerable air pollution in the closed air-shed of the Pljevlja valley. It is not surprising that recent attempts to privatise the plant and the remaining government-owned shares in the Pljevlja mines have been unsuccessful.

Discussion

Considering the current condition of lignite extraction in Pljevlja lignite basin and the low level of technology and utilisation rates of the Pljevlja TPP, the government will likely face additional challenges in terms of security of energy supply and the difficult social situation in the Pljevlja area. Other challenges include the important employment aspect of the lignite mines and the Pljevlja TPP, and the environmental problems accumulating in the area. These challenges could expand beyond the institutional, technical and financial capacity of Montenegro and the Pljevlja municipality. A complex remediation strategy is needed to address the problems and propose practical solutions.

If the lignite mine in Pljevlja, which is already majority privately owned, were willing to pursue a more commercial strategy (*e.g.* selling products to retail markets in the region), it should be free to improve productivity, efficiency and decrease employment. Authorities need to consider the economics of various options including closure of the Pljevlja TPP or its eventual use as reserve capacity for certain periods. This analysis should fully consider opportunities arising from the recently ratified Kyoto Protocol, as well as the longer term option of replacing the TPP with different combustion technology.

Given the many inter-related and sensitive issues, the government should undertake a comparative least-cost investment plan to assess the best way forward in the lignite sector. The social consequences of any of these strategy options must be considered within the scope of a wider economic development strategy for the Pljevlja region. Eventual privatisation of the remaining state shares in lignite mines and the Pljevlja plant could be reconsidered within the scope of these policy options, keeping in mind the aim to identify sustainable and practical solutions for environmental, social and local development issues.

Oil products

Key issues

- ***Barriers to entry***
- ***Quality of fuels***
- ***Use of LPG***
- ***Market facilitation***
- ***Public transport***

There is no production of oil products in Montenegro; the entire domestic consumption is imported. Two offshore exploration blocks off the coast of Montenegro are held by Jugopetrol Kotor (owned by the Hellenic Group of Greece).

The largest importer, trader and retailer of oil products is Jugopetrol Kotor. Other participants include the state-owned Montenegro Bonus and INA of Croatia, as well as a subsidiary of Srbija Gas of Serbia (which produces only LPG). A small number of private retailers own and operate 70 filling stations.[225] Supply to the domestic market includes gasoline (60 kt), jet fuel (4 kt), diesel (80 kt) and light heating oil (15 kt).

The quality of imported products is supposed to be in line with EU standards adopted by Montenegro. However, the lack of appropriate technical standards and legislation, coupled with lax enforcement within Montenegro's customs procedures, means that imported products often fail to meet these standards. The government has requested international technical assistance to develop capacity to fully enforce EU standards as of 2008. Montenegro also plans to introduce biofuel blends as of July 2008.

LPG supply to the domestic market rose from 2.7 kt in 1997 to 4.8 kt in 2004 and is increasing. A strategy to increase utilisation of LPG, particularly along the coast and in the region of the city of Podgorica envisages that, in the short term, LPG could enable some tourist facilities to operate year-round. It is the first step in a longer term plan to introduce natural gas to small- and medium-sized consumers in these regions.

Discussion

At first glance, Montenegro has a vibrant and open oil products market. However, the country still has much work to do to further open the market, reduce barriers to entry, and improve the quality of products and service. Montenegro lacks the technical and institutional capacity needed to ensure the appropriate level of fuel standards. This is a critical problem in the densely populated city of Podgorica and in coastal areas, where the bulk of traffic is concentrated. Public transport is not well developed and mostly based on buses.

LPG is considered as a fuel of choice by both the authorities and the market in Montenegro. Although LPG consumption has increased, volumes are still far below those of other liquid fuels. The *EDS 2025* envisages an increase in the use of LPG in commercial facilities and residential buildings, but not in transport. However, in

225. Jugopetrol Kotor operates 39 fuel stations; another 31 stations are owned by other companies. Several companies – including Montenegro Bonus (in co-operation with Petrol of Slovenia), Jugopetrol Kotor and OMV of Austria – have all announced intentions to build more stations.

order to develop a larger LPG market, it would be necessary to establish emergency stocks and/or strategic reserves. This would mean major investments in a number of areas, including enhancing limited storage capacity. Comparative feasibility studies will be needed to assess the economics of this strategy.

Natural gas

Key issues

- ***Natural gas market***
- ***Regional integration***

Montenegro does not have natural gas resources or natural gas infrastructure. There is potential for offshore natural gas production with total estimated reserves of 425 bcm (*Draft Energy Development Strategy, 2007)*. In October 2007, Montenegro entered into an arrangement with Albania and Croatia to consider a gas pipeline (capacity of 5 bcm per year) from Croatia towards the Albanian border via Podgorica. The *EDS 2025* lists the possibility of an LNG terminal (capacity of 5 bcm per year) near the Port of Bar, in conjunction with a 1 200 MW combined cycle plant and undersea cable to Italy. However, these plans are in a pre-feasibility phase and no further consideration or sector analysis is available.

Discussion

There is a lack of strategic considerations on the eventual role of natural gas in Montenegro's energy mix, as well as on its economic rationale and its potential impact on security of supply. Montenegro envisages a role for itself in the regional development of natural gas infrastructure; however, it still lacks an overall understanding of the role natural gas can play in its domestic market and in the country's economic development. The implicit strategy pursued by the government to date has been more supply-side oriented, without sufficient assessment of consumer demand and market.

Electricity

Key issues

- ***Least-cost investment plan***
- ***Participation in regional energy market***
- ***De-centralised generation***
- ***Energy efficiency***

Electricity is the most important energy product in Montenegro. Total installed capacity (868 MW) is 75% hydropower and 25% lignite-fired. Electricity is produced by the Pljevlja TPP (210 MW), by HPPs at Piva (342 MW) and Perucica (307 MW), and by a few small HPPs[226] (all of which are owned by the electrical utility EPCG). In 2006, HPPs generated 1.7 TWh and TPPs generated 1.2 TWh. Total imports were 2.9 TWh or 47% of electricity supplied; this includes 1.2 TWh exchanged with Serbia

226. Seven small HPPs with total capacity of 7 MW and annual production of about 17 GWh.

(the remaining imports were primarily from Bosnia and Herzegovina). Total exports were 1.07 TWh, including 1 TWh to Serbia.

The *EDS 2025* envisages several projects to increase electricity generation and reduce environmental impacts. The most significant project is the construction of additional lignite-fired units (225 MW) in Pljevlja, coupled with the installation of pollution prevention equipment (de-sulphurisation, electrostatic precipitators, etc.) on existing and new units. Other planned construction projects include a range of HPPs along the Moraca River, the Komarnica HPP and a few small power plants using renewable energy.

Electricity output of Montenegro's HPPs fluctuates considerably (by as much as a factor of two) from year to year and even more between the highest and lowest monthly production levels. This affects the utilisation rate of the Pljevlja TPP, as do the large seasonal fluctuations of electricity demand.

The HPP at Piva is rented to EPS, Serbia's national electricity company, in exchange for base-load electricity supply. This arrangement was made in 1976 in the form of a 30-year framework contract (which has been *de facto* extended). The Piva HPP has strategic importance for use of hydropower resources along the Piva–Tara–Drina water regime, and has considerable impact on the use and output of HPPs downstream along the Drina River in Bosnia and Herzegovina and Serbia.

Electricity transmission and distribution are ensured by two separate companies, both owned and operated by the EPCG. The transmission grid is largely integrated with those of Bosnia and Herzegovina and Serbia. Network losses, especially in distribution, are still very high – reaching an estimated 30% of consumption.

In 2006, total electricity consumption in Montenegro was 3.8 TWh, broken down as follows: industry (60%), households (30%), and service and other sectors (10%). There are two main high seasons in terms of electricity demand: the winter season, due to the use of electricity to supplement or cover heating needs, and also a shorter peak demand during the tourist season in mid-summer.

A large share – some 43% – of electricity consumption is used by the aluminium smelter (KAP) in Podgorica. KAP has a continuous base-load demand of roughly 200 MW, which is technologically bound and cannot be interrupted or decreased at short notice. Securing this supply is a challenge for the Montenegro electricity system and for the import and export infrastructure. According to the contract for privatisation of KAP, the government of Montenegro guarantees the smelter a certain level of electricity supply at predetermined prices.[227] The contracted volumes decline from year to year and the obligation is scheduled to expire in 2011.

227. Prices are set in line with the international price of aluminium. As international prices were in short-term increase during recent months, they exceeded tariffs approved by the ERA. However, international prices remained below regional market price and the EPCG declared its satisfaction with price levels. During 2008, the EPCG is contracted to supply two-thirds of electricity to KAP; this will drop to one-half in 2009 and only one-third in 2010. In 2011, KAP will procure its entire consumption on the open market. This arrangement exposes the EPCG to severe risk in relation to future fluctuations of aluminium prices and liquidity problems. It also engages EPCG's infrastructure in serious duty to guarantee supply to a very sensitive industrial facility. Furthermore, because aluminium prices are set in USD and EPCG expenditures are primarily in EUR, the company is exposed to currency exchange rate risks. From a wider perspective, Montenegro could consider KAP's current net contribution to GDP against its energy consumption and the opportunity to use that energy in other industries and services.

The electricity tariff structure in Montenegro has evolved over the last seven years, from prices far below marginal costs to a much more comprehensive system that attempts to reflect marginal costs. Imported electricity is charged according to average import prices; however, domestic production is subject to ERA regulation. At present, considerable cross-subsidy is built into the system for low-voltage networks: electricity prices for commercial consumers are several times higher than those for residential consumers on the same network. Cross-subsidies are scheduled for elimination by 2012 through a gradual tariff increase for residential consumers. Over the same period, the government will introduce targeted subsidies for vulnerable households.

Discussion

Construction of new electricity generating facilities is a key element in Montenegro's *EDS 2025*. The bulk of new generation will come from an additional lignite-fired unit in Pljevlja. However, the *EDS 2025* envisages relatively low utilisation rates (below 5 000 hours per year) for this new plant due to fluctuating hydro resources and the limited availability of lignite in the Pljevlja basin. The combination of high capital expenditures (*i.e.* conventional TPPs + enlargement in lignite mine + environmental protection) and low utilisation could limit the economic feasibility of this plant.

To date, Montenegro has not undertaken a least-cost investment plan to compare various other plant options (including those that are not currently envisaged by the EPCG). A least-cost investment plan would also provide better information regarding more effective valuation of current and future hydro resources on the regional electricity market, de-centralised energy options and energy efficiency improvements. Considering the remaining useful life of the existing Pljevlja TPP, its upgrade should be assessed within the scope of a least-cost investment plan.

Montenegro's *EDS 2025* is well co-ordinated with the national environmental strategies, the *National Spatial Plan* and the *Poverty Reduction Strategy*. However, its critical recommendations carry an implicit increase in carbon intensity, notably with the increased use of lignite in Pljevlja and a "business as usual" scenario in industry (particularly at KAP). The use of natural gas, de-centralised energy options and renewable energy are included in the *EDS 2025,* but only in a limited way.

The *EDS 2025* places considerable emphasis on reducing both technical and commercial network losses. However, policies focus on conventional technical measures (*e.g.* new generation capacities and technical reinforcement of network) and on guidelines for disconnections.[228] The *EDS 2025* does not envisage more sustainable and longer term options such as de-centralised generation, increased digitalisation[229] and demand-side energy efficiency. Considering the climate conditions and the concentration of population in urban and coastal areas, Montenegro would do well to improve flexibility and manageability of electricity distribution network. Such measures, in conjunction with conventional network reinforcements and de-centralised generation, would help to reduce technical network losses.

228. Disconnection policy establishes the rules for disconnecting non-paying customers; this is done according to volume of outstanding debt and availability of technical teams.

229. The EPCG recently completed installation of set of digital electricity meters within the framework of a World Bank assistance project. Pilot installations have been carried out at selected sites on the distribution network to facilitate learning and technology dissemination.

Heat

Key issues

- *Heating strategy*
- *Use of fuelwood*
- *Cooling*
- *De-centralised energy*
- *Heating strategy for the city of Pljevlja*

The predominant heating mode in Montenegro is electric space heating, which accounts for at least 50% of heat consumed. This creates problems with peak electricity demand during the winter heating season and places undue stress on the network. Use of fuelwood is also important (estimated at around 40% of heat consumed) but problematic due to the use of low-efficiency, light heating stoves.

There is only minor heat production in Montenegro, generated in one small heat-only boiler plant in Pljevlja. A small amount of other heat is produced in private or institutional buildings. When the Pljevlja TPP was constructed in the 1970s, the plan envisaged a heat distribution system for the city of Pljevlja,[230] the rationale being that such a system would moderate air pollution originating from local burning of lignite and fuelwood.

Discussion

Montenegro's energy policy does not propose any heating strategy or measures to improve the energy efficiency of wood stoves, even though much of the population relies on fuelwood and is affected by considerable reductions in heated living space during the heating season. Similarly, there is no cooling/air-conditioning strategy to moderate summer electricity demand peaks in coastal areas.

Heat pumps are being imported into the country in vast numbers, and installed in residential and commercial spaces. However, there are no import regulations, energy labels or technical standards to facilitate improved energy efficiency of these devices at the point of use.

Renewable energy

Key issues

- *De-centralised energy*
- *Solar energy*
- *Heating/cooling strategy*
- *Biomass*
- *Heat pumps*

230. The plan developed at that time (and subsequently updated on numerous occasions) is based on steam extraction from the low pressure steam turbine in the Pljevlja TPP, which is a standard Soviet design. Such an approach implies that during periods with heat demand, electricity output is somewhat reduced. No heat distribution system has ever been built, even though its construction was repeatedly set as a condition in privatisation tenders for the plant.

Given its small size, Montenegro possesses remarkable renewable energy potential.[231] Considerable portions of TPES already derive from hydropower (19%) and fuelwood (18%, based on household surveys). The government has the objective of reaching a renewable share (excluding fuelwood) of 20% by 2020. To actively pursue this objective, the MED-ES envisages a new organisational structure to establish (in 2008) a Renewable Energy Unit.

The *Strategy for Development of Small Hydropower Plants* (adopted in April 2006) estimates the overall potential for small HPPs at approximately 800 to 1 000 MW of installed capacity (not including the Tara, Cehotina and Ibar Rivers), giving a technically assessed potential of 230 MW with about 640 GWh of annual generation. In line with this *Strategy's* Action Plan, first concession tenders were published in December 2007. Small renewable electricity producers have a guaranteed access to the distribution grid, and are exempt from transmission grid fees. Montenegro's *EDS 2025* envisages the installation of 80 MW capacities of small hydropower, with annual production of 200 GWh.

Forests covers about 42% (6 750 km^2) of Montenegro's territory. Wood is used predominantly for residential heating. Official sources report fuelwood consumption of 150 000 to 220 000 m^3 per year; other sources estimate actual use of fuelwood at 500 000 to 750 000 m^3. Wood waste and residuals are likely to have considerable potential although there are no available estimates. The *EDS 2025* envisages the construction of 5 MW capacity co-generation plants using wood biomass and 10 MW plants using municipal waste. However, no specific support mechanisms are available or envisaged.

Solar energy is considered economically viable in three regions of Montenegro: along the coast, near Skadar Lake and in the capital city of Podgorica. These areas have up to 2 500 hours of direct solar irradiation per year. Average solar energy measured in southern cities (Ulcinj and Bar) is higher. Solar thermal installations are used in some hotel and tourist resorts, with total installed surface of 11 000 m^2 for a capacity of approximately 5.5 MW. The *EDS 2025* does not envisage specific instruments to facilitate further use of solar thermal applications.

A wind atlas of Montenegro is not yet available. Various sources assume considerable wind potential in coastal areas and on mountainsides overlooking the seacoast, lakes and valleys. Measurements performed in the Niksic area (in 2002) indicate a wind potential of 225 W/m^2. One wind generator has been installed at Ilino Brdo, with Dutch technical assistance. The *EDS 2025* envisages the construction of 60 MW of installed capacity of wind energy in the medium term.

Use of underground water or geothermal sources is envisaged only for cooling purposes and only in the area surrounding the city of Podgorica.

231. In February 2007, the Italian Ministry for Environmental Protection, Land and Sea provided technical assistance to assess *The potential of renewable energy sources in the Republic of Montenegro*, which will serve as the basis for more detailed measurements.

Discussion

Montenegro has significant renewable energy potential both for network/centralised and de-centralised uses, notably biomass and solar thermal. The announced objective of a 20% share of renewable energy by 2020 is not an ambitious target if it includes hydropower, which already accounts for 19% of TPES.

Small hydropower potential is sizeable and has been given a priority through a concession approach. However, regulatory and economic barriers will need to be resolved in order to attract investment.

Fuelwood is used extensively in Montenegro, highlighting the need for adequate forest management and more efficient use to ensure its sustainability. Wood waste has a significant potential, notably in de-centralised facilities, but will require better co-ordination amongst the country's forestry strategy, the *National Spatial Plan* and the *EDS 2025*.

Solar energy offers much more interesting energy potential than envisaged by existing strategies. Montenegro would do well do explore the potential of solar water heating, solar space heating and even photovoltaic applications, as well as wider introduction of solar architecture and adjustments of building standards.

In term of renewable electricity, Montenegro's electricity network could benefit from skipping one technological generation and opting for a network that would support de-centralised energy options including various renewable energy options. Such a comprehensive strategy could be much more ambitious in making use of renewable energy.

OVERALL RECOMMENDATIONS

In addition to the recommendations and key findings included in the Overview and in the regional chapters, the government of Montenegro may consider the following recommendations useful.

Institutions and overall strategy

- Provide further support to the energy administration (ministries and agencies); ensure its capability to employ and retain high quality personnel.
- Continue regular and open public consultation on energy policy options; provide more relevant data in the public domain to facilitate independent and innovative research.
- Continue to develop a national system for energy statistics, with adequate resources and staff.
- Consider the use of a comprehensive least-cost investment plan (for both supply and demand) to ensure solutions that are environmentally and socially sustainable.

Market reforms and regulation

- Enforce the energy regulatory framework in compliance with the Energy Community Treaty; consider better integration into the regional electricity market.
- Continue to refine efforts to introduce viable competition in the retail oil market; reduce physical barriers to market entry.
- Build on the ERA's accomplishments to expand its regulatory scope to regulation of natural monopolies.
- Finalise the phasing out of electricity cross-subsidies; increase transparency of subsidies to large industries and progressively phase them out; design an electricity tariff structure to promote use of most efficient fuels, particularly for commercial purposes.
- Consider accession to relevant international conventions such as the Energy Charter Treaty to facilitate further market opening and reforms.
- Consider complex and sustainable re-structuring of publicly held energy companies prior to their privatisation, notably the Pljevlja energy complex, the Port of Bar and the EPCG; also explore various legal arrangements and assess eventual remediation costs.

Energy security

- Consider further development of competitive advantages within the domestic energy industry as a means to enhance energy security.
- Develop tools and instruments to enhance international competitiveness, notably by improving local demand-side management and reducing seasonal peaks.
- Continue to monitor strategic oil reserves and establish an emergency energy system.

Energy efficiency

- Implement the *Energy Efficiency Strategy* with the support of a strong public body; upgrade the capacity and scope of the existing Energy Efficiency Unit; create an inter-ministerial co-ordination mechanism similar to (or attached to) the Office for Sustainable Development.
- Provide better co-ordination amongst energy efficiency policies and other related policies (taxation, pricing, import regulations, spatial and urban planning, transport, etc.)
- Increase availability of advice and information in the public domain to facilitate investments in energy efficiency.
- Consider the development of integrated public transport systems in densely populated urban areas and along the coast to alleviate import dependence on liquid fuels.
- Adopt EU energy efficiency regulation, particularly for appliances and building standards.
- Establish support (*e.g.* tax cuts) and financing schemes (*e.g.* bank loans) for energy efficiency.

Energy and environment

- Strengthen the capacity of government institutions and civil society involved in the environmental governance to focus on the environmental impacts of energy production and use.
- Shift responsibilities for environmental governance in the energy sector to avoid conflicts of interest – *i.e.* transfer responsibilities from the MED-ES and the ERA toward the Ministry of Tourism and Environment (as in other European countries).
- Address carbon intensity and pollutant emissions through appropriate action plans within the scope of existing environmental strategies and in line with recommendations of the UNECE Second Environmental Performance Review.

Lignite

- Provide and assess options to address current problems and longer term sustainability in the Pljevlja lignite basin, possibly with the support of technical assistance programmes.
- Assess, using a least-cost investment plan, the economics of additional lignite-based electricity generation.

Oil products

- Develop quality control laboratories for oil products; enhance institutional enforcement capacity to control imports.
- Support broader use of LPG, notably in transport.

Natural gas

- Reassess the strategic role natural gas can play in the country's energy mix; consider its economic rationale (especially in relation to supporting a year-round tourist industry) and its potential impact on security of supply.

Electricity

- Upgrade the electricity sections of the EDS 2025 based on a least-cost investment plan that compares various supply and demand options.
- Increase the flexibility and efficiency of the electricity network.
- Consider increased participation in the regional energy market, notably through export of peak power.

Heat

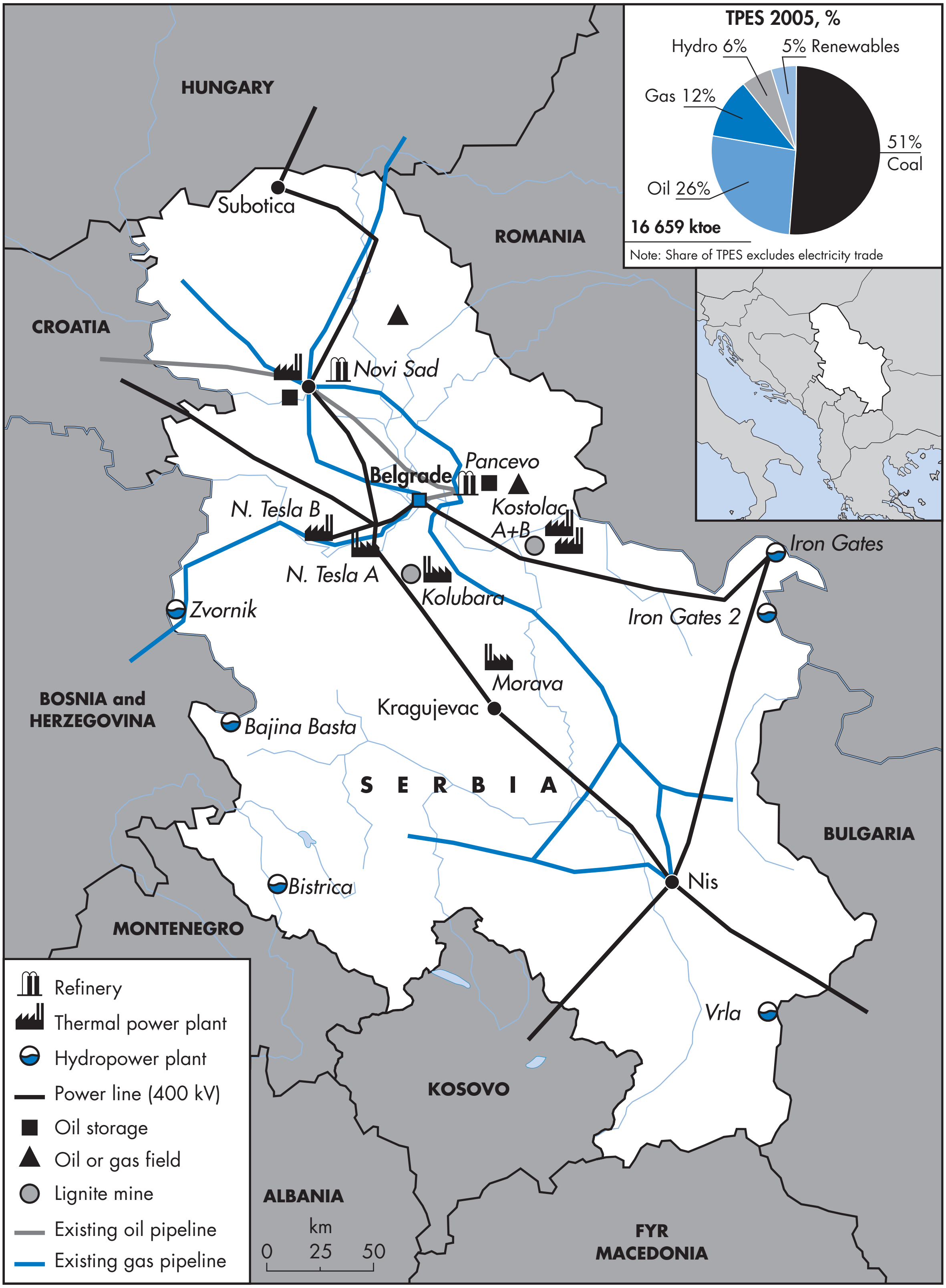
- Consider a least-cost investment plan to reduce electricity network losses; consider de-centralised co-generation and/or tri-generation, co-ordinated with an appropriate heating/cooling strategy.

- Develop a special heating strategy for the city of Pljevlja, taking into account recommendations from the UNECE *Environmental Performance Review of 2007*.

Renewable energy

- Design and implement a broad action plan for renewable energy, with ambitious and realistic goals related to institutional support, regulation (tariff) and incentives.
- Consider, within the scope of a least-cost investment plan, renewable energy options to reduce electricity network losses.
- Support wider use of solar thermal applications through the development of appropriate technical standards, energy labelling, knowledge dissemination, taxation and customs policy.

Map 10 ....Serbia's energy infrastructure



The boundaries and names shown and the designations used on maps included in this publication do not imply official endorsement or acceptance by the IEA.

IX. SERBIA

SERBIA'S ENERGY HIGHLIGHTS

Table 27 ....Energy snapshot of Serbia, 2005

	Serbia	Western Balkan region	OECD Europe
Total primary energy supply (Mtoe)	16.7	38.7	1 875.0
Total final energy consumption (Mtoe)	9.7	25.4	1 340.0
Energy consumption (toe) per capita	2.26	1.62	3.50
Electricity consumption (kWh) per capita	3 930	2 970	6 145
Energy intensity of GDP*	0.41	0.25	0.15
Carbon intensity (kg CO_2/GDP*)	1.24	0.69	0.33
Net imports as % of TPES (Dependence)	32	**	44%

* In terms of purchasing power parity; in toe per thousand USD (in year 2000 US dollars).
** Not calculated to avoid double counting due to intra-regional trade.
[i] Sources: Ministry of Mining and Energy of Serbia; CHELEM; IEA statistics (with additional data from administrations in Montenegro and Kosovo used for calculation of averages for the Western Balkan region).

Serbia's energy infrastructure suffered from the lack of maintenance and management during the 1990s and was damaged extensively by the NATO bombing campaign in 1999. By 2004, Serbia's electricity network had been sufficiently rebuilt to play a key role in the reconnection between Zones 1 and 2 of the Union for the Co-ordination of Transmission of Electricity (UCTE). By contrast, refineries remained in a fragile condition.

Since 2003, Serbia has developed its energy strategy and established a market-based regulatory framework, enforced by an independent regulator. This serves as a foundation for energy reforms, particularly the re-structuring and modernisation of the state-owned energy companies and the further development of energy markets.

Reducing energy intensity provides large investment opportunities and potential gains for business competitiveness and population welfare. Development of a market-based regulatory framework, coupled with a comprehensive least-cost investment plan to assess supply and demand options in the energy sector, could ensure adequate consideration of all aspects (*e.g.* economics, energy security and environment) for long-term sustainability. Much of this could be tapped through simple and low-cost measures (*e.g.* awareness campaigns, improved building insulation, performance regulations and codes for appliances and building).

Serbia ratified the Kyoto Protocol as a Non-Annex I country and will be eligible for clean development mechanism (CDM) projects over the commitment period 2008-12. Serbia plans to release its First National Communication to the UNFCCC in 2008.

SERBIA'S ENERGY CHALLENGES

Lignite dominates Serbia's domestic energy production and contributes to its relative energy self-sufficiency. However, lignite mining and processing by the electricity sector lacks efficiency and has significant negative environmental impacts: it accounts for almost 90% of the country's energy emissions of SO_2 and NO_x, and for 65% of CO_2 emissions. The government has put in place national policies and measures to reduce emissions, and is moving toward ratification and implementation of the Convention on Long-range Trans-boundary Air Pollution (CLRTAP), the Aarhus Convention and other international agreements.

Cost-reflective tariffs and the phasing out of cross-subsidies are crucial to providing adequate financial resources to the energy sector and to preparing for market opening. Serbia needs to assess options (*e.g.* digital metering technology, effective control of tariff category eligibility and direct payment) to establish a more effective and diversified tariff system.

Serbia's large energy sector has considerable development potential, and could play a key role in future energy transit and in the regional energy market. Serbia opened its electricity market to commercial customers in 2008 and will expand it to all customers in 2015, in line with the Energy Community Treaty. However, several barriers (particularly low tariffs) prevent any real switching of suppliers or emergence of eligible customers.

Serbia's overall energy import dependency is moderate at 32%; however, it imports more than 85% of its crude oil and natural gas needs, and depends on foreign services for gas storage. Security of supply of natural gas in Serbia depends on a single supplier (Russia), via a single supply route, for the bulk of gas supplies. The recent sale of oil and gas infrastructure to Gazprom – Serbia's sole natural gas supplier – raises concerns about the long-term impact on Serbia's energy security and market opening.

INTRODUCTION

Serbia[232] emerged from the break up of the former Socialist Federal Republic (SFR) of Yugoslavia following the wars and political turmoil that affected the region during the 1990s. The first general elections were held in December 2000, and marked the beginning a period of democratisation and economic reforms. In early 2005, Serbia and the European Commission initiated negotiations on the EU Stabilisation and Association Agreement. Following a referendum held in May 2006, Montenegro declared its independence and separated from the Federation of Serbia and Montenegro.

As in many countries in the Western Balkan region, the combination of military conflicts, political instability and international sanctions since the early 1990s[233]

232. This chapter refers exclusively to the Serbian energy policy, without reference to information on energy policy for the territory of Kosovo and Metohija (which is covered in the subsequent chapter on Kosovo).

233. Within the SFR Yugoslavia, Serbia experienced financial liquidity problems from the late 1980s, as well as decreasing volumes of barter trade arrangements with Comecon countries. As of December 1988, Serbia experienced disruptions in barter supplies of fuels and chemicals. UN sanctions began in May 1992.

damaged Serbia's economy and delayed its transition to a market economy. Since 2001, Serbia has experienced rapid economic growth with GDP increasing at an average rate of 5.5% per year, one of the highest rates in the Western Balkan region. In 2005, the GDP per capita was about EUR 2 700 per year (IMF, 2007).[234]

Serbia's total population is 7.4 million (Statistical Yearbook of Serbia, 2006),[235] including about 500 000 refugees and internally displaced persons. Serbia is located at the heart of Southeast Europe; its total land mass[236] is 77 474 km^2. It is geographically diverse, with altitudes measuring between 70 m and 2 000 m above sea level. Forest cover is slightly below 30% of the country territory. Northern Serbia is exceptionally well supplied with inland waterways: sections of the Danube (588 km), Tisza (168 km) and Sava (206 km) Rivers are interconnected, comprising almost 900 km of navigable channels through 40% of Serbia's territory. More than half of the population lives along these waterways and most economic activity is concentrated in urban centres on their banks. Although Serbia is landlocked, its navigation and irrigation systems are among the largest in Europe (second only to the Netherlands). Thus, the use, maintenance and development of these systems are important to support Serbia's economy.

Box 7..................Serbia's energy infrastructure

Serbia's energy infrastructure, which already suffered from lack of maintenance and management over the 1990s, was all but destroyed by the NATO bombing campaign in 1999. The bombings demolished Serbia's two oil refineries (in Pancevo and Novi Sad) and caused heavy damage to the electricity networks (400 kV, 220 kV and partly 110 kV). The most strategic sub-stations were demolished together with the most important river crossings, as was almost the entire tank capacity for oil reserves. Power plants and boiler plants making up part of the district heating (DH) network suffered secondary damage; the main gas line was disrupted at the key Danube River crossing.

A reconstruction programme began in the summer of 1999, with a focus on rapid restoration of key functions. Although unreliable, the power network was restored by November 1999. Reconstruction continued after the political change in October 2000, with more comprehensive international assistance. Crude oil imports restarted in December 2000 via the Adria pipeline; these were refined at the Pancevo refinery.

In 2001, the government took a decision to concentrate donor funding on the power and DH sectors. The government also elected to prohibit all imports of oil products in order to secure refinery margins and provide incentives for their reconstruction. Unfortunately, some funds were diverted and refineries remained in a fragile condition in 2007.

234. At current prices.

235. This figure does not include inhabitants of the territory of Kosovo and Metohija.

236. Without Kosovo and Metohija.

Between 2000 and 2002, the electricity company was able to use the revenues from increasing electricity tariffs and donor assistance to dramatically improve the technical sustainability of operations. In October 2004, the network was sufficiently rebuilt to play a key role in the reconnection between Zones 1 and 2 of the UCTE.

Overall, the Serbia has received about EUR 1 billion in foreign assistance from international donors, as well as about EUR 200 million in "soft" credits from Russia and China.

Source: UNOCHA, www.reliefweb.org.

ENERGY DEMAND AND SUPPLY

Sources and methodology

Serbian energy data have not been reliable during the period 1990-2003. The unusual economic conditions prevented the establishment of a full and reliable database, especially on energy imports and energy consumption.

In accordance with Serbia's *Energy Law*, the Ministry of Mining and Energy (MME) is responsible for preparing the country's energy balance, which follows the format of the Eurostat Summary Energy Balance sheet. Serbia began establishing a framework for energy statistics in 2005. This is a long process under the best circumstances; thus, it is not surprising that the availability and quality of energy data (especially on final energy consumption) are still quite poor.

The MME recognises the importance of energy statistics as a key tool in creating and monitoring energy policy. It also acknowledges the need to develop a sound statistical system in accordance with international standards, which is recognised as one of five instruments for the realisation of the objectives of the *Energy Policy* and *Energy Sector Development Strategy* by 2015. However, lack of financial and human resources devoted to statistics continues to be a key concern. The Statistical Office still lacks the legal capacity to collect, process and publish appropriate energy statistics.[237] With the support of Sweden, the Statistical Office is working towards using methodologies developed by Eurostat/IEA/UNECE to carry out national energy balances, which should be completed by 2009.

As of 2007, Serbia's Statistical Office still did not produce comprehensive energy statistics. In addition, data published and used by other parts of the government and public energy companies may differ from Statistical Office data. Statistics on energy,

237. The MME organised a first workshop, entitled *Establishing New Modern System of Energy Statistics in Serbia* (April 2005), with more then 30 participants from the Republic Statistical Office and the Sweden Statistical Office, as well as representatives from Germany and energy companies. Following adoption of the *Energy Sector Development Strategy to 2015*, Serbia's Statistical Office established (in 2005) a division focused on energy statistics.

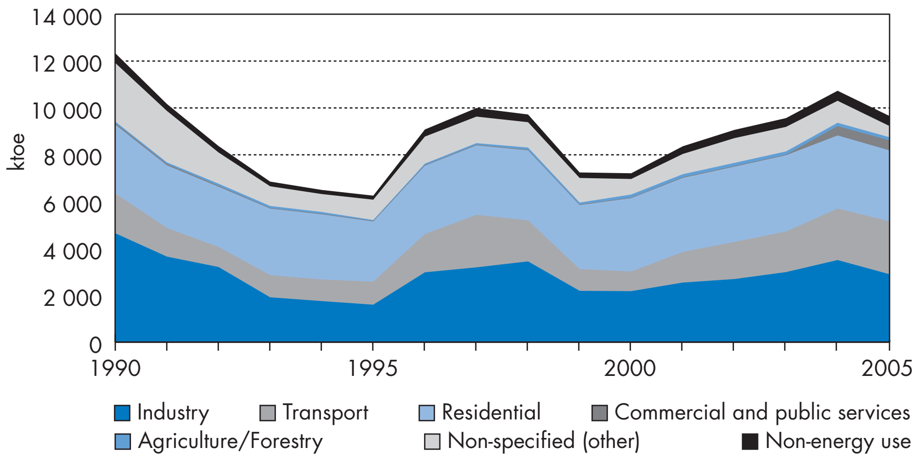
environment and transport still lack scope and reliability to support the development and implementation of strategies.[238]

Because of the data inconsistency and discrepancies, this Survey relies on data from several sources: the Serbian Statistical Office, the IEA and UNDP, as well as government agencies, public companies, the Serbian Chamber of Commerce and various donors. Until the energy balance of 2005, the IEA prepared a combined balance for Serbia and Montenegro. Following the separation of Montenegro (which took effect in June 2006), two separate country balances will be prepared.

Demand

Since 2001, Serbia has registered an overall growth in energy demand of almost 4% per year. Energy demand growth rates almost match GDP growth rates, largely due to increased activity in the residential and public administration[239] sectors, and increased demand for oil products and electricity. The residential sector accounts for 55% of electricity final consumption (IEA, 2007a) and more than 80% of fuelwood demand. Since 1990, the transport sector has experienced rapid growth in energy consumption and now accounts for 23% of TFC. Both TFC (9.6 Mtoe) and TPES (16.6 Mtoe in 2005) have increased strongly since 2000 (Figures 22 and 23).

Figure 22 ....Serbia and Montenegro's total final consumption by sector, 1990-2005*

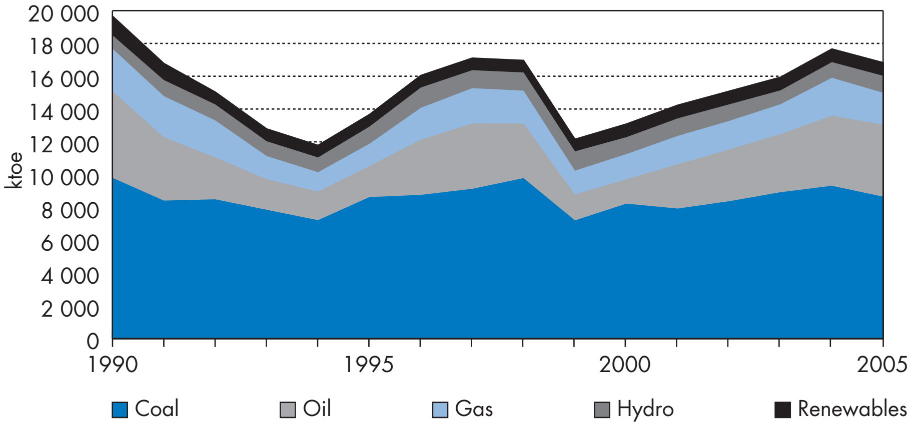


* According to the official submission of the Ministry of Mining and Energy of Serbia, data supplied to the IEA for Serbia include Montenegro until 2004 and Kosovo until 1999.
Source: IEA statistics.

238. Essential energy data in certain areas simply does not exist. Demand-side data lack residential energy consumption; cross-sectoral data need to be strengthened. Productivity in the energy sector is not measured.

239. Government, retail banking and financial services are the fastest growing sectors.

Figure 23 ....Serbia and Montenegro's total primary energy supply by fuel, 1990-2005*



* According to the official submission of the Ministry of Mining and Energy of Serbia, data supplied to the IEA for Serbia include Montenegro until 2004 and Kosovo until 1999.
Source: IEA statistics.

By contrast, industrial electricity demand has remained relatively low; virtually all increases can be attributed to exporting industries that take advantage of the low (*i.e.* subsidised) electricity prices as an effective export subsidy and competitive advantage. In the absence of effective energy and industrial policy, much of the growth in industrial output is driven by under-priced electricity; at the same time, slow growth in domestic power generation capacity acts to limit industrial growth.

Domestic demand for natural gas is driven by two sectors: the DH system and the fertiliser industry. Both are subsidised by municipal and state budgets. Export-oriented industries are also increasing their demand for natural gas.

Economic recovery and increases in the living standards of Serbia's population will inevitably boost TFC across key sectors (*e.g.* residential, public, commercial and agriculture). In 2005, the combined share of these industries in TFC was 37%.

Supply

Serbia's total primary energy supply (TPES) is 16.6 Mtoe (2005), of which 68% is produced domestically. Imports of crude oil and natural gas account for the rest of TPES. Coal (mainly lignite) dominates TPES accounting for 52%, followed by crude oil (25%), natural gas (12%), hydropower (6%) and fuelwood (5%) (Figure 23). Lignite-fired power plants generate two-thirds of Serbia's electricity needs. Electricity and fuelwood[240] provide space heating for more than two-thirds of the population (UNDP, 2004). Domestic energy production consists of low quality and low density

240. As in most countries of the region, fuelwood use is not fully accounted in official statistics. Serbia's Statistical Office reports about 2 Mcm of fuelwood is used per year. However, other studies estimate that actual annual consumption could be in the order of 12 Mcm (see Renewable Energy section).

energy with significant environmental impacts (largely related to lignite mining and burning). Import dependence is currently relatively low; however, the increasing costs of inefficient domestic production could lead to higher energy imports in the future.[241]

Energy intensity

According to 2005 IEA statistics[242], Serbia's primary energy intensity in terms of purchasing power parity (PPP) was 0.41 toe per thousand USD of GDP (in year 2000 USD), or 2.7 times higher than the average for OECD Europe (0.15 toe). By contrast, energy consumption per capita and electricity consumption per capita are 65% the OECD Europe average.

The Serbian economy is also very carbon intensive, with the energy sector being the main source of emissions. To date, there are no official data on CO_2 emissions; the inventory of greenhouse gases is under preparation. According to 2005 IEA statistics, Serbia's carbon intensity based on PPP (1.24 t of CO_2 per thousand USD of GDP) is 3.8 times higher than the average for OECD Europe. This trend is expected to worsen over time as the energy intensity of the energy extraction process is increasing. Provision of fuelwood is also becoming more carbon intensive in that, as the density of forest resources declines, greater energy input is required to cover the increase in average transport distances.

ENERGY POLICY AND INSTITUTIONS

Institutions and overall strategy

Institutions

The ***Ministry of Mining and Energy (MME)*** performs a range of administrative tasks related to energy, particularly in the fields of mining, energy, and the oil and gas industry. In addition to preparing Serbia's energy strategy and energy balance, the MME grants licenses for exploration and development of natural resources and is in charge of pipeline transport of gas and liquid hydrocarbons. The MME oversees the functioning of public enterprises that fall under its scope and provides supervision in fields related to its mandate. The Ministry has a staff of 70 distributed across six departments: General Energy; Power; Oil and Gas; Mining and Geology; Public Utilities; and International Co-operation.

The Regulatory Authority - Energy Agency of Serbia (EAS) was officially established in June 2005 by the Energy Law of 2004. The main aspects of the EAS mission are to promote energy market development, establish tariff methodologies and monitor

241. The extraction of 1 Mt of lignite requires the removal of about 3.5 Mt of rubble; this ratio is deteriorating as mining depletes easily accessible reserves. Fuelwood supply is energy intensive in terms of road transport; average transport distances increase with deforestation.

242. With revised GDP based on CHELEM database, February 2008.

the implementation of operation codes. It also collects and processes data on energy entities (with reference to performing energy activities) and monitors the behaviour of energy entities regarding separation of accounts and protection of customers. A technical assistance project, funded by the European Agency for Reconstruction (EAR), has supported the development of the EAS since 2002 and is to continue until 2008-09.

To date, the EAS has made important steps in two key areas. First, it has approved the methodology and criteria for setting costs for connection to electricity transmission and distribution systems. Second, it has set electricity and gas price methodologies for regulated customers; these prices cover electricity generation, transmission and distribution as well as distribution and transport of natural gas and transport of oil and oil products. Regulated companies use these methodologies to propose prices to the EAS for opinion and then to the government for final approval. The EAS is also responsible for licensing energy operators and traders. The Agency has a staff of 35.

The Serbian Energy Efficiency Agency (SEEA) was first established in 2002 by the government, then re-established according to the Energy Law of 2004 with a clearer mandate. It has status as a special organisation for carrying out professional activities aimed at increasing the efficiency of energy use within all energy end-use sectors, and to stimulate energy savings. It exists as a separate legal entity under the state budget. The SEEA has received EU donations (through EAR) for part of its programmes and projects. The Agency's main task is to implement activities to improve energy efficiency and increase the use of renewable energies. Five ***Regional Energy Efficiency Centres (REECs)*** have been established (at the technical faculties of universities in Belgrade, Novi Sad, Nis, Kragujevac and Kraljevo) to assist the SEEA in implementing energy efficiency and renewable energy policy, and further promoting energy efficiency. These Centres were established through financial and technical assistance from the government of Norway. The SEEA has a staff of 11.

The Ministry of Infrastructure and the Agency for Spatial Planning are responsible for spatial organisation of energy facilities at the national level. At the local level, city and municipal authorities, with their respective urban planning departments, are responsible for strategic allocation of energy facilities. The Ministry of Infrastructure sets building standards.

The Ministry of Finance controls wage bills and cash flows of state-owned energy companies.[243] The government approves regulated end-use prices for electricity and natural gas, as proposed by the MME. The Ministry of Finance and the Ministry of Trade and Services approve prices for key oil products (also proposed by the MME) in compliance with energy pricing regulations.[244]

243. The use of cash flow from state companies to support liquidity of public budgets is about 8.5% of GDP (World Bank, 2003).

244. According to the *Decree on Petroleum Product Prices*, oil product prices are linked to import prices of crude oil. A second government decree (*Official Gazette of Serbia 42/05 amended in 111/05; 77/06*) prescribes automatic adjustments of domestic price caps.

The Ministry for Environmental Protection (MEP) has the main responsibility for a wide range of issues including:

- Environmental protection systems and sustainable use of natural resources.
- Environmental monitoring and information systems.
- Climate change and protection of the ozone layer.
- Monitoring of, and protection against, trans-boundary air and water pollution.
- Providing permits and licenses, in accordance with the environmental impact assessments.
- Protection from ionising and non-ionising radiations.

The Environmental Protection Agency (EPA) was established in 2004 in accordance with the Law on Environmental Protection. As an enforcement institution within the Ministry for Science and Environment, its main functions include the development, harmonisation and management of the national environmental information system and development of the cadastre of polluters. In this regard, the EPA is responsible for the collection and unification of environmental data, and for developing procedures for processing and assessing such data. The Agency inspects and monitors the country's main energy facilities and sites in relation to environmental protection, and prepares reports on environmental conditions and implementation of environmental policy. As of 2007, the EPA had still not assumed its responsibilities.

The Ministry of Trade and Services and (since 2006) ***the Anti-Monopoly Agency*** are responsible for monitoring the monopoly behaviour of energy companies. As of 2007, there had been no anti-monopoly rulings related to energy companies. ***The Ministry of Agriculture, Water and Forestry*** controls the public company SrbijaSume, which manages public forests and is the most important fuelwood supplier in the country. This Ministry is also responsible for overseeing water management companies. ***The Ministry of Science*** facilitates scientific work in energy efficiency through the National Programme for Energy Efficiency, which was founded by the government in 2001. ***The Ministry of Economy and Regional Development*** oversees the activities of the Privatisation Agency and sets priorities in the privatisation process. It is also responsible for the national industrial policy.

The administrations of Vojvodina province and the city of Belgrade[245] play important roles in the areas of energy planning, energy efficiency and renewable energy sources. According to the Energy Law, municipal authorities are in charge of energy planning and energy balance at the local level.

The Serbian Chamber of Commerce[246] has an Energy Section, which is active in the energy sector, primarily by co-ordinating the involvement of almost all active players from large public companies to entrepreneurs and energy professionals.

245. Authorities of the city of Belgrade control the largest district heating company, which has more than one-third of Serbia's total district heating capacity. Belgrade also has the country's largest port and is located on critical sections of the Serbian waterways. Belgrade's urban planning and city transport policies affect more than one-third of the country's transport energy consumption.

246. The Chamber of Commerce also houses the association of district heating companies, a section for renewable energy and the Serbian Energy Society (an umbrella organisation of energy professionals).

Energy policy and strategy

Key issues

- ***Energy sector influence on policy and regulation***
- ***Separation of state functions***
- ***Co-ordination of administrations***
- ***Reliability and availability of energy statistics***

In October 2000, the Ministry of Mining and Energy (MME) began to establish a new legal, institutional and regulatory framework for the energy sector. These efforts were undertaken in line with the transition process and in harmonisation with EU principles, with the goal of creating a viable and efficient energy market. Key elements of the reform and the reform process include:

- Approval of the national *Energy Law of 2004* and adoption (in 2005) of the *Energy Sector Development Strategy of Republic of Serbia to 2015* (hereinafter referred to as the *ESDS to 2015*).
- Adoption (in 2005) of the National Gasification Action Plan.
- Establishment of the Energy Agency of Serbia (EAS) as regulator, according to the *Energy Law*.
- Establishment of the Serbian Energy Efficiency Agency (SEEA).
- Adoption (January 2007) of the *Programme for Implementation of Energy Sector Development Strategy - 2007-2012* (hereinafter referred to as the *Programme for Implementation*).[247]
- Ratification (July 2006) of the Energy Community Treaty.

According to the *Energy Law*, the main objectives of energy policy are to:

- Ensure safe, good quality and reliable supply of energy and energy sources.
- Balance development of energy activities (aimed at providing the required quantities of energy) and energy sources to meet the needs of consumers.
- Stimulate market competition based on principles of non-discrimination and transparency.
- Create conditions for the safe and reliable operation and functioning of energy systems.
- Ensure development of the energy infrastructure, including the introduction of state-of-the-art technologies.
- Promote energy efficiency in both supply and demand.
- Create transparent, attractive and stable conditions for investments in the construction, reconstruction and modernisation of energy facilities and systems, as well as in initiatives to link domestic facilities to the energy systems of other countries.
- Create conditions to stimulate use of renewable energy sources and of combined heat and power (CHP) generation.
- Promote environmental protection.

The MME is in charge of creating, implementing and monitoring energy policy. Energy policy is pursued through the implementation of the *ESDS to 2015* and the related *Programme for Implementation*, as well as through the energy balance (which also provides a projection of energy supply and demand for the following year). The MME drafts these documents for approval by the government and the Parliament, and also adopts secondary legislation.

247. The *Programme for Implementation of Energy Sector Development Strategy – 2007-2012* has a status of a decree.

Box 8..................Serbia's *Energy Sector Development Strategy to 2015*

In 2005, the Parliament adopted the *ESDS to 2015*, which outlines five priorities:

- Ensure the continuous technological modernisation of existing energy facilities, systems, and sources in all energy sectors (*e.g.* oil, natural gas, lignite, power and district heating).
- Ensure efficient use of high quality energy products; increase energy efficiency in the production and distribution of energy and in the utilisation of energy by end consumers.
- Enhance use of new renewable energy sources, as well as new technologies (including installations and equipment) that are more energy efficient and environmentally acceptable.
- Assess investments required in new electricity sources.
- Construct new energy infrastructure facilities and electricity generation capacity, within the framework of national and regional infrastructure.

Adopted in January 2007, the *Programme for Implementation* sets the conditions, policy tools and timeline for implementation of the *ESDS to 2015*. The *Strategy* aims to ensure that anticipated growth in energy demand can be met through more extensive use of domestic energy sources. This will require technical modernisation of existing utilities, enhanced efficiency and broader diversification of the sources and supply routes of oil and natural gas.

The role of hydropower in meeting future demand could be enhanced by increasing generation capacity through the refurbishment and upgrading of existing hydropower plants (HPPs) and the construction of new HPPs.

Existing and new open-pit mines are expected to provide lasting and reliable lignite supply to existing thermal power stations and to supply additional units already in the planning stages for the 2012-15 period. Additional electricity and heat production could be provided through the construction of new 350 to 400 MW natural gas-fired thermal power plants (TPPs), and through the commissioning of the Kolubara B TPP. Total investment costs for achieving the *ESDS to 2015* goals to increase capacity are estimated at EUR 6 billion. Of this total, some 80% would be directed to modernising the energy infrastructure; the remainder would be devoted to improving energy efficiency (12%) and expanding the role of renewable energy (5%).

To date, the government of Serbia has applied two key energy policy tools: regulation of energy prices and state-owned energy company wage bills and revenues; and regulation of energy trade. The government has also re-organised several public companies, primarily by unbundling activities of vertically integrated companies and scheduling them for privatisation. This has been the case in the oil sector.

Table 28 ....Implementation schedule of energy sector reform and priorities, 2002-15

PRIORITIES	
Basic priority of continuous improvement of technological and operating performance of energy sources and facilities	**Programmes of modernisation of technological systems and energy sources/facilities:** • Oil sector • Gas sector • Coal sector • Power sector • Production systems (TPPs, HPPs, CHP-district heating Companies) • Transmission systems • Distribution systems • Thermal energy sector (district heating companies and industrial power plants)
Targeted priority for economical use of energy products and increase in energy efficiency	**Programmes of economical use and increase of energy efficiency:** • Substitution of power for thermal energy services in the building sector, on the basis of the use of gas • Increased operating efficiency of all thermal sources in industry and municipal energy • Decreased electrical and thermal losses in district heating systems, industrial processing and buildings • Increased introduction of new energy efficient electric appliances and equipment/systems
Special priority for the use of new renewable energy sources and energy efficient technologies	**Programme of selective use of renewables and new energy technologies:** • Selective use of biomass, geothermal and wind energy for decentralised production of thermal/power. • More efficient use of natural gas by combined energy production (CHP) in municipal/industrial energy system. • Introduction of environmentally acceptable coal combustion technologies. • Construction of small and mini hydropower plants
Optional priority for extraordinary investments in new energy sources	**Programmes/projects of introduction of new gas technologies:** • A new combined natural gas cycle plant (250 MW) located in intensive consumption region. • Projects of local energy sources for CHP – low/medium capacity
Long-term priority for capital-intensive investments in new energy sources/facilities, and participation in the planning of new strategic energy sources and facilities (Regional/European markets)	**Programmes of capital-intensive and economically effective investments:** • Finalisation of TPP "Kolubara B" construction, or construction of a new TPP of similar power, using lignite or a combined natural gas cycle plant under new investment models (private/collective) and ownership • Construction of new oil pipelines for diversification of supply sources/transport routes • Construction of new systems of gas supply/transport, including a natural gas storage facility • Construction of trunk/distribution network of natural gas, in central Serbia (individual consumers) • Participation in the planning/construction of strategic energy sources; new HPPs on "border" rivers, including construction of new pump-accumulation hydropower plants

Note: Elements of energy reforms: The Energy Law adopted (in July 2004) as well as the Energy Sector Development Strategy of Serbia (in November 2004); Establishment of Energy Regulatory Agency (2004); Reorganisation of energy companies (2005 and 2006); Joining the regional energy market and establishment of internal energy market, including the harmonisation of regulations with those of the EU (2005/2009).
Source: MME.

Discussion

The government of Serbia has made much progress in implementing the country's *Energy Law* and delineating the responsibilities of the MME and the EAS, as well as setting the rules for energy company operation. However, as in many parts of the Western Balkan region, the Serbian government could derive much value from continuing to re-establish its effective power over the energy sector. At the same time, it should continue efforts to separate its own functions even more clearly – *i.e.* between policy making (MME), regulation enforcement (EAS) and company operation. Such separation would limit conflict of interests and political interference, as well as enhance rational market decisions.

As in many transition economies, the extensive network of institutions and the lack of co-ordination create a complicated institutional framework in which to develop, implement and monitor a comprehensive energy strategy. The Ministry of Finance has the strongest capacity to enforce policies, and assumes the role of co-ordinator between pricing policy, human resources and fiscal policies related to the entire energy sector.[248] The Ministry of Economy and Regional Development sets priorities for privatisation of energy companies, as well as provisions related to energy use and outstanding energy bills of other privatised industrial companies. The city of Belgrade and the provincial administration in Vojvodina pursue their own energy priorities.[249]

Serbia needs to improve the institutional organisation of government departments. It should also build capacity within the energy administration to improve energy policy design, implementation and monitoring. An option being considered is to establish the Development Institute as a focal point and advisor to the government on energy policy design and monitoring.

Sub-sectors (lignite, power generation, natural gas, district heating, etc.) are managed with little cross-sector optimisation. This is reflected in the lack of co-ordination in spatial planning and lack of synergy between the various energy development projects.

Despite its limited human and financial resources, the Statistical Office is now assuming its role in gathering data and producing energy statistics. It is encouraging that an initial least-cost investment plan has been prepared. However, this exercise lacked reliable data and its main results have not been made public.

Despite this progress, there is a risk that the persistent low efficiency of Serbia's energy sector and end-use may become a burden on the country's economic development, in particular due to:

- The extensive use of lignite, which lacks co-ordination with spatial management, health and environmental policies. The use of low efficiency (30%) power plants and heat-only boilers in DH systems in more than 40 cities (one-third of capacity concentrated in Belgrade), which is likely to be expanded.
- The extensive use of fuelwood for residential heating which generates complex environmental (*e.g.* deforestation and soil erosion) and health problems, and lowers the utilisation of energy network infrastructure.
- The lack of a coherent transport policy, including poor development of public transportation and use of waterways.

As in many countries in the Western Balkan region, the involvement of the non-governmental organisations (NGOs) and civil society in the energy and environment fields is still in its early development. Professional energy organisations play a major role in the formulation of energy strategies in IEA member countries; in Serbia, they still play only a minor role. In practice, no donor funding has been directed to domestic professional associations or associations of energy journalists. For the most

248. The government has not published inventory and capital statements for several years, nor is there any publicly available portfolio analysis of national asset management. However, oil company account receivables are linked to the budget and effectively controlled by the Ministry of Finance. Electricity bills are paid into the Treasury, then reimbursed to the company according to approved requirements in the budget. Effectively, the Ministry of Finance controls the financial liquidity of the entire energy sector and, thus, affects directly its credit rating.

249. For example, the *ESDS to 2015* envisaged use of waste heat from Nikola Tesla power plants for district heating in Belgrade. However, in 2006 the Belgrade district heating company dismantled the hot water pipeline built for that purpose.

part, organisations that do exist are funded by state companies, which are also large advertisers and donors to Serbia's main media channels. Serbia has not yet applied the public discussion practice envisaged by the Aarhus Convention,[250] which would support a broader and more open dialogue, notably on energy policy and its priorities, particularly investment projects.

Market reforms and regulation

Key issues

- ***Regulatory performance***
- ***Over-regulation***
- ***Distinction between natural/regulated monopoly and commodity markets/ price regulation***

The *Energy Law of 2004* regulates four main aspects of the energy sector: the generation, transmission, distribution and supply of electricity; the organisation and functioning of the electricity market; the transportation, distribution, storage, trade and supply of oil products and natural gas; and the production and distribution of heat. The MME monitors public service obligations. The EAS has established the first basic instruments for market reform and regulation, notably for operator licensing, energy pricing and methodologies to calculate network access tariffs. These instruments are used to prepare electricity and gas markets for opening to competition.

The government has completed the unbundling of the Electricity Networks of Serbia (EMS), and of the electricity transmission and network operator from *Elektroprivreda Srbije* (EPS), the incumbent. In the oil sector, the government has also unbundled Transnafta, the pipeline operator from the Oil Industry of Serbia (NIS). However, both EPS and NIS remain largely vertically integrated. Srbijagas, the natural gas utility, which traditionally focused on transmission and import activities, is now actively expanding into natural gas retailing, thereby strengthening its vertical integration. This is, in fact, a step backwards on the road to opening the sector to competition.

In accordance with the 2004 *Energy Law*, the EAS establishes the tariff systems; once these systems are approved by the government, energy companies use them to calculate energy prices. Electricity prices increased significantly since 2000, but from a very low initial level. After the last price increase in May 2007, the average electricity price was EUR 0.048/kWh for end-users. Electricity prices do not fully cover costs (*e.g.* for generation, network operation and measures to mitigate environmental impacts); rather, they reflect a cross-subsidisation of the residential sector by industry.

Discussion

The government of Serbia has unbundled key monopoly activities in the electricity and oil sectors. In parallel, the re-structuring of companies aims to bring corporate governance standards to European levels. This is a complex process, and Serbia is no exception in encountering delays in implementation.

250. Article 16 of the Energy Community Treaty (in relation with Annex II) envisages immediate implementation of the EU Directive 2003/35/EC from 26 May 2003. This enables public participation in the drawing up of certain plans and programmes relating to the environment, as well as access to court decisions.

Table 29 .... Main energy prices in Serbia by carrier and sector, 2007 (in EUR/unit)

	Residential	Services	Industry
Electricity (kWh)	0.045 – 0.190*	0.051	0.046
Gas (m^3)	0.309	0.260	0.260
Heat (kWh)	0.041**	0.091	0.091
Diesel (Eurodiesel) (L)	1.08	1.08	1.08
Gasoline RON 95 (L)	1.16	1.16	1.16

* This range reflects a three-tier system. Residential price increases with monthly consumption. Industrial tariff decreases with increase of actual monthly consumption due to fixed capacity fee.

** Price is declared per square meter per month flat tariff, based on a year-round flat tariff. It is recalculated according to average heat consumption per square meter in Belgrade. Prices in other cities could be higher.

Note: VAT is included for residential prices.

* Sources: Beogradske elektrane; EPS; NIS, Novi Sad Gas; OMV; Srbija Gas.

Very few consumers have applied for the eligible consumer status because regulated energy prices are artificially cheap and are cross-subsidised. Industrial and commercial electricity tariffs for low-voltage (0.4 kV) consumers remain relatively cheap (below EUR 0.022/kWh). The average price for electricity in the residential sector is close to EUR 0.04/kWh, whereas commercial DH tariffs are more than double that rate. By contrast, VAT rates for gas and DH services are less than half of VAT rates for electricity. Fuelwood and lignite are supplied to selected customers in the retail market at below-market prices; in many cases, these are then resold on the open market. When a tiered-tariff system for electricity was introduced in 2002, thousands of residential consumers installed additional meters in order to effectively "share" their consumption and reduce individual bills. At the same time, most large consumers shifted from residential status into commercial status, lowering their actual costs even more.

Both the legal framework and the *ESDS to 2015* embrace energy market reform. However, the government still applies tight regulation and discretionary control over almost all energy prices. The government sets electricity prices low as a means of conducting social policy – *i.e.* of protecting regulated consumers. Yet because these prices are below marginal costs, the government creates significant financial pressures and difficulties for incumbent companies. The pricing scheme is not in line with the stated energy policy or energy efficiency goals outlined in the *ESDS to 2015*, much to the detriment of electricity companies. The role of the Antimonopoly Agency in the energy sector has yet to be established.

As the newly established regulator, the EAS advises the government on energy sector prices and sets the methodology for calculating connection charges for electricity networks. It also monitors and approves accounting and calculation procedures of state companies. Thus, the EAS not only regulates natural monopolies, but also influences the sector at the policy level.

The MME is working to transfer the government's statutory power over energy price setting for natural monopolies to the EAS in the near future – and to ensure that the Agency has sufficient independence and resources. This will add credibility and strength to the energy regulatory framework.

Serbia has signed and ratified the Energy Community Treaty, which is now part of the domestic legal system.[251] The country has also expressed an interest in accession to the Energy Charter Treaty.

Energy security

Key issues

- ***Hydrocarbon dependency and storage***
- ***Limited transport capacity***
- ***Concentration of transport routes***

Energy security is a high priority for Serbia. This concern is reflected in the *ESDS to 2015*, particularly in its focus on diversification of energy sources and imports, product supply, energy technologies and selective use of renewable energy. Another key objective of the government relates to capital-intensive investments in new energy sources and facilities, and in strategic energy projects (*e.g.* in gas, oil, hydropower and power transmission) at the domestic, regional or pan-European level. Such investments would provide new and alternative capacities for electricity supply, ensure diversification of the sources of supply and of transport routes for oil and gas, and promote integration into regional and international infrastructure systems.

Serbia's energy import dependency is moderate at about 40%; however, it imports more than 85% of its crude oil and natural gas needs and depends on foreign storage services for natural gas. The priority on energy security includes the construction of an underground gas storage facility and of new de-centralised thermal facilities using domestic coal, with new combustion and environmental protection technologies. The *ESDS to 2015* aims to achieve high physical and economic performance in line with the new conditions in domestic and international energy markets.

Domestic lignite is the backbone of Serbia's energy supply. However, its intensive use and outlook for expansion imply even higher energy intensity. The lignite industry is large-scale in nature and very capital intensive; it requires massive imports of machinery, which are then used at relatively low rates.

Domestic production of both natural gas and crude oil declined by more than 60% between 1999 and 2006,[252] largely due to depleting reserves and an overall lack of resource management and exploration activity. The government signed (in January 2008) an MoU with Gazprom on the development of the South Stream gas pipeline from Bulgaria across Serbia to Croatia. Through its subsidiary, JugoRosGaz, Gazprom

251. In compliance with the *Article 194 of the Constitution of the Republic of Serbia*, ratified international agreements become an integral part of the domestic legal system. However, there has been no instance of a direct application of the provisions of the Energy Community Treaty. No domestic or foreign party has ever requested court protection in relation to the Treaty.

252. In 1999, production was 500 Mcm of gas and 600 kt of crude oil; in 2006, levels were 200 Mcm and 200 kt.

already controls development rights for the pipeline from the city of Nis to Bulgaria (Sofia), and of the existing gas pipeline from Bulgaria (Pojate) to Nis.[253]

Security of supply of natural gas in Serbia depends on one main supplier (Russia), via one main supply route. There is no domestic storage capacity for the natural gas pipeline system, which limits Serbia's ability to cope with seasonal peaks. This creates pressure stress due to irregular consumption patterns in summer and winter. There are also considerable day/night fluctuations due to the fact that the main DH systems, the largest consumers of natural gas during the winter, tend to switch off at night.

In January 2008, the Serbian government agreed to sell oil and gas facilities to Russian companies, including Gazprom and GaspromNeft. The Serbian assets on offer included 51% of NIS (oil and gas production, oil refining, oil retail and storage) for a total price of about EUR 360 million (Maximov, 2008).

In 2007, Serbia's electricity infrastructure was able to carry the full load of domestic consumption and provide reliable transit of electricity. Utilisation of the main TPPs has improved to meet growing demand and there is ample reserve capacity from accumulation lakes attached to HPPs. However, insufficient maintenance and investments in the utility could lead to the deterioration of the infrastructure in the medium to longer term. Should a situation arise in which either the DH or the gas network is out of use, the power system may not have spare capacity to fill the energy supply gap.

Discussion

Despite the complexity of energy security challenges in Serbia, as of 2007, the country did not have a comprehensive energy security strategy or any specific institution to co-ordinate the government in a crisis situation. That said, Serbia surmounted the difficulties faced during the 2000/01 electricity shortages, notably by setting a tier-tariff system to limit peak demand. An emergency preparedness system and co-ordinator would enhance the country's energy security.

Prices in Serbia are relatively high for the quality of energy services available: this is true of natural gas, fuelwood, coal and oil products. Due to its lack of energy infrastructure, Serbia imports fuel to cover seasonal demand fluctuations. Therefore, reliability of the fuel supply and related services is a critical factor in overall energy security. The establishment of public strategic oil stocks and an emergency preparedness system are of key importance.

253. Through a chain of implicit decisions, the government allowed Gazprom (along with its companies and partners from third countries) to acquire 75% of JugoRosGas. Following the Dayton Peace Agreement and the 1996 Agreement between the Russian Federation and SFR Yugoslavia, JugoRosGas was formed as a 50:50 joint venture company between Gazprom and a number of Serbian counterparts (including another Gazprom joint venture company, ProgresGas Trading). In the deal, Gazprom converted its outstanding debts for delivered gas; the Serbian government provided pipeline development concessions and accepted obligations to repay outstanding debts by providing actual construction work. In 2000, the arrangement ended, with only part of the construction completed and additional outstanding debt piled up. During 2006, through a number of transactions, Gazprom acquired control of both ProgresGas Trading and JugoRosGas, as well as a considerable portion of Serbia's foreign obligations.

Overall, Serbia's import dependence should remain at reasonable level – if effective energy security and energy efficiency policies are put in place to limit risks. However, recent developments and the agreement with Gazprom on the sale of Serbian oil and gas assets and infrastructure raise concerns. In the absence of robust regulatory structures, the possibility that a single company – of any nationality – might control the major part of oil, gas or electricity assets in a market reduces the likelihood of developing market-based approaches to energy policy. The fact that the investor in question is already a dominant supplier of natural gas underscores concerns about market openness and the extent of Gazprom's influence over the energy sector and beyond. In turn, this underlines the need for strengthened regulatory and anti-monopoly frameworks in order to sustain a commitment to transparent market operation – including the possibility for competing suppliers to enter the market and to have access to networks and storage facilities.

Energy efficiency

Key issues

- ***Policy focus and co-ordination***
- ***Institutional responsibilities and resources***
- ***Limited customer awareness***
- ***Low electricity prices***

Until 2002, Serbia experienced significant deterioration of economic effectiveness and efficiency of energy use across the country. This was largely due to the difficult economic situation, the dominance of heat-only boilers in the country's DH system and the domination of lignite-fired electricity generation in TPES. This situation was exacerbated by the lack of investment in the maintenance and upkeep of the energy infrastructure.

In 2005, energy intensity was estimated at 0.41 toe per thousand USD of GDP (PPP year 2000) or 2.7 times higher than the average for OECD Europe. Energy intensity appears to have decreased over the last five years, mainly as a result of the GDP increase associated with revenues generated through the privatisation of various state assets.

Industrial energy intensity in Serbia has risen by 25% since 1990, reflecting increased energy consumption increased in four energy-intensive sectors (*e.g.* ferrous metallurgy, non-ferrous metallurgy, construction materials and chemical products). Industrial co-generation plants (250 MW) have been installed in about 30 industrial companies but most are not in operation, which partly explains the sector's low energy efficiency.

This rapid increase in energy intensity since 1991 can be attributed to several factors. Transport loads shifted from river transport and railways to road transport. Traditional imports of high quality coal were replaced either by domestic lignite or by other forms of energy. Residential energy consumption that was relatively diversified (*e.g.* light heating oil, wood, coal, lignite, heavy fuel oil, natural gas and electricity) narrowed to fuelwood, lignite and electricity. In addition, to manage technical risks, the government called for the vertical integration of the electricity sector and of the oil and gas industry, thereby contributing to low energy efficiency trends.

Energy efficiency trends have worsened in recent years; Serbia's economy is now one of the most energy intensive in the region. Estimates indicate a technical potential for energy efficiency of around 30% of TFC, equating to an economic potential of about 20%.[254]

The MME is responsible for energy and energy efficiency policy development and implementation. The Serbian Energy Efficiency Agency (SEEA) is responsible for implementing sectoral energy efficiency programmes (*e.g.* industry, municipalities and public buildings), including training and public awareness campaigns. Since 2001, the Ministry for Science manages the *National Programme for Energy Efficiency*, which focuses on technology dissemination and some demonstration installations.[255] The Ministry of Infrastructure works on building standards, including some energy efficiency provisions. A grant from the government of Norway helped to establish five Regional Energy Efficiency Centres within the technical departments at universities in Belgrade, Novi Sad, Nis, Kragujevac and Kraljevo. Also, over the period 2001-04, the Alliance to Save Energy established a national office in Serbia, which has developed energy efficiency awareness and training programmes.

Despite nominal prioritisation of energy efficiency both in the *Energy Law* and the *ESDS to 2015*, there is no institutional mechanism to co-ordinate policies (financial, fiscal, spatial planning, technical standards, monetary, labour, poverty reduction, etc.) with a focus on energy efficiency.[256]

The energy efficiency section of the *Programme for Implementation* identifies the main barriers to energy efficiency in various sectors, as well as proposed technical, regulatory and organisational measures to overcome the barriers. One of the most important proposed measures is the establishment of the Energy Efficiency Fund, which is foreseen as a tool to stimulate energy efficiency and wider utilisation of renewable energy sources. Also important is the adoption of the *Law on Rational Use of Energy* with provisions to implement the EU *acquis communautaire* in the energy efficiency field and to introduce energy management in energy-consuming sectors. Several IFIs, such as the KfW and the EBRD, are in the process of establishing "soft" credit lines for the implementation of energy efficiency and renewable energy projects. The World Bank is providing funds for the ongoing Energy Efficiency Project.

Discussion

Despite donor assistance and the establishment of the SEEA, there are few signs of progress in limiting Serbia's growing energy intensity. Potential energy savings are significant in all sectors (on both supply and demand sides) and can be tapped with simple and low-cost measures (*e.g.* awareness and information, building insulation and performance regulation for appliances and buildings). To date, there is insufficient

254. SEEA estimates that energy consumption could be reduced by more than 50%; however, this is based on results of only a few pilot projects and, therefore, should be considered a rough estimate.

255. Examples include biomass boilers and other biomass technologies, improvement in efficiency of conventional boilers, etc.

256. There is no inter-ministerial co-ordination mechanism on this issue. The scope of work for the Energy Efficiency Agency does not contain any provision for co-ordination of policy with other ministries.

co-ordination among government bodies on energy efficiency policies and programmes. Instead of playing a lead role in co-ordination, the SEEA focuses mainly on engineering activities and donor-funded projects. Thus, the IEA considers that implementation of energy efficiency policy still needs to be improved, under the direction of an agency that is accountable for carrying out this role.

Existing public policies (*e.g.* taxation, poverty reduction, energy policy, spatial planning, housing and industrial policy) do not adequately incorporate energy efficiency. The government and the central bank focus almost exclusively on financial and monetary indicators and targets, without properly considering energy efficiency or cost-reflective energy pricing. As a result, industrial energy efficiency and competitiveness remains low.

Energy and environment

Key issues

- ***Environmental assessment***
- ***Cumulative environmental damages (deforestation, acidification)***

In 2005, Serbia's CO_2 emissions from fossil fuel combustion amounted to 50.4 Mt.[257] Total SO_2 emissions dropped from 390 kt in 2003 to 353 kt in 2004, however the level is still high enough to make Serbia a significant emitter of SO_2 in Europe (SENCO, 2000). Over the period 2003-04, total NO_x emissions decreased from 51 kt to 46 kt (UNECE, 2006). Lignite combustion generates 90% of the energy related SO_2 and NO_x emissions, 65% of CO_2 emissions and roughly 67 kt (EPS, 2007) of particulate emissions.

Air quality in certain urban areas of Serbia[258] is seriously affected by emissions of SO_2, NO_x, CO_2 and particulate matter, most of which originates from TPPs and industrial plants. Air quality is also affected by the burning of solid fuels in residential stoves and by road traffic.

Serbia's refining facilities are ageing and have been insufficiently maintained. Thus, they have significant negative impacts on the environment, notably through air pollutant emissions. Reducing the environmental impact of refineries was an industry priority over 2006/07.

The MEP has main responsibility for the environment; however, the MME is in charge of ensuring that aspects of environmental protection are included in development plans and programmes for the energy sector. The MEP has prepared a *National Environmental Strategy*, which is in parliamentary procedure and is expected to be implemented through the *Action Plans for Air Protection and Climate Change*. Since 2004,

257. IEA data. Serbia is in the process of preparing its National GHG Inventory; however, there are no official data on annual GHG emissions for the territory as a whole. Data on annual CO_2 emissions are only rough estimations.

258. Urban areas include Obrenovac, Lazarevac, Beograd, Kostolac, Pancevo, Bor, Smederevo, Novi Sad and Sabac.

the legal framework[259] for environmental protection has been gradually harmonised with the EU *acquis communautaire*. A new *Law on Air Protection*, harmonised with EU legislation, has been drafted and is currently under review by relevant institutions, after which it will enter the parliamentary procedure. The *Law* includes pollution and emission quotas. Since January 2006, a charge on the main pollutants applies to large polluters; this is foreseen to be expanded to medium and small polluters. Serbia has not yet signed a number of protocols under the Convention on Long-range Trans-boundary Air Pollution (CLRTAP).

Serbia ratified the UN Framework Convention on Climate Change in 2001 and the Kyoto Protocol in October 2007. As a non-Annex I country to the Kyoto Protocol, Serbia will be eligible for clean development mechanisms (CDM) projects over the commitment period 2008-12. MEP plans to release the First National Communication to the UNFCCC in 2008.

With the assistance of the EAR, Serbia's national power company (EPS) completed upgrades of precipitators at two lignite complexes (one unit in Kostolac and one unit in Kolubara). Particulate emissions at the two complexes have since decreased to EU standard levels. Activities to upgrade ash disposal technology are underway, also with EAR assistance.

With the support of a UNDP project, *Promoting investments for energy efficiency and renewable energy through carbon financing,* Serbia is building capacity for CDM, including the creation of a Designated National Authority (DNA). These efforts are designed to prepare the necessary legal and institutional framework and build capacity for the implementation of the Kyoto Protocol. Serbia is also working with the Italian and Norwegian governments on various related issues.

Discussion

Serbia faces significant challenges in improving its system of environmental protection while also undergoing profound socio-economic transformation in its transition to a market economy. The government needs to improve environmental policy by expanding it to encompass all sectors and reinforcing the concepts of environmental and natural resource management, based on the principles of sustainable development.

There are several policies in place aiming to prevent further environmental degradation. In addition, a number of projects are underway that focus on lowering pollutant emissions from key facilities, such as combustion plants (through the replacement of electrostatic precipitators) and ash deposits (through the replacement of existing systems of ash and slag transportation and disposal).

Current cost structures and pricing mechanisms do not properly account for the environmental and health costs of emissions from energy facilities (particularly lignite power plants) and their utilisation patterns. These emissions have the largest impact on poor populations in rural and suburban areas. There is no public policy to try to

259. The legal framework consists mainly of the *Law on Environmental Protection*, the *Law on Strategic Environmental Assessment*, the *Law on Environmental Impact Assessment* and the *Law on Integrated Prevention and Pollution Control.*

eradicate acidification and land devastation, even through conventional measures that are relatively simple and inexpensive (*e.g.* compulsory calcification,[260] reforestation and other land restoration measures). Similarly, there are no technical standards or urban regulations to prevent use of open-fire stoves in densely populated areas or to provide more efficient stoves to domestic markets.

In reality, responsibility for environmental protection related to energy facilities rests almost entirely with the environment departments of public companies themselves, although the government continues to monitor policy implementation. Within this framework, environmental regulation is considered as a bilateral relation between the government (or municipality) and the investor. The basis of this relationship is that investors and public companies that cause environmental impacts are obliged to pay contributions to local and national environmental funds. A more effective approach would be to focus on effective and least-cost ways to limit such impacts.

The government of Serbia is moving toward ratification and implementation of the Convention on Long-range Trans boundary Air Pollution (CLRTAP), the Aarhus Convention and other international agreements.

THE ENERGY SECTOR

Lignite

Key issues

- ***Sustainable lignite extraction***
- ***Spatial planning***
- ***Land reclamation and remediation***
- ***Population and activity re-settlement***
- ***Externality costs***

Lignite is Serbia's largest primary energy source, accounting for about one-half of TPES. In 2005, two large open-pit lignite mines (Kolubara and Kostolac) produced 35 Mt; eight smaller underground mines produced 0.8 Mt of brown coal, lignite and hard coal. Total lignite reserves are estimated at 8.9 billion tonnes and current mine-able reserves guarantee about 55 additional years of exploitation. In total, coal mines employed around 13 000 staff in 2005.

Lignite quality is relatively poor with calorific values ranging from 5 to 8 MJ/kg.[261] Deposits are found mainly in large slopes with an overburden to lignite ratio of 3.5:1.

260. Land calcification is a compulsory measure in countries with considerable coal/lignite-based energy industry. The process involves mixing fertilisers with limestone to provide calcium, which is then introduced to the land on regular basis. Regular soil sampling needs to be undertaken by a competent public institution, and should be provided without additional costs for the landowners. Calcification eradicates acidification and limits the impact of heavy metals, which require much more expensive and demanding restoration procedures. During 1996, the Soil Institute carried out partial soil sampling and estimates about one million hectares of land near major lignite complexes are acidified.

261. According to UNECE (1991), low-rank coals or ortho-lignite is the lowest quality coal, having a gross calorific value below 15MJ/kg.

The overburden ratio is increasing as extraction is forced to move beyond the most attractive deposits. The Kostolac and Kolubara Field D is an exception: lignite is located in thick slopes up to 120 m below the surface, making it suitable for large-scale bucket extraction. However, lignite in other open pits is in relatively thin slopes separated by layers of soil.

Direct production costs are estimated at more than EUR 7.50/t; however, this does not fully account for environmental, spatial, land and social costs. In most cases, lignite extraction operations are heavily subsidised by public funds and by use of public goods (*e.g.* expropriation of land, removal of surface infrastructure, spatial planning to divert infrastructure and delays in re-cultivation of land). If all these costs were included, total lignite production costs per unit of energy would be twice the price of potential imported coal (UNOCHA, 2002).

Lignite extraction has significant environmental and social impacts. Existing lignite extraction operations affect more than 600 km^2 – about 0.7% of Serbia's territory. The environmental impacts of lignite extraction, drying and combustion are considerable in terms of air, water and soil pollution, and affect mainly mining areas and major urban areas. At present, mining companies are largely responsible for land re-cultivation activities and environmental protection. There is no plan to unbundle these activities.

Box 9.................Kolubara lignite power plants and coal mines

The opening of additional units in the Kolubara lignite complex is a critical priority in Serbia's *ESDS to 2015*. However, these coalfields present a complicated situation. Mining has been terminated in some pits (Tamnava-East Field) and is nearing termination at others (Field D). However, replacement pits have yet to be developed and remaining deposits will not be accessible before 2010.

In order to avoid a production deficit, it may be necessary to expand Field D's open-pit mine. This would mean the displacement of the Vreoci village and a local cemetery – at a high financial and social cost. Kolubara's Field E presents a particular challenge in that several factors make its development and exploitation much more difficult than any other pit in Serbia. In fact, Field E will likely not be developed to its design output of 12 Mt/y before 2015. A comparative technical and economic study is needed to assess which site (Radljevo or Tamnava-South Field) would be more suitable for mining in order to supply coal to the future Kolubara B or Nikola Tesla B3 TPPs.

In reality, such investments are high risk given the uncertain environmental aspects of the projects. There are no provisions to limit investor risk related to past and future environmental impacts, which are already far above European standards in terms of emissions. At present, EPS is not properly separated from the budget and does not have its own credit rating. To finance construction under these conditions, the government has considered a tolling arrangement. Instead of providing a practical solution, this arrangement has become the focus of much debate.

The Kolubara mines (Box 9) are a subsidiary of the EPS, the vertically-integrated state-owned electricity company. They produce 25 to 27 Mt/y, including 15 Mt to Nikola Tesla A and B plants (also owned by EPS) and 1 Mt of dry lignite for the retail market. The Kostolac mines produce 9 to 10 Mt/y of lignite; they are also integrated within EPS. Based on the *ESDS to 2015*, the government plans to increase production at both mines.

To meet increasing demand at Serbia's power stations, the *ESDS to 2015* projects an increase in lignite extraction of 10 Mt/y by 2012. This ambitious outlook is not backed by any policy to address the problem of low mine productivity,[262] which is far below that of similar mines in northern Europe. Low mining productivity is directly linked to low utilisation of extraction machinery, which typically operates at below 40% of equivalent capacity. Plans to re-structure and improve labour productivity at the Kolubara lignite complex will have major social impacts: it is estimated that these initiatives could create about 80% redundancy in the labour force (USAID, 2007) and seriously affect the city of Lazarevac. The current policy is to increase the stock of machinery – an effort to which large shares of donor assistance and international loans are diverted. Measures to raise utilisation rates might be a more effective approach.

Discussion

Lignite accounts for the largest share in Serbia's electricity mix and dominates domestic energy production, contributing to the relative energy self-sufficiency of the country. However, lignite mining and processing have significant negative impacts. Its low productivity, in terms of energy use and input per metric tonne produced, is a major bottleneck to economic development. The low utilisation rate of extraction machinery adds to this problem. The total cost of lignite mining and processing (including impacts on the environment, health and land, as well as direct and opportunity costs) is far greater than both current domestic retail prices and internal pricing between mines and power plants owned and operated by the EPS.[263] Despite these significant drawbacks, Serbian energy policy focuses mainly on the expansion of new mines and the procurement of additional equipment.

According to IEA statistics, solid fuels (including coal and fuelwood) account for at least 60% of TPES in Serbia.[264] Production of solid fuels is the largest economic operation in Serbia, accounting for more than 100 Mt of material (*e.g.* overburden, water, wood residues and fuels for extraction works), a much larger share than any West European country. As current electricity and heat prices do not fully cover costs and externalities, all of this burden falls on the EPS and is, in turn, passed on to the economy as a whole through higher national debt and taxes. Improving the management and performance of mining, notably its productivity, will be particularly challenging. Ensuring the viability and sustainability of both the industry and the economy must be pursued through reforms that better address the socio-economic impacts of lignite production and use.

262. Serbian mine productivity was about 2 700 t per year, per worker in 2005.

263. Prices of imported brown coal in Serbia are among the highest in Europe. This is due primarily to high (road) transport costs. The cost to mechanically remove 1 tonne of lignite plus 3.5 tonne of overburden in high productivity mines – with similar technology and double utilisation rates of similar machinery – would be approximately EUR 9 (*i.e.* mechanical cost only of lignite extraction).

264. IEA data based on official statistics.

Crude oil and oil products

Key issues

- ***Low quality products***
- ***Performance of refineries***
- ***Import smuggling***
- ***Urban planning and transport***
- ***Inflated retail network***

Serbia's domestic crude oil production has been in decline since 2001, largely due to the depletion of domestic resources and insufficient exploration activity. As of 2006, it was 646 kt[265] or 15-20% of domestic crude oil needs. The Oil Industry of Serbia (NIS) is a state-owned, vertically integrated oil company that carries out oil and gas exploration, oil refining, transport and distribution. It employs about 13 000 workers and has an annual turnover of almost EUR 1 billion. Following an agreement between the government and the IMF, the privatisation of NIS was scheduled for 2006. This deadline was then postponed because of a change in government.

The bulk of Serbia's crude oil imports come from Russia and are purchased on a tender basis. Crude oil is delivered through the Croatian port of Omisalj and the Adria pipeline network. The Serbian section of this pipeline is operated by the state-owned company Transnafta, which was established in 2006 and has a staff of 70. A small portion of crude oil is imported from the Black Sea region and transported by barges (capacity 100 kt) along the Danube River.

Serbia's storage capacity for crude oil and oil products was destroyed during the war in 1999. Since then, efforts to rebuild storage capacity have focused on capacity for refinery operation and distribution of oil products. Crude oil storage capacity of less than 100 kt is sufficient only to facilitate crude transport over the Adria pipeline to Serbian refineries. As of 2008, Serbia has no storage capacity to establish state oil reserves. A limited amount for reserve storage capacity (for oil products only) is available through NIS and Beopetrol, and through major consumers (DH companies and the EPS). The MME is drafting amendments to the *Energy Law* to provide for the establishment of a public authority for strategic crude reserves.

At present, NIS operates two oil refineries in Pancevo and Novi Sad. Originally, their respective nominal annual capacities were 4.8 Mt and 2.3 Mt, which exceeded domestic market demand. However, both refineries were severely damaged during the 1999 bombing campaign and their annual processing capacity remains much lower, about 3 Mt and 1 Mt, respectively.

The efficiency of these two refineries remains far below European standards in terms of the ratio of heavy to light oil products. In 2005, output of light products (primarily motor fuels) totalled 2.3 Mt (62.7% of overall production) compared to 1 Mt of heavy products (heavy fuel oil and bitumen). The output of lead-free petrol (LFP) accounted

265. An additional 200 kt is produced in NIS concessions in Angola, and swapped for imports or outstanding debts.

for 40.7% of total. Medium sulphur-content diesel fuel (*i.e.* up to 350 parts per million [ppm] as per Euro III standards) represents 12.4% of total production; the remaining production has a much higher sulphur content. In 2006, the two refineries began to produce limited quantities of Euro IV diesel (up to 50 ppm sulphur).[266]

NIS operates the largest retail network with 480 filling stations (40% market share). A large number (240) of private companies own another 800 stations; this group includes foreign investors such as LukOil[267] of Russia, OMV of Austria, MOL of Hungary and Hellenic Petroleum of Greece. Serbia has experienced an increase in oil product smuggling in recent years. This can be attributed to three factors: the low quality of domestic fuels; the level of sales taxes (including VAT and excise tax) resulting from the official ban (in 2001) on oil product imports; and insufficient import controls.[268] Smuggled volumes are estimated at 15 to 20% of retail trade.

To address the black market trade, the government adopted (in 2001) the *Decree on Specific Conditions for the Importation and Processing of Crude Oil and Oil Derivates*. The *Decree* introduced standards for oil products and established the rules for fiscal order on the market. It also facilitated the renewal and normal operation of the oil industry. The *Decree* has been amended several times in an effort to gradually liberalise the retail market for crude oil and oil products. In 2007, the government adopted a new decree in line with rules of the World Trade Organization and European Union.

Discussion

The position of NIS in the oil products sector is firmly protected. In 2001, the government approved a decree giving NIS exclusive rights to import oil products. This is strengthened further by a tight system of import licences, which remains the most important policy tool in the sector.

Plans to privatise NIS were delayed for several months, due to a change in government. This may have created an opportunity for the government to take steps to maximise revenues from the privatisation by providing potential investors with a clear legal, fiscal and regulatory environment, and a transparent privatisation process. In the event, NIS stakes were sold at a lower price than comparable sales completed through open tenders in other countries (*e.g.* Croatia and Romania). It remains to be seen if the new majority owner will carry out an adequate and timely modernisation of the company.

Low levels of product quality and high levels of smuggling are ongoing problems in the oil products sector, as is the relatively high number of retail outlets in relation to the volumes of sales. Compared to retail activity in the 1980s, about twice as many

266. Serbian refineries produce up to 95 kt per year of EURO 95 gasoline. Various additives can reduce the sulphur-content of leaded gas by 30%.

267. LukOil owns the subsidiary LukOil Beopetrol, which has about 200 stations and some logistical infrastructure. This network, previously part of INA of Croatia, was nationalised at the beginning of the 1990s under the name of Beopetrol. It was then privatised and sold to LukOil in 2002.

268. Thousands of tonnes of smuggled oil products are seized on the Danube River (using bunkers or ballast tanks of transiting vessels) and other border crossings. Smuggling is conducted through unregistered production from domestic refineries or by declaring products as industrial chemicals.

outlets now serve about half the level of consumption. This translates into higher distribution costs per unit. Still, the volume of liquid fuels consumed in Serbia is very large in relation to GDP. In fact, the growth rate of liquid fuel consumption is outpacing that of GDP, which drives up the country's overall energy intensity.

Consumption of oil products is inadvertently stimulated by a policy to encourage car ownership through direct or indirect subsidies, and to provide easy credit or leasing terms to potential car owners. However, a rapid increase in the number of road vehicles creates a situation in which the government must direct additional public expenditures toward the infrastructure for private vehicles (parking facilities, bridges, streets, etc.) at the expense of investing in effective public transport (which would favour employment and economic growth). Efficient use of liquid fuels is an increasingly important issue for urban planning in Belgrade and other major cities.

Natural gas

Key issues

- ***Import, route and storage dependency***
- ***Seasonal demand fluctuations***
- ***Prices below costs for major users***

As of 2007, Serbia's consumption of natural gas (2.3 bcm) remained below pre-1990 levels (3 bcm in 1988). Government estimates project consumption will increase to 3.4 bcm by 2012, even though the current price ratio of electricity and gas reduces the competitiveness of gas as a fuel of choice. Less than 10% of households (about 180 000 households) have access to gas networks; by contrast, most retain the capacity to shift to electricity and/or solid fuels for heating. The low competitiveness of gas against electricity has a direct effect on winter peak demand for electricity.

The bulk of Serbia's natural gas supply is imported from Russia, based on a "take or pay" contract renewed in 2006.[269] NIS facilities in Vojvodina supply the totality of domestic natural gas production. NIS produced slightly above 0.2 bcm in 2006, representing only one-half of the volumes produced in 2001. The decline is largely due to depletion of existing gas fields.

Serbia has a high-pressure gas pipeline system that links domestic gas fields. The system also supports imports from Russia (via Hungary) and transit to Bosnia and Herzegovina. The pipeline's minimum transmission capacity is 6.1 bcm per year; with minor upgrades, this could be increased to more than 10 bcm per year. The average age of the transmission system is more than 30 years; its overall condition is aggravated by inadequate maintenance.

The high-pressure transmission system is owned and operated by the public company JP Srbijagas,[270] with one exception: the Pojate-Niš section of the trunk pipeline is

269. As of 2007, SrbijaGas reportedly purchases gas from YugoRosGas – a GazProm subsidiary in Serbia – on a short-term contract basis.

270. SrbijaGas separated from NIS in 2006. It employs about 1 200 workers, with an annual turnover of EUR 0.6 billion.

owned by Jugorosgas a.d. (a joint-stock company owned by JP Srbijagas at 25% and Gazprom at 75%). Serbia also has medium-pressure gas pipelines and local low-pressure distribution networks, which are owned by various local distributors as well as JP Srbijagas and Jugorosgas.[271] In response to public investments to extend the retail network to additional municipalities (in line with the national gasification plan), more municipal public companies are being established.

Since the 1980s, Srbijagas has traditionally been involved only in transmission and import operations, serving primarily local distributors and large direct customers. An active policy now seeks to involve SrbijaGas into the retail distribution sector; the company is actively competing with other parties to extend the retail network to new areas.

Serbia has initiated market opening to competition. However, as of early 2008, only one customer, the Pancevo fertiliser plant, was granted eligible status (the *Energy Law* sets the eligibility consumption threshold at 50 Mcm per year).

The development of the gas industry is analysed in the *Energy Source Development Strategy*, the *Spatial Development Plan* and the *National Gas Supply Plan*. These documents outline the following project priorities:

- Construction of a 400-km gas pipeline for the transmission of Russian gas from the Bulgarian border to Nis (this was agreed with Gazprom at the end of 2006).[272]
- Increase the capacity of the gas transmission network to at least 6.8 bcm by upgrading the Batajnica compressor stations and building 420 km of new pipeline.
- Expand the gas distribution network to reach an additional 140 000 households by 2012, at a cost of EUR 140 million.
- Construction of an underground gas storage facility.[273]

Discussion

Natural gas accounts for a significant share of domestic energy needs in Serbia (12% of TPES and 13% of TFC), mainly in the industrial and residential sectors. In the past, a large share of gas was used for feedstock in the fertiliser and chemical industries. This has declined significantly since 1999 when key fertilisers plants were closed; to date, they have not returned to full operation.

---

271. Publicly available statistics are scarce on gas distribution controlled by municipal or privately owned companies. Serbia has 36 local gas distribution companies; most are established and controlled by municipalities, but legally owned by the government. Some municipal district heating companies are also engaged in gas distribution. A few local distributors are privately owned. The gas distribution infrastructure is built largely based on consumer contributions; thus, consumer associations are requesting stakes in these local companies.

272. In December 2006, representatives of Russia's GazExport and the Serbian MME signed (in Moscow) a MoU on the construction of a 400-km gas pipeline with capacity of 20 bcm per year

273. The Banatski Dvor natural gas storage facility has a potential capacity of 850 Mcm or about 25% of Serbia's total annual consumption; however, only 250 Mcm is envisaged for development. Even this lower amount would alleviate seasonal fluctuations in demand, due largely to the Belgrade district heating system. However, it is not clear how this facility could compete in terms of costs with the economies of scale of the Hungarian storage facility. The January 2008 agreement between the government and Gazprom foresees Gazprom's investment in this project (details are not yet known).

The state company SrbijaGas controls Serbia's gas transmission system. It also imports natural gas from YugoRosGaz, a company that is 75% controlled by Gazprom. YugoRosGaz and Gazprom are planning a new transit pipeline through Serbia to connect Bulgaria with Italy (*i.e.* the South Stream project). If this project is realised, Serbia's sole natural gas supplier would also control key transit infrastructure. Such a situation would increase Serbia's dependency, prevent supply diversification, discourage energy efficiency strategies, and limit market openness and transparency.

Serbia has an extensive network of small and private local gas distributors. Although all gas distributors operate according to the same rules and business conditions, local distributors with well-established customer bases have an advantage over new companies trying to enter the market. The *National Action Plan for Gasification on the Territory of Serbia* does not provide sufficient support for new entrants; rather, it focuses on public investment and creates a range of local public companies. The *Plan* provides for public investments for the expansion of the retail natural gas network.[274]

Serbia experiences three major seasonal peaks in gas demand: in winter due to heating needs, and in the seasons during which fertiliser is produced and sugar beets are processed. In each instance, demand peaks to four to five times higher than summer demand. District heating companies (particularly the large DH systems in Belgrade) are the main winter consumers. One way to address this problem would be to construct an underground gas storage facility near Belgrade. Several gas fields (some already exhausted, others active or potential) lie within 100 km of Belgrade, including the Banatski Dvor where construction of UGS is already underway (with investments from the government of Serbia) and is the subject of negotiations between Serbia and Gazprom. However, DH companies are currently unable to pay even the full cost of fuels: they have no capacity to pay for UGS services.

The scope for opening the gas market to competition has remained limited. To date, the privatised fertiliser plant is the only eligible natural gas customer. In addition, no independent supplier has yet emerged. As discussed above (see section on Energy Security), the agreements in January 2008 on the sale of 51% of NIS assets to GazpromNeft and on the South Stream pipeline project raise questions about the prospects for supply diversification, and underline the importance of robust regulatory regimes to ensure market openness and competition.

Electricity

Key issues

- ***Prices below costs***
- ***Insufficient maintenance***
- ***Non-compliance to environmental performance standards at lignite plants***

Serbia's total installed generation capacity is 7.1 GW; two-thirds is thermal power and the rest is hydropower. Despite a relatively high base-load overcapacity (peak demand at 6.95 GW), Serbia must import electricity during the winter to cover seasonal peak capacity needs.

274. One of the main features in urban plans in most cities with district heating systems is a strict division of coverage between district heating and gas networks.

Elektroprivreda Srbije (EPS), the national electricity company, has sole responsibility over power generation and distribution. It also provides heat to DH networks and industrial consumers. In 2006, it employed more than 30 000 workers and generated about 37 TWh of electricity[275] and about 1 Mt of dry and raw lignite for the domestic retail market. In 2006, EPS gross revenues were about EUR 1.2 billion.

The lignite-fired power plants of Nikola Tesla are the core suppliers of base-load power generation. Despite recent improvements,[276] their overall fuel efficiency and utilisation rates remain low. Future donor-supported overhauls are expected to result in considerable improvements in reliability. In addition, two new lignite-based projects are being considered. The first aims to complete the construction of the Kolubara B power plant (2 x 350 MW), which began in the 1980s but was interrupted in 1990. The second involves the construction of a third unit at the Nikola Tesla B3 (2 x 620 MW) power plant. To supply these two plants, lignite extraction would need to increase by 8 Mt/y.

EPS also operates about 3 GW of hydropower, of which 60% is 30 years old. The Iron Gates dam (2 120 MW) on the Danube River is one of largest HPPs in Europe and is shared between Serbia and Romania (EPS' share is 1 060 MW). The government has set a priority to modernise and overhaul HPPs, and to build new plants. Modernisation of Iron Gates would increase its rated capacity by 128 MW (4.5%) and the annual output by 247 GWh (2.2%); however, at least one unit (176 MW) will be provisionally out of operation over the next six years.

In 2005, the Electricity Networks of Serbia (EMS) was unbundled from the EPS to become an independent transmission operator. It employs fewer than 1 400 workers. In 2006, the domestic transmission system delivered 47 TWh, of which about 8.5 TWh was transit to third countries. Installed transformer capacity was 17 758 MVA. The EMS used loans – of EUR 60 million from the EBRD and EUR 59 million from the European Investment Bank – to strengthen its transmission network and connection to Bosnia and Herzegovina (Ugljevik). It used another EUR 21 million of EAR assistance to develop the Nis-Skopje 400 kV line to improve the inter-connection with FYR Macedonia.[277] These plans did not require approval from EAS as they were not funded from company revenues.

The EPS operates the five regional electricity distribution networks. While still remaining part of the EPS structure, these companies are legally separated and have separate accounting systems. The EPS publishes consolidated annual accounts and claims that collection rates have improved to 97%. However, collection and billing methods allow for considerable delays.[278]

275. For comparison purposes only, Verbund of Austria generates similar volumes of electricity employing a labour force of only about 3 000 workers – *i.e.* 10% of the EPS' workforce.

276. Average fuel efficiency is around 30%; utilisation rates are below 7 000 hours per year. Recent reports reflect deterioration in the reliability of some units that were upgraded between1999 and 2002, including failures of key machinery and ash deposit leaks at lignite mines.

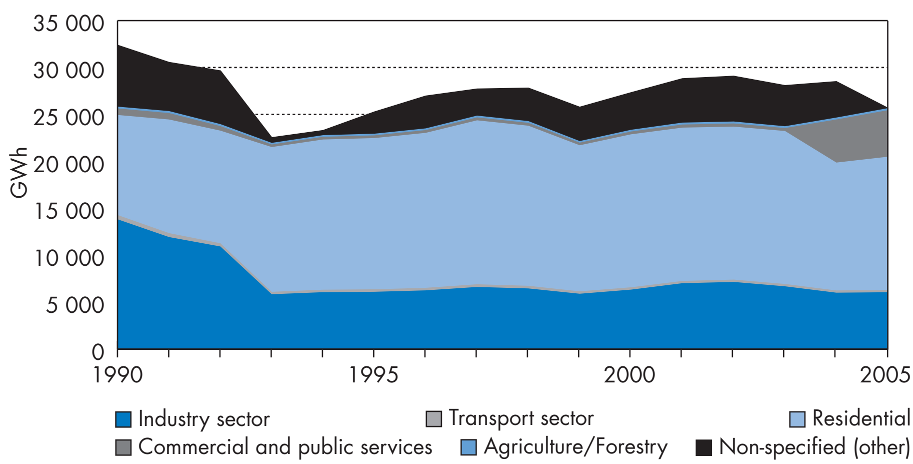
277. Since 1999, the Serbian transmission system has been probably the most efficient user of international assistance.

278. Electricity bills are actually paid to the Treasury, which delays receipt of data related to tariff collection by EPS and distribution companies.

The government sets final electricity prices as well as network tariffs, within the framework of the methodology developed by the EAS. In 2001, the government introduced a tiered tariff system for residential customers in a bid to reduce peak loads caused by excessive use of electricity for space and water heating[279] (*i.e.* seasonal peaks); the new tariff system was also partly the result of government programmes to support poor families. The current tariff system consists of three tiers according to the monthly level of consumption. The first 300 kWh consumed is priced at a level 2.8 times cheaper than consumption levels beyond 1 600 kWh. In addition, daytime tariffs are four times higher than overnight tariffs.[280]

In 2005, Serbia's total final electricity consumption of 25.6 TWh, with households accounting for the largest share (55%), followed by industry (22%), services (18%) and others[281] (10%) (Figure 24).

Figure 24 ....Electricity consumption by sector in Serbia and Montenegro, 1990-2005* (GWh)



* According to the official submission of the Ministry of Mining and Energy of Serbia, data supplied to the IEA for Serbia include Montenegro until 2004 and Kosovo until 1999.
Source: IEA statistics.

Such a tiered tariff system carries risks of unwanted side effects including cross-subsidies to customers connected to well-supplied DH systems. This allows larger consumers (*e.g.* wealthy households using electricity as a comfortable mode of heating) to shift to industrial tariffs.

279. Estimates of the breakdown of residential electricity consumption are as follows: space heating (61%), water heating (11%), cooking (10%), washing (7%), food cooling (6%) and lighting (3%). Based on electricity consumption in Belgrade area apartments (UNECE, 2006).

280. Since 2006, a tiered-tariff system has remained in place with the first tier (60% of customers) at 350 kWh per month for a price of EUR 0.033/kWh. The second tier (38% of customers) applies to consumption of 350 to 1 600 kWh at a price of EUR 0.043/kWh. The third tier (only 2% of customers) applies to consumption of more than 1 600 kWh at a price of EUR 0.079/kWh.

281. Agriculture, construction, etc.

Market opening had been foreseen for commercial customers starting in 2008, and for all customers as of 2015. However, artificially low regulated tariffs prevent any real switching of suppliers or emergence of eligible customers. As of 2007, no large consumer had applied for eligible customer status (at 3 GWh per year), despite the EAS having issued 19 licences for electricity trade.

Discussion

The efficiency of thermal electricity generation in Serbia is low at about 30%; in addition, losses are high in transmission (7.3%) and distribution (13.5%) according to IEA statistics. Electricity generation in Serbia is concentrated at two major lignite-fired power plants, both of which have pollutant emissions and concentration levels far beyond EU standards.

The EPS is now looking for joint-venture partners to build additional lignite-fired units in Kolubara. The *ESDS to 2015* prioritises this project as a way to limit energy import dependency. However, this approach is expensive if all costs (including remediation) are considered; it also has potential negative impacts on the environment. The decision to expand lignite use should be taken only on the basis of a comparative least-cost investment plan for electricity, which accounts for all aspects related to economics, energy security and environment. The IEA recommends that Serbia assess such an expansion in comparison with other options (*e.g.* co-generation and distributed generation, natural gas and biomass).

The EPS has been re-structured to unbundle it from a number of non-energy activities.[282] Further vigorous efforts are needed (in line with EU regulation) to enhance corporate governance and unbundle monopoly activities from potentially competitive activities. Cost-reflective pricing and effective third-party access are prerequisites to attract new players to ensure effective market opening.

The government policy to maintain monetary stability by keeping electricity prices low has led to a deterioration of installed generation and distribution capacity, largely due to lack of maintenance.

The tiered-tariff system, despite its sound principles, has largely failed in its main objectives. In fact, it has essentially subsidised wealthier households that are connected to DH systems and, therefore have low electricity consumption, and also allowed the largest consumers to split consumption to more than one electricity meter or to shift to industrial metering and/or tariffs. The tiered tariffs are also considered ineffective in that electricity rates have not kept pace with inflation. Over the period 2001-03, the tariffs prompted a decrease of peak demand but no real decrease in electricity demand. Since then, electricity consumption started to grow.

282. However, separation remains nominal as most of the separated companies retain long-tern service contracts with their former parents. The most significant decrease of staff resulted from a combined control of salaries imposed by the Ministry of Finance and a generous offer for early retirement. As a consequence, the most experienced and capable staff left the public energy companies.

A more suitable and diversified tariff system could be implemented through the use of new digital metering technology, effective control of tariff category eligibility and direct payment. A selection of tariffs could be made available to customers and would help to enhance energy efficiency of the existing infrastructure.

Heat

Key issues

- ***Ownership and regulatory responsibilities***
- ***Low capacity utilisation***
- ***Low efficiency and high costs***

District heating systems operate in about 50 towns in Serbia, serving 24% of the population. The total installed capacity is 6.6 GW, most of which is heat-only boilers fuelled by natural gas with the ability to switch to heavy fuel oil, lignite and brown coal. Two systems are linked to large power plants in Kolubara and Kostolac.

Serbia's DH system suffers from relatively low efficiency, even by technical standards of the time at which most of it was built – *i.e.* the 1980s. Average thermal efficiency of boilers is about 60%. Network (heat and water) losses remain very high, despite work carried out with donor assistance to improve and replace piping. Serbia's DH system relies entirely on heat-only boilers,[283] which have several disadvantages compared to CHP systems. With heat-only boilers, heat is extracted from the main steam cycle, which results in a decrease in electricity output. The energy from the combustion of natural gas or other fuels is used only to produce hot water; there is no means to produce high value energy such as steam or electricity. In Serbia, these disadvantages are aggravated by the low utilisation rate (average 800 hours per year) due to the short heating season.

Efforts to improve efficiency of DH networks, and to decrease network losses and increase utilisation are ongoing, with the support of donors such as the EBRD, the Swedish International Development Agency (SIDA), the Kreditanstalt für Wiederaufbau (KfW, Germany) and SlovakAid.[284] However, DH companies are directing their own resources to expand the networks and install additional heat-only boilers. This practice does not address the fundamental problem of low efficiency and the under-utilisation of waste heat (*i.e.* true CHP). Expansion of heat-only boilers would also limit investment options that focus on renewable energy, and detract from efforts to alleviate the seasonal gas supply problems.

MME does not have direct responsibilities in the DH sector; in accordance with the *Energy Law*, DH systems fall under municipal jurisdiction. Local governments specify the terms and conditions necessary to ensure heat supply, including the rights and obligations of heat producers, distributors and consumers. Local governments also

283. These boilers have energy efficiency ratings as low as 30%, whereas CHP is typically 60 to 80%.

284. Since 2001, rehabilitation of district heating systems in large cities such as Belgrade, Novi Sad and Nis (undertaken with KfW assistance) has significantly expanded the operation of these systems. In recent years, systems in other towns have also been rehabilitated (with assistance from the KfW and EAR). However, despite some government assistance for renovations and increases in heat prices, smaller cities still need financial assistance to improve operations.

designate a body for adopting tariff systems. District heating companies are state-owned under the management of municipalities, which appoint their managerial boards.

In general, the Serbian government controls prices of communal services.[285] Heat tariffs are the exception, being set by municipalities. In 2007, average DH prices were EUR 0.35/m^2 per month,[286] taking into account that prices for households are lower than for social institutions and industry. In any case, this level that does not cover costs, largely because of the low efficiency of the systems.[287] In a pilot project, the Belgrade DH company installed meters and thermostatic valves in a number of flats and is studying the impacts of this initiative.

The *ESDS to 2015* outlines the three main priorities for the DH sector:

- Rehabilitation of district heat generation and distribution systems.
- Increase in energy efficiency and environment performance.
- Increase in the number of users (with a goal of 180 000 new users connected to the DH system).

Another important related goal of the *ESDS to 2015* is to reduce electricity consumption for space and water heating in the household sector by 2.3 TWh (or around 20% of the sector's electricity consumption). The *ESDS to 2015* favours natural gas to replace electricity.

Discussion

The use of heat-only boilers in Serbia's DH systems represents significant opportunity costs for the government, for the technological reasons explained earlier. Direct costs of operating DH systems are usually subsidised by municipal budgets – a practice that strains public finances and essentially reduces revenues collected from more affluent segments of the population. A number of DH companies have replaced old boilers with new more efficient heat-only boilers. Despite being more efficient, these new boilers will probably exacerbate seasonal energy demand problems and further delay the introduction of renewable energy sources and CHP.

To address this problem, Serbian policy makers sought to increase the density of heat consumption within the existing DH network. This process has reached the limits of the existing gas infrastructure's ability to cover winter demand peaks. In recent years, major improvements have been realised in the energy efficiency of some DH networks as a result of projects undertaken with major donor and domestic funding. However, these efforts focused on the network itself and not on re-structuring networks or improving configuration to facilitate the introduction of renewable energy supplies and CHP.

There are no plans to re-structure or un-bundle DH companies,[288] which remain vertically integrated (*i.e.* from heat source to distribution network). Institutional

285. Municipalities that increase prices of communal services (waste management, water supply, district heating, etc.) beyond prescribed levels may see cuts in what they would receive from the central budget. As municipalities have no independent sources of income, this acts as an effective price control tool. It also implies that district heating systems are effectively subsidised from central budgets via municipal accounts.

286. Taking into account actual volumes of delivered energy, the price per kWh of heat is almost equal to the price per kWh of domestic electricity.

287. Both heat and electricity are subsidised to more or less equal extent.

288. A few municipalities with very small district heating systems in technical difficulty are considering privatisation or private investments (WEC, 2004).

(*e.g.* municipal control) and economic (*e.g.* the existing system of subsidies) barriers to entry remain high. Potential heating alternatives, such as co-generation, heat pumps, geothermal energy or biomass, need to be assessed at the local level by a least-cost investment plan for heat supply and/or local energy planning. It would be beneficial for the performance of the DH sector if MME were to provide guidance to municipalities in adopting a least-cost supply plan for the heat sector.

More than 98% of households have installed electrical water heaters,[289] reflecting low residential electricity prices. Electricity consumption for domestic hot water production accounts for almost 25% of total electricity generation. Viable, reliable and economic alternatives need to be developed (*e.g.* natural gas and LPG), together with energy efficiency improvements to provide a choice to consumers.

Renewable energy

Key issues

- ***Statistics on fuelwood use***
- ***Efficiency of wood heating stoves***
- ***Energy poverty***
- ***Deforestation***
- ***Low electricity prices***

Hydropower is the only renewable energy source widely used for energy production in Serbia; it accounts for 6% of TPES and 33% of the electricity mix. Small hydropower capacity amounts to almost 50 MW in 39 plants. The remaining technical hydro potential (around 7 TWh) represents about 8.6% of final electricity consumption and is mostly located on the Morava (2.3 TWh), the Drina and Lim (1.9 TWh), and the Danube (1 TWh) Rivers. Construction of individual facilities (mostly located along border rivers) with capacity more than 10 MW would have a technical potential of 5.2 TWh. The potential for small hydropower (up to 10 MW) is about 1.8 TWh per year at about 900 sites.

Forests cover about 28% of Serbian territory but only about half of these forests have wood productivity. More than 55% of forests are state-owned, of which almost 50% are protected. Fuelwood is extensively exploited by SrbijaSume (a state-owned company), as well as by private companies and individuals. A large portion is acquired through illegal logging, which pushes logging beyond its sustainable capacity.

Wood is used extensively as a fuel in Serbia (FAO, 2002). Annual use is estimated at 12 Mcm (1.5 Mtoe), whereas the estimated sustainable use of forestry stock is only 6 Mcm (or 0.75 Mtoe). The estimated level of use, if confirmed, would indicate that fuelwood provides a high share (50 to 60%) of space heating needs.

Fuelwood prices are extremely volatile, especially during cold weather when they can rise daily. This creates great risk for poorer households that rely on both wood

289. When electricity is relatively cheap, installation of electric water heaters is the least-cost option for domestic hot water production. However, it is an extremely inefficient use of energy, with only about 25% overall efficiency of the system.

and electricity for heating. Increases in electricity prices or the introduction of new tariff systems prompts them to depend more heavily on fuelwood, which raises the unpredictability of heating expenditures during winter months. Fuelwood use in Serbia is inefficient: the domestically produced light heating stoves that dominate the market have a fuel efficiency of only about 20%.[290] Their use for fuelwood combustion causes indoor pollution and contributes to particulate emissions (through the high temperature of exhaust gas) in densely populated areas.

Serbia's technical potential[291] of biomass use (*e.g.* agriculture and wood) is significant at 2.4 Mtoe per year (Djevic, 2003). Economic potential is estimated at 1.4 Mtoe,[292] with the majority (60%) from agricultural waste and the remainder from wood biomass (UNECE, 2006). Agricultural biomass (more than 20 Mt) is mostly available in Vojvodina and northern Central Serbia, an area served by an extensive river transport system. More than 9 Mt/y of biomass could be economically delivered to existing lignite-fired plants for use in drying and co-firing with lignite. The supply cost of this biomass would be far below the actual supply costs of lignite, even before calculating the considerable environmental, economic and social benefits this shift to biomass could bring.[293]

Total geothermal potential in Serbia is estimated at 800 MW (0.2 Mtoe), located in four key areas: Vojvodina, the Sava basin, Macva and the Danube basin. However, use of geothermal is limited due to the lack of incentives and a systematic approach to its utilisation. About 100 drill holes already exist at relatively low temperature (rarely more than 60°C). Exploration results indicate a geothermal potential at least five times higher than that currently being tapped.

No solar or wind atlas is available for Serbia although studies are being carried out.[294] There is no active policy to enhance use of solar thermal or wind potential. It should be noted that, given current electricity tariffs, solar water heating and wind power generation are not competitive.

The *Energy Law* sets a priority to increase the use of renewable energy sources; however, it does not prescribe any actual support mechanisms (*e.g.* taxes or feed-in tariffs). The *Programme for Implementation* identifies the main barriers to wider utilisation of renewable energy sources and proposes various technical, regulatory and organisational measures. The government plans to introduce incentives measures, including the establishment of the Energy Efficiency Fund – by mid-2009 at the latest. In addition, several IFIs (*e.g.* the KfW and the EBRD) are establishing "soft" credit lines for the implementation of energy efficiency and renewable energy projects.

290. Simple masonry stoves (that were common in Central Europe and Northern Serbia in the 1930s) or down-burning stoves could achieve efficiencies of more than 50%; modern wood boilers could have fuel efficiencies in the range of 75% or more.

291. Studies and data are scarce on the potential of renewable energy sources; most information is based on estimates.

292. Independent professional sources estimate the potential to be almost 7 Mtoe (*Energy Sector Development Strategy*, 2005).

293. Lignite-fired boilers in Serbia are based on similar technology as those in the Czech Republic, Hungary and Slovakia (UNECE, 2004).

294. Wind potential is estimated at 1 300 MW (2002). Solar water heaters could cover 50 to 60% of hot water needs in the central region.

The MME is responsible for developing policy on renewable energy sources, whereas SEEA is responsible for providing support for renewable energy development and use. The Ministry of Science supports research, development and demonstration activities. However, low electricity prices, the subsidisation of DH services and public energy policy priorities act as barriers to enhancing the use of renewable energy sources in Serbia.

Discussion

Apart from large hydropower, Serbia's renewable energy sources remain largely untapped. Electricity generation from renewable energy sources is among the top priorities in Serbia's *ESDS to 2015*, with the objective to increase its share in primary supply; the *Energy Law* grants special status to these generators. However, mechanisms to facilitate renewable energy use (*e.g.* tax incentives or regulations) are not yet in place. Moreover, the current low level of electricity prices is one of the main barriers to broader-scale renewable energy investment.

As a result, the projected share of renewable in TPES by 2015 is expected to decrease below the current rate of 7% (UNECE, 2006). There is a lack of data on solar, wind and geothermal potential, as well as few market opportunities for these sources. Improved data collection systems are needed to facilitate analysis; improved information dissemination systems are needed to enhance public awareness. The biomass utilisation strategy and action plan proposed by the Slovak co-operation project (Energy Centre Bratislava, 2006) could form the basis for developing a national renewable energy strategy.

There is also a lack of reliable data and statistical reporting of fuelwood resources and use. Serbia's Statistical Office reports stable use of fuelwood, at about 2 Mcm per year, for the past few years, based largely on reports from the public company SrbijaSume. However, the Statistical Office does not account for small forests and orchards, or for irregular, young and dedicated forests. The *Statistical Yearbook 2003* reports significant possession and use of land for wood sources. A study by forestry professionals (Nikolic, 1992) applied a model to Serbia's current demography and land-use figures; it estimates total winter fuelwood use at 11 to 12 Mcm (roughly 1.5 Mtoe). This figure is confirmed by the findings of the FAO's 2002 report on Serbia forestry. Household surveys conducted by the UNDP in 2003 confirmed similar volumes of fuelwood use from a demand-side perspective. Data available from land statistics indicate widespread deforestation, erosion and land sliding (*i.e.* eroded land area has increased from 284 km^2 in 2002 to 1 635 km^2 in 2005, representing almost 2% of Serbia's territory).

Existing data does reflect, however, excessive over-cutting and rapid deforestation. Still, there is no comprehensive policy to address extensive use of fuelwood or to regulate its pricing. In addition, the low efficiency of wood stoves leads to higher than necessary demand for wood. There is no industrial policy to improve the efficiency of stoves, nor any poverty reduction strategy to replace low efficiency stoves in poor households. Similarly, there is no environmental policy to limit the negative impacts of wood use. However, the *Programme for Implementation* foresees detailed analyses and the introduction of standards for utilisation of renewable energy sources equipment.

Implementation of the standards will be linked closely with other policies to support renewable energy sources.

Studies suggest that almost 1 Mtoe of wood (per year) could be economically made available – under sustainable and controlled conditions – for commercial scale use in central parts of Serbia. Wood could replace virtually all fossil fuel-fired DH systems in central Serbia on the condition that inefficient wood stoves were replaced with efficient masonry or down-burning stoves.[295] More efficient stoves in households would also enhance the economics and environmental performance of fuelwood.

Private sector initiatives are starting to produce biodiesel or ethanol fuels from energy crops. These are not associated with any public policy regarding land use or tax support, nor do they have any relation with conventional agriculture production.

OVERALL RECOMMENDATIONS

In addition to the recommendations and key findings included in the Overview and in the regional chapters, the government of Serbia may consider the following recommendations useful:

Institutions and overall strategy

- Give priority to statistical systems, including the financial and human resources needed to reach international standards, as one of five instruments for realising the objectives of existing energy policy and the *ESDS to 2015*.
- Prioritise energy policy development and institutional capabilities in line with the *ESDS to 2015*.
- Reinforce the regulatory independence of the EAS by ensuring sustained and sufficient financial resources, staff and training.
- Enhance energy policy design and co-ordination with other sectoral policies (*e.g.* transport, housing and spatial planning) within the government and the administration; consider establishing a focal point for co-ordination, possibly the Development Institute.
- Create transparent, attractive and stable conditions for investments in the construction, reconstruction and modernisation of energy facilities and systems, and for linking these facilities to the regional energy systems.
- Continue to support the emergence of professional organisations to foster broad and open policy discussion; pursue public consultation processes in line with the Aarhus Convention.

295. As described in the section on renewable energy and in the chapter on Energy and Poverty, more efficient masonry and down-burning stoves could be used instead of common light stoves. These stoves combine better combustion chambers with thermal mass to extract energy from flame and exhaust gases to facilitate a more complete combustion of the fuel. Their efficiency is about double that of light stoves, and could result in considerable savings of fuelwood.

Market reforms and regulation

- Transfer authority for energy price setting for natural monopolies away from the Ministry of Finance to the energy regulator, EAS; enable EAS to finalise the price reform process to fully reflect costs; ensure EAS has sufficient independence and resources.
- Continue to unbundle public companies in line with obligations of the Energy Community Treaty; enhance corporate governance towards international accounting standards; clarify the role of the government as a shareholder.
- Ensure transparency in the privatisation and operation of state-owned companies.
- Accede to the Energy Charter Treaty, as well as the related Protocol on Energy Efficiency and the Related Environmental Aspects.

Energy security

- Adopt policy priorities for energy security, backed by adequate institutional set-up.
- Consider diversification of energy sources and imports in the context of regional and international agreements.
- Consider practical steps to establish emergency preparedness plans, including strategic reserves of fuels and energy-intensive raw materials.
- Strengthen the regulatory framework and its enforcement, in order to guard against abuse by monopolies and/or dominant suppliers and their potential impacts on energy security.
- Consider import of energy-intensive goods and raw materials, as well as broader industrial re-structuring to improve security of supply.

Energy efficiency

- Design and adopt a multi-sectoral action plan for energy efficiency with ambitious but realistic goals, backed by adequate resources and regulation.
- Ensure that the MME or other inter-sector institutions co-ordinate their activities with respect to related sector policies (taxation, environment, transport, spatial and urban planning, etc.).
- Provide SEEA with the financial and human resources necessary for it to assume fully its role and responsibilities in relation to implementing the *National Energy Efficiency Programme*.
- Adopt and implement EU Directives on energy efficiency and best practices, in particular for building standards, CHP, appliance labelling and minimum performance standards.
- Integrate energy efficiency into the *Poverty Reduction Strategy Paper* and into industrial policy.
- Set targets for energy efficiency improvements for regulated energy companies, with the support of SEEA and the monitoring of the EAS.

Energy and environment

- Implement the *National Environmental Strategy*, in line with international and EU standards, and within the planned timeframe.
- Ensure the Ministry of Environment has the capacity and authority needed to oversee environmental issues in the energy sector, including public companies.
- Continue the close co-operation and co-ordination between the Ministry of Environment and the MME on environmental protection.
- Ratify and apply major international protocols and conventions (*e.g.* CLRTAP with protocols, the Kyoto Protocol and the Aarhus Convention).
- Take measures to reduce environmental impacts of energy facilities, especially those related to lignite-fired power plants and oil refineries; implement measures (regular measuring and control, etc.) to reduce land calcification and to promote reforestation.
- Prepare strategies to reduce pollutant emission in existing large combustion units; adjust electricity and heat prices to comply with the Energy Community Treaty and other international obligations.
- Establish and enforce strict standards for indoor and outdoor pollution, in line with international standards and backed by public awareness campaigns.

Lignite

- Consider ways to enhance the viability and sustainability of the lignite mining sector, taking into account its socio-economic impacts.
- Apply a comprehensive framework of governance for the lignite mining sector, including the creation of a separate, independent authority for land reclamation.
- Adjust lignite prices to cover all associated costs and socio-economic impacts.
- Improve lignite extraction productivity and machine utilisation rates.

Oil products

- Consider security of supply for crude oil and oil products, taking into account shipping/pipeline transport costs and strategic reserve requirements, as well as EU quality standards.
- Enhance the quality of oil products and the performance of refineries and retail networks, in line with EU standards; set a clear implementation timeframe prior to NIS privatisation.
- Enforce strict control of imports to address tax and product quality issues.
- Introduce direct taxes, based on horsepower or emissions, for registered motor vehicles.
- Support urban and inter-urban public transport through tax incentives, transport planning and infrastructure development.

Natural gas

- Continue to re-structure the gas industry to enhance its performance and prepare for gas market opening according to Energy Community Treaty requirements.

- Pursue an active policy toward security of supply and diversification in the context of regional gas markets; ensure that future transit routes are coherent with the objective of diversification.
- Monitor the market structure in the gas sector to avoid abuses by dominant suppliers.
- Address seasonal fluctuations of natural gas demand through comprehensive national policies for sustainable district heating and co-generation.
- Re-consider the feasibility of underground gas storage facilities in the context of regional gas markets envisaged by the Energy Community Treaty.

Electricity

- Ensure progressive increase of electricity tariffs to reach cost-reflective levels; transfer the government's price-setting power to the regulator, EAS.
- Develop a comprehensive least-cost investment plan for electricity to assess supply and demand options, taking into consideration long-term sustainability.
- Continue to re-structure the EPS, enhancing corporate governance and performance.
- Ensure the realisation of the plan to unbundle (by mid-2008) monopoly activities, in line with Energy Community Treaty obligations.
- Ensure, through the EAS, that electricity companies have sufficient resources to maintain facilities and improve safety, technical and environmental performance.

Heat

- Clarify institutional arrangements between levels of government, the regulator and municipalities concerning the management and regulation of DH systems.
- Remove DH system subsidies from public budgets; divert available funds toward eradicating energy poverty.
- Ensure realisation of least-cost investment plan for heat supply and local energy planning as a means of identifying viable options (*e.g.* CHP and renewables); validate initial findings through feasibility studies.
- Support re-structuring and modernisation of DH systems, notably by improving energy efficiency and introducing consumption-based billing; ensure that companies are able to provide services at competitive rates.

Renewable energy

- Adopt a comprehensive action plan for renewable energy, backed by specific regulation to include feed-in tariffs and simplified administrative procedures.
- Identify market potential for renewable energy uses, based on recent comprehensive studies assessing their potential supply.
- Provide temporary, targeted support to industries that manufacture renewable energy equipment, particularly those manufacturing efficient solid fuel stoves.
- Reinforce actions against illegal logging; develop a national reforestation programme.
- Support efforts to improve statistics on fuelwood consumption in the residential sector.

Map 11 ....Kosovo's energy infrastructure

The boundaries and names shown and the designations used on maps included in this publication do not imply official endorsement or acceptance by the IEA.

X. KOSOVO[296]

KOSOVO'S ENERGY HIGHLIGHTS

Table 30 ....Energy snapshot of Kosovo under UN administration, 2005

	Kosovo[i]	Western Balkan region	OECD Europe
Total primary energy supply (Mtoe)	2.0	38.7	1 875.0
Total final energy consumption (Mtoe)	1.0	25.4	1 340.0
Energy consumption (toe) per capita	0.83	1.62	3.50
Electricity consumption (kWh) per capita	1 333	2 970	6 145
Energy intensity of GDP*	0.42	0.25	0.15
Carbon intensity (kg CO_2/GDP*)	0.81	0.69	0.33
Net imports as % of TPES (Dependence)	40	**	44%

* In terms of purchasing power parity; in toe per thousand USD (in year 2000 US dollars).
** Not calculated to avoid double counting due to intra-regional trade.
[i] Sources: Ministry of Energy and Mining of Kosovo; UNMIK, IEA statistics (with additional data from Montenegro used for calculation of averages for the Western Balkan region).

The adoption, in 2005, of the *Energy Strategy of Kosovo 2005-2015* was a major step toward developing a comprehensive energy policy. The *Strategy* outlines a progressive institutional framework for gradually taking over from the United Nations Interim Administration Mission in Kosovo (UNMIK) and international donors.

Kosovo's *Energy Strategy* has a strong policy focus on energy demand and recognises that enhancing energy efficiency is an important tool to reduce both inefficient use of electricity and widespread energy poverty.

Kosovo's regulatory framework aims to comply with the Energy Community Treaty, which seeks to establish a regional energy market in Southeast Europe, in accordance with EU regulation. Kosovo's electricity transmission grid is synchronised with the Union for the Co-ordination of Transmission of Electricity (UCTE) system and with all neighbouring countries. Nonetheless, before contemplating activities in regional markets and new supply investments, Kosovo needs to deal with its domestic challenges of limited energy supplies in the face of uncontrolled growth in domestic energy demand.

296. At the time of preparation of this Survey, Kosovo was under the administration of the United Nations Interim Administration in Kosovo (UNMIK), according to the terms of UN Security Resolution 1244 of June 1999. This territory is referred to as Kosovo in this Survey.

KOSOVO'S ENERGY CHALLENGES

Current energy production and consumption trends in Kosovo lead to serious negative environmental impacts. Lignite mining, which provides the main source of electricity generation, results in high levels of air pollution. Obsolete electricity generation technologies do not effectively control emissions. Widespread use of fuelwood (mainly by households) leads to deforestation, and creates local and indoor air pollution.

Electricity shortages and load shedding are persistent problems in Kosovo, and are directly linked to issues in both production and consumption. Despite domestic and international efforts and investments (since 2000), the economic and technical performance of Kosovo's electricity generation and network infrastructure remain low. In terms of consumption, low prices and non-payment result in excessive and inefficient use of electricity, particularly for heating.

To reduce the high level of energy intensity and the environmental impacts of energy use (mainly lignite), Kosovo needs to improve energy efficiency on both supply and demand sides. The broad orientation of Kosovo's energy and environmental strategies is consistent with the European Union. Nevertheless, the public authorities need to adopt and enforce action plans with clear target dates for implementation.

INTRODUCTION

Since 1999, Kosovo[297] has been governed by the United Nations Interim Administration Mission in Kosovo (UNMIK)[298] and the local Provisional Institutions of Self-Government. International negotiations began in 2006 to determine Kosovo's final status. In February 2008, Kosovo's Provisional Institutions of Self-Government declared independence from the Republic of Serbia, which contested the act; as the Republic of Kosovo, it has received partial recognition.[299]

In 2001, Kosovo's population was estimated at 2.4 million people,[300] predominately ethnic Albanians mixed with smaller populations of Serbs and other ethnic groups. A large Kosovar diaspora (estimated at 500 000) lives in Western Europe.[301] An estimated 230 000 refugees, mostly Serbs, have left Kosovo.

Kosovo covers an area of 10 887 km^2 and shares borders with Albania, FYR Macedonia, Montenegro and Serbia. Kosovo's largest cities are Pristina, the capital

297. Serbian: Kosovo i Kosovo i Metohija, also Kocmet or Kosmet; Albanian: Kosovë or Kosova. Kosovo has been subject to long-standing political and territorial disputes and a violent conflict in 1996-99 between the Serbian (previously Yugoslav) security forces and parts of the Albanian population of Kosovo.

298. Pursuant to the United Nations Security Council Resolution 1244.

299. As of 19 March 2008, 33 states had recognised the Republic of Kosovo.

300. This estimate is according to the Organisation for Security and Co-operation in Europe (OSCE). A census conducted in 1981 and 1991 estimated Kosovo's population at 1.6 and 1.9 million, respectively. However, it is likely that the 1991 census undercounted Albanians.

301. Primarily in the EU 15 and Switzerland.

(600 000 inhabitants) and Prizren (120 000). The climate is continental with warm summers and cold, snowy winters.

Despite substantial external subsidies, Kosovo has one of the poorest economies in Europe: annual per capita income in 2004 was estimated at EUR 1 565.[302] During the 1990s, the economy suffered severe damage due to poor economic policies, political and military conflicts, and weak access to external trade and finance.

Despite the net economic growth since 2000, Kosovo's economy remains weak. There is a small private sector in trade, retail and construction. Unemployment is pervasive, at around 40 to 50%. Officially, UNMIK has a "zero tolerance" approach to corruption and organised crime; however, a thriving black market economy still exists.[303]

Kosovo's main trade partners are Germany, FYR, Macedonia, Serbia and Turkey. Since 1999, Kosovo has experienced a large trade deficit (43% of GDP in 2005). International assistance has accounted for a large portion of Kosovo's financial flows in recent years.

ENERGY DEMAND AND SUPPLY

Sources and methodology

The *Energy Law* (2004) provides the legal basis for the Ministry of Energy and Mining to collect energy data from other administrations (*e.g.* customs), energy utilities and private companies. An energy balance, based on Eurostat methodology was prepared for the period 2003-05.

Demand

Since 2003, Kosovo's total final energy consumption (TFC) has been above 1 Mtoe, comprising oil products (50%), electricity (27%), fuelwood (20%), coal (3%) and district heating (1%).[304] Oil products are used mainly in transport (54%) and industry (26%); electricity is used primarily in the residential sector (73%), with services (14%) and industry (13%) making up the remaining demand. The residential sector is the main consumer of fuelwood (50%), followed by the service sector (25%), industry (15%) and agriculture (10%).

The energy demand of industry has stagnated since 2003 and now represents 21% of total consumption. With an average growth rate of 8% since 2003, the residential

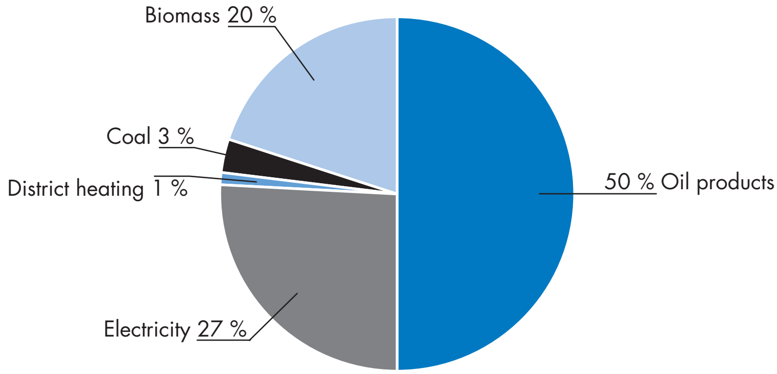
302. The Euro is the official currency in Kosovo, although the Serbian Dinar is used in areas populated by Serbs.

303. Unofficial figures suggest the black economy accounts for up to 60% of economic activity.

304. Natural gas is not yet available in Kosovo.

sector currently accounts for the largest share (33%), followed by transport (27%), the service sector (13.5%) and agriculture (5.5%).

Figure 25 ....Kosovo's total final consumption by fuel, 2005



Source: Kosovo Energy Balance for 2003-2005, Ministry of Energy and Mining, Kosovo, 2006.

Electricity consumption in Kosovo is increasing rapidly (8% per year since 2000); in 2005, consumption was 3.2 TWh (1 620 kWh per capita). However, the sector has several serious and inter-related challenges. Peak demand increased from 1 050 MW (2005) to 1 300 MW (2006), creating a gap of 700 MW between demand and supply, and leading to chronic supply restrictions. This is largely due to the extensive use of electricity (it is estimated that more than 30% of electricity is devoted to space and water heating), which is stimulated by low electricity prices and low payment discipline by consumers. Such excessive use, in turn, leads to frequent problems of overload and black-outs. Since 2004, these restrictions have been managed by a regional load-shedding system.[305] Electricity supply in Kosovo is also limited by a lack of installed generation capacity, poor system reliability and import restrictions (mostly for economic reasons). Finally, the high level of non-payment further depletes the sector's limited financial resources, which are needed for adequate maintenance and replacement of facilities.

The *Energy Strategy of Kosovo 2005-2015* (Box 10) includes an energy demand forecast that is updated every two years;[306] it predicts an increase in energy demand of 43% to 1.6 Mtoe over this 10-year period. Energy demand is expected to increase most in the transport sector (+57%), followed by the service sector (+56%), households (+47%), industry (+37%) and agriculture (+23%). As for electricity demand, the *Energy Sector Technical Assistance Project* (ESTAP I; World Bank 2002-05) considers a medium-growth scenario of 3.9% per year (5.1 TWh) and a high growth scenario of 5.5% (6.5 TWh).

305. As of 5 December 2005, Kosovo's integrated electricity utility (KEK) changed the way it provides electricity to customers. KEK now splits consumers into three groups (A, B and C), according to importance of supply and ability to pay. Group A receives 24-hour electricity supply. Group B receives five hours supply and one hour shedding. Group C receives three hours supply and three hours shedding. The ABC distribution method has been relatively successful and has improved the cash collection rate.

306. Difficulties gathering data on energy statistics reduce the quality and reliability of energy projections.

These expected growth rates are below the recently recorded growth of 8% per year, largely due to expected electricity price increases and stricter enforcement of payment for electricity.

Supply

Since 2003, total primary energy supply (TPES) has been stable at above 2 Mtoe. Kosovo is largely self-sufficient in this area, producing more than 65% of its energy needs domestically in 2005. Lignite, the main domestic fuel, accounts for 59% of TPES; other main contributors are fuelwood (11%), imported oil products (28%) and net electricity imports (2%).

Energy intensity

Kosovo's energy and electricity intensity as a function of GDP are five times higher than the average for OECD Europe (33 kWh per thousand USD of GDP). This is largely due to the high electricity consumption (due to low prices and non-payments), high transmission losses and low domestic economic performance. On a per capita basis, Kosovo's energy consumption (1.07 toe) and electricity consumption (1 455 kWh) are among the lowest in the Western Balkan region – a substantial 46%. This low consumption reflects a low level of economic activity and a modest comfort level in residential and service sectors.

Despite low consumption, Kosovo's energy intensity is very high. On a ratio of final energy consumption to primary energy supply (TFC/TPES), the total energy efficiency of Kosovo's system is only 50%. Losses are very high in the electricity sector. The efficiency of electricity generation in Kosovo averages only 31% compared to 42% in more modern European coal-fired plants. Kosovo's grid also has very high (37%) transmission and distribution losses:[307] about 15% of such losses are attributed to technical losses; the larger portion – about 22% – is due to theft and written off as "commercial losses".

ENERGY POLICY AND INSTITUTIONS

Institutions and overall strategy

Institutions

Several government bodies and independent agencies are involved in overseeing the energy sector, all of which were established following the partial transfer of responsibilities from UNMIK to the provisional government of Kosovo in October 2004.

307. By comparison, average transmission and distribution losses are much lower in the EU 15 (3 to 8%), Slovenia (7%) and Croatia (14%).

Responsibility for policy and strategy in energy and mining was transferred to the ***Ministry of Energy and Mining*** (MEM). MEM employs a staff of 120 and has three main departments:

- *Strategy and Development Department* focuses on energy supply security, competition and environmental protection.
- *Department of Energy* designs and implements energy sector and market reforms.
- *Department of Mining* prepares strategy for the mining sector, as well as legislation and technical regulations on matters related to exploration and utilisation of raw minerals.

The ***Energy Regulatory Office (ERO)*** was established by the Law on the Energy Regulator (Law No. 2004/9). Its mandate includes licensing, authorising new investments, setting tariffs (for network access, end-use electricity, heat and natural gas), setting technical regulations (*e.g.* grid code) and monitoring effective unbundling and competition. ERO is directed by a five-member board, which is proposed by the authorities and appointed by the *Assembly of Kosovo* for a period of two to five years. A staff of 16 experts assists the board.

The ***Independent Commission for Mines and Minerals (ICMM)***, established in 2005, administers all mining related permits and licences. It also carries out technical supervision of mines and plants, and monitors the implementation of safety and health regulations at working sites. It has a staff of 50.

The ***Kosovo Trust Agency (KTA)*** administers publicly owned enterprises (POEs). The KTA has a mandate to administer and re-structure the POE *Korporata Energjetike e Kosovës (KEK)*, Kosovo's integrated electricity utility (which includes coal mining and the generation, distribution and supply of electricity). The KTA appoints the board of directors for KEK, which in turn hires the company management. However, the KTA cannot privatise KEK's assets.

Other governmental bodies also play various roles in overseeing social, economic and environmental responsibilities in the energy sector, including: the *Ministry of Environment and Spatial Planning; the Ministry of Labour and Social Welfare; the Ministry of Trade and Industry; and the Ministry of Economy and Finance*

Energy policy and strategy

Key issues

- ***Capacity building***
- ***Obstacles to effective and durable implementation of the Energy Strategy***
- ***Achieving economic and financial balance in state companies as international support declines***

In 2005, MEM prepared the *Energy Strategy of Kosovo 2005-2015* (Box 10) as required by the *Law on Energy*. The *Strategy* is based on several initiatives and studies undertaken by key agencies: the Energy Sector Technical Assistance Projects (ESTAP I and II) (World Bank 2002-05); a Kreditanstalt für Wiederaufbau (KfW) study (2000); and a MEM White Paper (2003). It also reflects expert feedback financed by the European Agency for Reconstruction (EAR) and the Riinvest Institute, as well as public hearings.

Box 10 ....Kosovo's *Energy Strategy 2005-2015*

Kosovo's *Energy Strategy* addresses the effective management of energy resources and the development of new resources. It sets out policies and measures to ensure energy resources are used in a rational way to meet goals of economic development, social welfare and environmental protection based on international standards.

The Strategy identifies six main priorities:

- Increase electricity generation capacity (lignite-fired) to at least 1 800 MW for domestic supply and exports (30 to 50%), with foreign investors contributing more than 60% of investment.
- Improve the energy sector's viability by re-structuring KEK (the vertically integrated electric utility) and achieving full collection of electricity bills by 2009.
- Modernise the electricity network to ensure its integration with regional and European networks.
- Reduce technical losses to international levels by 2010-12.
- Implement natural gas and district heating in regional centres by the end of 2012.
- Rehabilitate existing power plants to incorporate environmental protection technologies by 2010; enforce environmental protection standards (including the Kyoto Protocol) during construction of new electricity generation capacities.

In early 2006, MEM published the Programme for the Implementation of the Energy Strategy for the Period 2006-2008, which contains a list of short-term priorities and an implementation timetable.

Discussion

Since 2004, Kosovo has made significant progress in establishing the institutional framework needed to implement energy sector reforms. Approved legislation determines the roles and responsibilities for the regulation and management of Kosovo's energy sector, and clearly defines a leading role for MEM. The energy and the mining regulators both play very important roles in promoting energy markets; however, these agencies lack the capacity needed to fulfil their roles. In 2006, an initiative to align employment standards to public administration at the ERO essentially reduced the staff by one-half to 20. Both regulators need to establish sufficient independence from political and industrial influence and secure adequate resources to attract highly qualified staff.

Kosovo needs new sources of economic growth to support energy, social and environmental improvements. The Kosovar energy authorities will need to co-ordinate with other public policy makers, particularly in the process of implementing environmental, residential, service and transport sector policies. Some governments in the Western Balkan region have established inter-governmental bodies (through special Task Forces) to facilitate information exchange and policy co-ordination.

The adoption of the *Energy Strategy of Kosovo 2005-2015* was a major step forward in the development of a comprehensive energy policy for Kosovo in a sustainable and durable way. This reflected the progressive establishment of an institutional framework, gradually taking over from UNMIK and international donors. It is encouraging that the provisional government adopted a *Strategy Implementation Plan*, which gives MEM a strong co-ordination role, to help reach the ambitious objectives of the *Strategy*.

The *Strategy* has a strong policy focus on energy demand, an area largely neglected in the past, and recognises enhancing energy efficiency as an important tool to resolve the persistent energy crisis and energy shortages. Excessive and inefficient use of electricity, particularly for heating, is driven by low prices and weak payment enforcement, as well as by the lack of viable alternative energy sources (*e.g.* LPG, natural gas, efficient boilers and wood stoves). The *Strategy* and sectoral action plans should provide concrete steps for effective management of demand-side energy and improvements in energy efficiency.

The expected reduction in grants by international donors, particularly those directed toward lignite mines and power plants, will create a need for sound investment decisions. These should fully consider both least cost and global cost (*i.e.* investment and maintenance costs *plus* externalities), which can be used as a powerful tools in assessing the economic viability of supply-side projects compared to demand-side measures.

At all stages of the policy and investment cycle (*e.g.* design, implementation, monitoring), authorities, energy companies and customers will need access to reliable energy statistics and indicators. In order to overcome the energy challenges facing Kosovo, it will be important to ensure broad consultation within the energy sector and with the public, to raise awareness and reach general agreement on objectives, priorities and implementation. Ensuring transparency and open communication at all stages will be equally important to gain support and ownership of the reform process.

Market reforms and regulation

Key issues

- ***Law enforcement***
- ***Low electricity tariffs***
- ***Non-payment***

Kosovo is in the process of liberalising its electricity market by establishing an independent national regulatory authority and a transmission system operator (TSO). Kosovo's regulatory framework[308] largely complies with EU Directives and the Energy Community Treaty for the creation of a regional energy market[309]. There are two energy regulators: the *Energy Regulatory Office* (ERO) for the electricity and district

308. The regulatory framework is based on the following legislation: *Law on Energy 2004/8; Law on Energy Regulator 2004/9; Law on Electricity 2004/10, Law on Environment Protection 2003/9; Law on Trade of Petroleum and Petroleum Products in Kosovo 2004/5.* All laws and regulations for the period 1999-2006 are available online at: www.unmikonline.org/regulations/unmikgazette/index.htm. Laws and regulations for the period starting June 2006 are available at: www.ks-gov.net/gazetazyrtare.

309. See chapter on Energy Co-operation and Trade.

heating (DH) markets, and the *Independent Commission for Mines and Minerals* (ICMM) for the coal sector regulation.

In the process of incorporating KEK (December 2005),[310] MEM made the former entity's transmission division independent (as of July 2006). In October 2006, the ERO granted a licence to the new entity, known as KOSTT, which now serves as the national transmission system and market operator. KOSTT controls energy flows in, out and through Kosovo, thus serving an important function in the domestic electricity market. In January 2007, all final customers connected at 35 kV lines were assigned rights to apply for the status of eligible customer, and choose their electricity supplier.

Past decisions and policies are having a negative impact on the viability of KEK. In July 2000, KEK gave free electricity access to vulnerable groups located in regions most likely to suffer extensive load shedding. The goal of this initiative was to ease their situation, and to limit illegal power connections and excessive woodcutting for heat. In other regions, a tariff was introduced for monthly electricity consumption below 800 kWh (peak tariff of EUR 0.04/kWh).

These direct subsidies affect both the budget and taxpayers. Because of them, current electricity tariffs do not cover the cost of generation or of imports. In addition, KEK is accumulating debt due to low payment of bills.

In December 2006, the ERO approved a new reduced "lifeline" tariff for two consumer groups: those who consumed below 200 kWh/month and those who consumed 200 to 600 kWh/month (those who consumed more than 600 kWh/month paid the full tariff). This system better addressed the real needs of consumers; however, it placed all associated costs on KEK, thereby exacerbating the utility's financial difficulties.

In response, KEK proposed a new tariff to the ERO in February 2007. The proposed tariff would replace the "lifeline" system with a single tariff of EUR 0.04/kWh for all households. Households without meters (a significant share of customers) would continue to pay a flat fee of EUR 23/month (equivalent to an estimated consumption of less than 400 kWh). KEK's proposed changes would not affect benefits for special groups (*e.g.* war veterans) that currently receive free electricity supply. As of publication of this Survey, the ERO had not yet approved KEK's proposed tariff.

Discussion

With the help of international donors, Kosovo has established energy legislation that aims to comply with EU Directives and provides the tools needed for energy market reforms. On behalf of Kosovo, UNMIK signed (in 2005) the Energy Community Treaty, making Kosovo an equal partner and player in the regional energy market. The legislation envisages the development of Kosovo's lignite reserves for major power exports to Southeast Europe.

310. *Korporata Energjetike e Kosovës* (KEK) is Kosovo's vertically integrated electricity utility; its activities encompass coal mining, electricity generation, distribution and supply. KEK is a state-owned enterprise, administered by the KTA under UNMIK and EU Pillar IV.

Before participating in regional markets, Kosovo needs to address its domestic challenges of limited energy supplies in the face of uncontrolled growth in domestic energy demand, investment delays and increasing costs in opening up new coal mines.

Kosovo remains heavily dependent on foreign investment to move ahead with developing its energy markets and market reform. However, Kosovo's attractiveness to investors – and therefore its ability to become an important energy supplier – is undermined by political uncertainty and risk, artificially low domestic electricity prices and widespread non-payment.

The enforcement of laws clarifying market fundamentals, coupled with a viable tariff system and enforcement of payment, depends largely on the political will to adopt and implement a range of sectoral and cross-sectoral laws (*e.g. Law on Mining, Law on District Heating*, and *Law on Energy Efficiency*). It will also depend on the availability of affordable heating sources.

An important condition for a competitive energy sector is the unbundling of monopoly activities and the creation of independent regulatory bodies that can ensure fair and transparent access to transmission infrastructure. The creation of KOSTT as an independent transmission system and market operator was a major achievement in this respect.

Energy security

Key issues

- ***Vulnerability of the energy sector to persistent black-outs and brown-outs***
- ***Outlook for increasing import dependence***

Energy facilities in Kosovo are primarily made up of lignite mines and the electricity system, which had deteriorated before a rehabilitation process was initiated in 1999. Electricity can be imported from countries in Southeast Europe to complement domestic supply, thereby enhancing reliability.

Approximately two-thirds of Kosovo's domestic energy needs are met through the use of domestic lignite production (used in electricity generation) and fuelwood for heating. However, Kosovo is completely dependent on imports for oil products. The significance of this dependence will increase in the future because of transport demand, as will its relation to the main energy security issue,[311] – widespread electricity outages.

The *Energy Strategy* plans to diversify the energy mix through additional use of other fuels, notably with the expansion of LPG in the residential sector (for cooking and heating). The *Strategy* also considers the introduction of natural gas by 2012, an ambitious but realistic plan given that FYR Macedonia's natural gas infrastructure

311. Measures to enhance the security of oil and gas supply in Kosovo are discussed in sections related to oil and natural gas.

is less than 100 km away. It also incorporates a plan to establish a 90-day strategic reserve of oil products by 2015.

Discussion

Pressing and persistent electricity shortages underline the need for effective energy security policies in Kosovo, coupled with solid implementation measures in line with EU requirements. In the short term, the major issue is the persistent electricity crisis. Over the longer term, the main issue is the negative environmental and social impacts associated with a perceived need for energy self-sufficiency that relies on lignite and, to a lesser extent, fuelwood as primary energy sources.

In the short run, supporting the penetration of LPG could help to reduce pressure on the overloaded electricity system. It also provides a system that ensures consumers pay for the fuels they consume, thereby stimulating more efficient energy use. Coupled with the planned introduction of natural gas by 2012, this would lead to a higher dependence on energy imports. However, the supply reliability of those fuels has been good in the region. Use of LPG and natural gas will increase the diversification of supply and reduce the negative environmental impacts associated with current energy sources.

Energy efficiency

Key issues

- ***Institutional framework and funding for the action plan***
- ***Multiple regulatory barriers***

Improving energy efficiency and increasing use of renewable energy sources will be key to reducing the high energy intensity and environmental impacts of energy use in Kosovo. In 2006, with the support of the EAR, Kosovo developed a *Programme for Energy Efficiency and Renewable Energy Resources* for the period 2007-09. The resulting report outlines six programmes targeting the energy sector and main end-use sectors (*e.g.* government buildings, households, industry, transport and agriculture). It also includes a section on renewable energy. Implementation of the programme will require close co-ordination of activities at the national and municipal levels. Public awareness campaigns and the implementation of pilot projects for energy efficiency will be key components. To support long-term action in these areas, Kosovo is considering the creation of a National Energy Efficiency Agency.

Discussion

The *Programme for Energy Efficiency and Renewable Energy Resources* provides sound guidelines to establish action plans for tapping Kosovo's significant potential to improve energy efficiency on both the supply and demand sides. In addition, the assessment and recommendations of the recent World Bank study, *Energy Sector: Heat Market Study* (World Bank, 2007), provide valuable suggestions for demand-side management and energy-saving measures (*e.g.* building insulation and efficient stoves). However, legal and institutional frameworks are still lacking, as are the necessary budget allocations.

Developing freight rail transport in Kosovo will reduce transport costs, increase security of supply and reduce road congestion and illegal imports. Similarly, developing urban and inter-urban public transport for passengers will reduce congestion and pollution. Enhancing the quality of motor fuels and control of vehicle engine performance will enhance energy efficiency and decrease urban air pollution.

Energy and environment

Key issues

- ***Dust emissions and sewage from lignite mines and power plants***
- ***Illegal woodcutting***

Many aspects of Kosovo's energy sector have negative impacts on the environment. Coal is the primary resource for energy production in Kosovo; the negative effects of coal mining are well documented. In the energy transformation sector, the biggest problem is obsolete electricity generation technologies that do not effectively reduce emissions. In addition, the poor quality of fuels (both dry and raw lignite) for power generation and of engines in transport vehicles contribute to air pollution in urban areas. Finally, the widespread use of fuelwood by households leads to local pollution and serious deforestation.

Air pollution in Kosovo is high, much of it deriving from lignite, the main energy source. Lignite fires in open-cast mines affect rural areas; lignite burning at Kosovo's two power plants (Kosovo A and B) elevate air pollution levels in Pristina and the Kosovo valley, where a large portion (700 000) of the population is concentrated. The annual volume of emissions released by these plants is considerable: 3.9 Mt of CO_2 and 0.2 Mt of SO_2. Dust (fly ash) is also a major issue at both plants: Kosovo A emits 40 times more dust than EU limits (50 mg/m^3); Kosovo B emits ten times the EU limits.[312] Collectively, the plants release 18 000 t per year of dust; another 5 600 t per year is released through the transport and storage of ash in unregulated dumps. SO_2 and NO_X emissions from the Kosovo A and B power plants are also well above EU limits (400 mg/m^3); Kosovo B reaches 800 to 900 mg/m^3 of SO_2; together, Kosovo A and B reach 1 600 mg/m^3 of NO_X.

At the household level (in both rural and urban areas), inefficient use of biomass and low quality light heating stoves create high levels of indoor air pollution, having a negative impact on human health.

Demand for fuelwood in Kosovo is extremely high, largely due to increasing energy prices and limited access to other energy resources (*e.g.* sorted coal and LPG). These factors contribute to growing problems of energy poverty and of widespread deforestation. Large volumes of wood are cut illegally: some is used for fuel but high local market prices (EUR 25 for 1 m^3 of oak wood) prompt the importation of significant volumes. Kosovo risks losing most of its forests in the medium term, leading to soil erosion and problems with water availability. Eventually, Kosovo may need to draw more fuelwood resources from other countries in the region.

312. EU Directive on large combustion plants (2001/80/EC).

Together with economic and social problems, environmental protection is a major challenge facing Kosovo. The *Environmental Strategy* (adopted at the end of 2006), drafted by the Ministry of Environment and Spatial Planning, is based on a legal framework defined in the *Law of Environment Protection of 2003*. It represents an important step forward in establishing a comprehensive and long-term concept of environmental protection. The *Environmental Strategy* outlines four main goals for the electricity sector:

- Reduce emissions in air, water and soil.
- Increase energy efficiency in generation, supply and consumption.
- Apply environmentally friendly technologies, including clean coal technology.
- Establish a monitoring system and electronic database of environmental indicators.

In support of the *Environmental Strategy*, the Ministry of Environment and Spatial Planning has prioritised key measures and activities. Timely completion of a legal framework in accordance with EU standards and the Kyoto Protocol is set as a top priority, along with implementation of a timetable to reduce emissions and transpose the EU acquis communautaire on the environment. Major energy companies will be encouraged to establish an environmental management system. On a practical level, the Ministry will pursue four important activities: create a monitoring system for fuel quality; rehabilitate pollution control equipment at thermal power plants (TPPs); develop a plan and project implementation for land reclamation and mine closures; and mitigate the use of ash dumps to prevent pollution.

Discussion

In order for Kosovo to take part in the regional energy market, it must improve environmental standards at existing power plants in compliance with relevant EU environmental legislation (particularly the EU Directive on large combustion plants). The assistance of the European Commission, particularly in the implementation of Kosovo's *Energy Strategy*, will support efforts to attain such standards.

Effective wood drying and more efficient stoves – in addition to increased public awareness on the proper use of fuelwood – will help improve the efficiency of fuelwood use, reduce air pollution and limit the growth of demand for fuelwood.

The broad orientation and priorities of Kosovo's *Environmental Strategy* are consistent with the EU's environmental policy. Nevertheless, Kosovo needs to adopt and enforce an action plan with a clear timetable of implementation target dates. New tools, such as emission fees based on the "polluter pays" principle, may be needed to create an environmental fund that would finance projects to reduce emissions and support environmental and sustainable energy investments (*e.g.* to promote energy efficiency and use of renewable energy sources). Such a fund might also collect fees that would be disbursed for future mine reclamation activities. Over the longer term, a strategy is envisaged for implementing the EU Emission Trading Scheme.

THE ENERGY SECTOR

Lignite and electricity

Key issues

- *Complex exploitation of existing mines*
- *Opening process of new mines*
- *Environmental, social and economic impacts in densely populated regions*
- *Mine remediation*
- *Overuse of electricity for heating*
- *Low tariffs and non-payment*
- *Low efficiency, reliability and high pollution of thermal power plants*

Lignite

Kosovo has the world's fifth-largest accumulation of lignite,[313] technically recoverable reserves are estimated at 11.5 billion tonnes, located mainly in the Dukagjin valley. Lignite is Kosovo's only domestic fossil fuel source and accounts for 97% of domestic electricity generation. It is also used in DH systems and directly by households.

Korporata Energjetike e Kosovës (KEK) is Kosovo's vertically integrated electricity utility; its activities encompass coal mining and the generation, distribution and supply of electricty. KEK is a state-owned enterprise, administered by the KTA under UNMIK and EU Pillar IV. Since the end of 2005, KEK has been a joint-stock company and has undergone a process of legal and accounting unbundling. In 2005, it employed a staff of more than 8 350 people and had a gross revenue of EUR 113 million, reflecting a loss of EUR 39 million.

Lignite is currently extracted (by KEK) in the open mines of Bardh and Mirash in the Pristina basin, and used to feed the nearby power plants Kosovo A and B. The mines and plants are located in densely populated regions, adding to the difficult mining conditions. Emissions at the mines and power plants are well above internationally allowed limits, resulting in serious environmental and health impacts.

The existing mines have an expected lifetime only to 2009. Thus, KEK is placing high priority on the development of a new mine, the Sibovc South-West (Sibovc SW) mine, which has 830 Mt of exploitable reserves. Development of the Sibovc SW mine is now underway, using capital raised through donor funds and through the 2006 Kosovo consolidated budget. Total investment is estimated at EUR 237 million over the period 2006-12. The estimated mining costs are EUR 6.8/tonne of raw coal.[314]

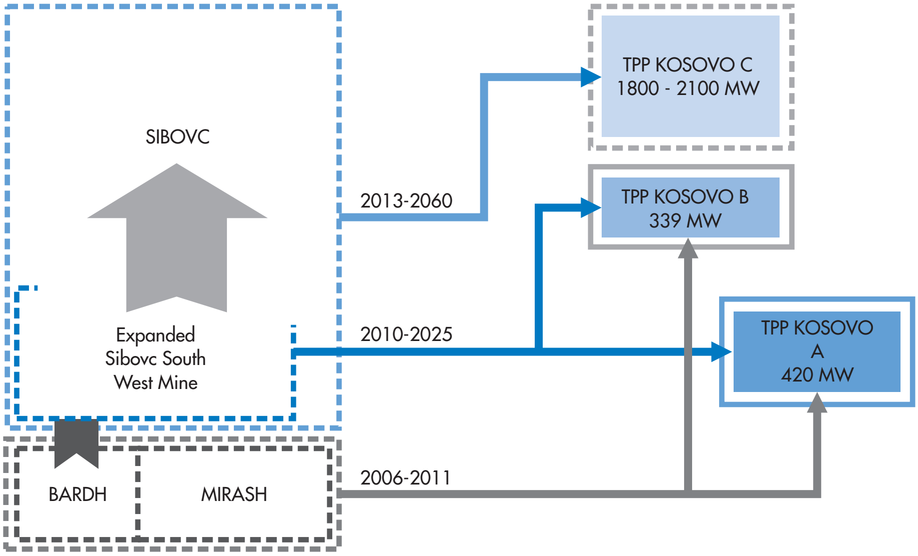
The *Energy Strategy* estimates that this new mine will supply the Kosovo A and B power plants until their expected closure (which is not yet determined) and provide the 650 to 750 Mt needed to fuel the new plant over its expected 40-year operational life. An

313. The Kosovo mines have an average overburden per tonne of lignite ratio at 1.7 m^3 and a calorific value is 9.20 MJ/kg. Their sulphur content is 0.65 to 1.50% with relatively low to medium ash content (9.80 to 21.30%) and high moisture content (38 to 48%).

314. This does not account for costs to the environment and population. Estimates of these costs will be available when a feasibility study is done.

additional 123 Mt of lignite will be needed to fuel the existing KEK plants to the end of their maximum expected lifetime (in 2025).

Figure 26 .... Plans for lignite supply from individual lignite mines in Kosovo



TPP: thermal power plant.
Source: MEM.

Power generation

Despite efforts by both Kosovar organisations and the international community since 2000, KEK´s ability to deliver electricity in a viable way continues to be compromised, primarily by its inability to collect full payments for the electricity it delivers. On average, KEK collects only about two-thirds of the value of electricity delivered (including technical and commercial losses). These persistent shortfalls limit KEK's ability to finance maintenance and other capital investments, and to provide 24-hour electricity.

Because Kosovo experiences significant power outages throughout the year, the use of individual diesel generators is common. On a larger scale, unreliable energy supply is frequently cited as the main impediment to new investments and business expansion. Enhancing the ability to deliver electricity is a critical aspect of Kosovo's economic development strategy. The situation has improved somewhat since late 2006, when a new management team took over KEK. A government programme to combat illegal connections has also helped to improve KEK's viability.

Kosovo's total installed generation capacity is 1 513 MW, almost entirely lignite-fired. Most electricity in Kosovo is produced by two thermal power plants (TPPs) – Kosovo A and B – which are operated by KEK.

Kosovo A (commissioned 1962-75) comprises five units and has an overall rated capacity of 800 MW; however, the technical condition of key components limit operational capacity to only 420 MW. This is largely due to poor maintenance since the 1980s. More recently, four of the five units have been partially rehabilitated;

however, their operation remains unreliable and their efficiency is less than 30%. The fifth unit is out of operation.

Kosovo B (commissioned 1983-84) consists of two units of equal rated capacity of 339 MW, which have an efficiency of more than 30%. In 2002, a fire caused massive damage to the plant; it resumed normal operation in 2004. The EAR provided grants of EUR 174 million for various operations in the plant, including those related to the fire.

Pollutant emissions (dust, SO_2 and NO_x) of the two plants are well above EU standards. However, as stipulated in the Energy Community Treaty and the EU Directive on large combustion plants, these facilities will have to comply with much stricter emissions standards as of 2017.

The hydropower plant of Gazivode/Ujman (2 x 17.5 MW) is in relatively good condition.

Box 11 .... International and domestic assistance to Kosovo's energy sector, 2000-2006

Significant investment has been made in Kosovo's energy sector in recent years, through international donors (mainly EAR) and international financial institutions (IFIs; mainly the World Bank), and through Kosovo's consolidated budget.

- Electricity imports: over EUR 200 million
- Repair of Kosovo B (lightning strike damage): over EUR 200 million
- Investments in KEK: over EUR 300 million
- Infrastructure (electricity grid) upgrade: EUR 280 million
- Assistance in implementing the *Energy Strategy* (new power plant and mine): EUR 23 million
- Technical assistance and management support: EUR 23 million
- Institutional capacity building and sector reforms: EUR 5.5 million

A large portion of the investment has been directed toward KEK. In total, KEK power plants received more than EUR 700 million (EUR 800/kW of installed capacity).

Source: Fact sheet on *Energy Issues in Kosovo* summarised by UNMIK Pillar IV.

Development plans

The expected life of Kosovo A and B runs to 2025; however, both plants require upgrades and maintenance. The *Energy Strategy* calls for the rehabilitation of unit A4 to be completed by mid-2008, and of unit A5 by 2009. Expected rehabilitation costs are more than EUR 150 million (EUR 350 per available kW of capacity). Rehabilitation of other units is on hold, pending a decision as to whether or not a new power plant will be built. Both units of Kosovo B are expected to obtain an extension of their working life for an additional 20 years.

The public authorities have identified the energy and mining sectors as a key to future growth. Lignite is abundant and has the potential to attract foreign investors. According to the Kosovo authorities, expanding these sectors would improve electricity supply to meet domestic demand and enable power export to the rest of the region. In turn, such expansion is expected to create multiplier effects on investment and job prospects,[315] and provide a substantial long-term source of income.

In 2006, a study commissioned by the EAR[316] recommended the construction of new generating capacities in Kosovo to supply both local and regional energy markets. The planned new lignite-fired power plant, Kosovo C, is to have a capacity of 1 800 to 2 100 MW and be constructed in phases (900 to 1000 MW by 2012-14; additional units by 2018-20).[317]

Kosovo C should achieve efficiency above 40% and fulfil all EU-mandated environmental requirements by using advanced and commercially proven technologies, namely either pulverised fuel (PF) or circulating fluidised bed (CFB). The recommended location for Kosovo C is in the Sibovc SW field, which will ensure a 40-year supply of raw material. This location also facilitates use of the existing infrastructure (land, network utilities, water supply, etc.) at nearby Kosovo B. The economic viability [318] of the new plant will depend primarily on its cost of construction,[319] which is estimated at EUR 2.1 to 2.5 billion (EUR 1.1 to 1.3 billion in the first phase; about 10% less in the second phase).

In October 2006, large power companies from Europe and the United States showed keen interest in the international tender for Kosovo's power generation plans, which include rehabilitation of Kosovo A, construction of Kosovo C and opening of the new Sibovc SW coal mine. Four companies were short-listed; the winner (to be announced by the end of the first half of 2008) will undertake detailed feasibility studies.

A number of studies, using various scenarios, have been undertaken to assess the environmental impacts of existing power plants and the proposed new plant.[320] One scenario assumes that when Kosovo C is commissioned, Kosovo A will be closed (and the site de-contaminated) while Kosovo B will continue to operate. To reduce environmental impacts, it is expected that modern thick, wet slurry technology will be used to transport ash, which will be deposited in depleted lignite mines. This scenario projects notable environmental improvements:

---

315. The potential of the energy sector in direct job creation should not be overestimated. In the near term, Kosovo will need to create approximately 700 000 new jobs. At best, the energy sector will be able to generate a few thousand new jobs – and even those are dependent upon new investments in coal and electricity generation.

316. *Pre-feasibility studies for the new lignite fired power plant and for pollution mitigation measures at Kosovo B power plant,* completed for EU CARDS by Elecktrowatt Ekono of Finland (February 2006).

317. The previous *Energy Strategy,* approved by the Assembly (Parliament) in 2005, assumed only 1 000 MW capacity.

318. Based on a lignite purchase price of EUR 7/t, a load factor of 85% and an electricity sales price of EUR 40/MWh, estimated operating costs (excluding capital costs) are EUR 13.4 to 13.9/MWh. Repayment of debt financing would be approximately 20 years.

319. Opening of a new mine (Sibovc SW) and rehabilitation of some units at Kosova A are estimated to cost an additional EUR 600 million.

320. Including EU CARDS pre-feasibility study for Kosovo C and Forum 2015.

- Airborne emissions would drop to less than one-third of current levels.
- Fly ash emissions currently amount to a total of 23 600 t per year: 18 000 t from plant operations (14 000 t from Kosovo A; 4 000 t from Kosovo B) and 5 600 t from the ash dumps. In the future scenario, with Kosovo C (four blocks of 2 000 MW) and Kosovo B in operation, and the ash dumping at de-commissioned Kosovo A, total emissions would fall to 6 200 t per year. Similarly, NO_x emissions would be reduced to 68% of current emissions. However, SO_2 emissions are expected to increase.
- Water pollution would be reduced dramatically.

Contamination of the Sitnica River is extremely high; concentrations of heavy metals and suspended solids exceed EU levels many times. In the proposed scenario, these levels would be reduced through three means: the closure of Kosovo A; investment in pollution mitigation technologies at Kosovo B; and the installation of wastewater treatment and/or emission control technologies in the planned Kosovo C.

Transmission network

The total length (in 2006) of Kosovo's transmission network (including 400, 220 and 110 kV lines) was 1 162 km. The network's high-voltage section is synchronised with the regional interconnected transmission system of UCTE. Kosovo's system is also interconnected with all neighbouring countries that have 400 kV lines (there is no interconnection with Albania, which has only a 220 kV line).

KOSTT, the transmission system and market operator, has developed an investment plan designed to improve the security and reliability of the network. The plan identifies four key investment projects to increase the interconnection capacity with neighbouring systems:

- Construct two new sub-stations (400/110 kV in Peja III and Ferizaj); rehabilitate 110 kV transmission lines.
- Construct a Kosovo-Albania interconnection line (400 kV); study the feasibility of a Kosovo-Skopje line (220 kV).
- Rehabilitate the dispatch centre; complete the load-frequency control project; establish a new SCADA/EMS[321] system.
- Strengthen transmission and interconnection capacities, including those necessary for electricity export and exchange with Albania (Albania's peak and Kosovo's base-load capacity).

It should be noted that current interconnection and transmission capacities outside Kosovo are insufficient to export the volumes envisaged in the current Kosovo C project (1 800 to 2 100 MW).

Distribution

Kosovo's distribution network (voltage below 110 kV and sub-stations) is characterised by a small number of supply sources and high loads on 110/35 kV and 35/10 kV. The network is overloaded and consistently exceeds capacity during peak load conditions. The medium-voltage network used in rural areas is problematic: the combination of long lines and small conductors at cross-sections causes high variability in voltage (drops and peaks of up to 40% of the nominal voltage) and considerable technical losses. In addition, the radial structure of the network makes it impossible to assure reserve supply, particularly in rural areas.

321. Supervisory Control and Data Acquisition (SCADA)/Energy Management System (EMS).

To improve the quality and reliability of power supply, KEK plans to increase the capacity of the distribution network. In addition, it will be necessary to improve the network configuration and the distribution feeders and transformers, and to build new sub-stations. Given the potential for new distributed generation systems based on natural gas, the expected reduction of peak demand could reduce investment needs in the existing electricity distribution network. At the same time, this may create new challenges for power system operation. A least-cost supply study should provide policy makers with the necessary information to make the right choices from amongst these various options.

Discussion

Kosovo's large lignite reserves seem economically attractive, particularly as estimated mining costs at the Sibovc SW mine now under development are relatively low (EUR 6.8/t). However, the opening of this new mine will further degrade the already damaged environment and force relocation of population and activities (particularly in the agricultural sector). These environmental costs should be incorporated in the selling price of lignite, including the expected price of land.[322] A global cost approach – adding investment, operation and remediation costs, and relevant externalities – would lead to significantly higher extraction costs. The ICMM needs to undertake an accurate assessment of direct and external costs of existing and future mines in order to determine the actual investment levels required by KEK and the public authorities.

Despite continuous efforts and investments (EUR 700 million or EUR 800/kW[323] for generation) since 2000, by both Kosovar organisations and the international community, Kosovo's electricity sector remains fragile. A supply deficit makes it necessary to carry out load shedding on a continual shift basis.

Measures described above to modernise and improve the reliability of the electricity sector (in all areas – generation, transmission and distribution) will bring additional revenues to KEK while also reducing total and peak demand to levels that the network can support. The experience in Albania since 2003, which had a similar structure and faced similar problems, demonstrates that such an approach was successfully implemented. Albania's approach may be a relevant model to help KEK and the Kosovar public authorities develop best practices and measures.

Kosovo needs to address the problem of old, inefficient and highly polluting thermal power plants (TPPs), which provide insufficient capacity for existing loads and reduce reliability. KEK has estimated its investment needs to 2010, for both rehabilitation and new investments, at EUR 700 to 800 million. A least-cost supply plan would be a powerful tool to assess the best options for KEK in light of its limited financial resources. It would also be effective for thoroughly investigating options to diversify the electricity mix, taking full consideration of new options such as small-to-large

322. The cost of land may reach a relatively high level; some sources indicate up to EUR 300/m^2 (one m^2 yields less than 45 t of lignite).

323. Investment cost in new generation capacity: coal-based (EUR 780 to 1 150/kW, four years construction), gas-based (EUR 300-600/kW, two to three years construction) (IEA, 2005).

hydropower, de-centralised combined heat and power (CHP), natural gas and biomass.

The ambitious undertaking to build Kosovo C (EUR 2.1 to 2.5 billion) and open a new lignite mine (EUR 237 million) reflect investments that almost match Kosovo's GDP. Foreign investment will be central to Kosovo's economic development policy and could help to position it within the wider regional energy market. Many stakeholders, including potential investors, see a valuable opportunity in developing the electricity sector in Kosovo: it has potential to open access to a relatively cheap electricity source.

However, the public authorities should carefully consider this investment project – in all its dimensions – notably in a global energy and long-term economic development analysis, as outlined by a recent study carried out by civil society foundations (Open Society and Riinvest Institute). The study identifies a number of physical problems likely to affect the population and the environment, particularly around the capital of Pristina. It concludes that water scarcity and water pollution will become major problems for the densely populated area. The Sinitca River (the main water source) is already saturated by existing power plant and industrial use for water and sewage disposal. It is also important to consider the possible cumulative effect of building Kosovo C close to existing mines, plants and ash dumps. Even if Kosovo C complies with EU emission standards, substantial investments in air and water treatment at existing and new facilities will be needed to keep pollution at acceptable levels. This is true even in the scenario that Kosovo A is closed and Kosovo B is upgraded to comply with EU emission standards by the time Kosovo C is commissioned.[324]

A least-cost supply plan could also be useful for assessing future development of the sector, taking into account relevant electricity generation options and investments. In particular, the study conducted jointly by the Open Society and the Riinvest Institute points to the fact that economic benefits, mainly consisting of mining revenues and plant staff salaries, will be limited and should be compared to the possibly higher negative impacts and costs of the mining activity. These impacts include water supply restrictions and the cumulative effect (over a 40-year period) of greater pollution in a densely populated and agricultural area.

There is a risk that a single, massive investment will create a strong dependency and an imbalance in the relations between the investor(s) and the authorities, notably in terms of the enforcement of regulation and contract obligations. Moreover, as long as demand and supply imbalances persist on the domestic scene, there is a risk that constructing a new plant dedicated to exports will generate further tensions and overload the transmission network with electricity needed for export. Another important issue is the lack of interconnection and transmission capacities to support electricity exports envisaged in the Kosovo C project.

The study clearly supports multiple and diversified investments. Before taking a final decision, the authorities should continue to assess the project using multiple tools

324. Before any construction permits are granted, an internationally recognised body should carry out a detailed environmental impact assessment, in compliance with EU legislation.

(least-cost plans, cost-benefit analyses, environmental impact assessments, etc.) in an open, public process. In parallel, potential investors should undertake additional studies. Within the least-cost supply plan, the government should also consider more in-depth studies to assess the potential contribution of other electricity generation options (*e.g.* CHP and small hydropower).

Oil products

Key issues

- ***Fuel quality***
- ***Smuggled fuel***
- ***Fragmentation of retail network***

Kosovo does not have any oil refineries and is completely dependent on imported oil products from neighbouring countries and the surrounding region. Kosovo's oil product market is fully liberalised following the 2005 adoption of the *Law on Trade of Petroleum and Petroleum Product*. The Petroleum Sector Council, established within Kosovo's Ministry of Trade and Industry, is responsible for regulation and monitoring of oil and oil products. The Council issues licenses for wholesale and retail sales, transport, storage and other operations pertaining to the trade of oil products.

There are about 350 filling stations in Kosovo, servicing a car fleet of 350 000 vehicles. Prices of light oil products reflect import prices and include an excise tax (EUR 0.30/L) and VAT (15%). In 2007, gasoline and diesel prices were around EUR 0.90/L. In recent years, the sector has encountered serious problems with smuggled fuels and fuels that have high sulphur content. In spring 2007, a new regulation entered into force for quality standards and mobile control units were established at border crossings. This has reduced the volume and share of low-quality and non-compliant (smuggled) products entering Kosovo from neighbouring countries.

LPG use has been increasing steadily in Kosovo over recent years, providing households with a viable and reliable alternative to space heating and cooking. Expansion of LPG use in the residential sector has reduced pressure on the electricity system.

Discussion

Smuggling and low-quality oil products have resulted in an over-sized retail network for oil products in Kosovo, which is difficult to manage and regulate. Effective enforcement of the 2007 regulation should improve the situation and increase tax collection.

Continued expansion of LPG use in Kosovo would help support initiatives to reduce the load on the electricity system; thus, it is complementary to energy efficiency initiatives. To realise these benefits, it will be necessary to further develop LPG distribution networks in order to reduce costs and increase availability. Developing the LPG networks may be more economically viable than building a new electricity plant or establishing a new natural gas distribution network. A comprehensive, least-cost investment plan is needed to assess the economic advantages of such expansion options.

Natural gas

Key issues

- ***Market size estimates***
- ***Peak demand***
- ***Tariffs and payment guarantees***
- ***Gas supply capacity and security***

Plans to introduce natural gas to Kosovo were developed in the late 1980s, with a view to providing an alternative source of energy for the industrial sector. These plans were sidelined by the break-up of the former SFR Yugoslavia and the subsequent events in Kosovo, both of which weakened industrial growth and created a climate of uncertainty.

Introduction of natural gas is a priority in some elements of the *Energy Strategy*, which sets a target date of 2012 to connect Kosovo with the regional network. The underlying goal is to reduce the extensive use of lignite in electricity generation, and of electricity and fuelwood by households and industry. The *Strategy* calls for a phased approach. The first two stages focus on establishing connections for Pristina, through natural gas transmission pipelines from either FYR Macedonia (95 km) or Serbia (135 km). Following stages foresee the connection of smaller cities such as Prizren, Peja and Mitrovica.

As of early 2008, there has been no final decision on the routing of gas pipelines or an implementation schedule. Three main issues require further analysis: market size; tariffs and payment guarantees; and the development of an economic model for the gas market.

Discussion

Even though FYR Macedonia's natural gas infrastructure is less than 100 km away, due to the small size of Kosovo's market, the *Energy Strategy's* objective of linking Kosovo to the regional natural gas network will be feasible only within the framework of a transit pipeline. The lack of natural gas storage facilities in Kosovo (or even in close proximity) is another factor in determining the likelihood of developing a gas future for Kosovo – particularly in that expected gas consumption peaks in the winter will constrain retail network capacities. Questions related to tariffs and bill payment must be resolved in order to determine the economic viability of the investment, the most appropriate economic model (*e.g.* public distribution companies or concessions), and the most effective and efficient structure for operation of the proposed natural gas network. Despite the high density of population, such an investment will be expensive.

Heat

Key issues

- *Low technical and economic performance*
- *Inadequate pricing and low payments*
- *Regulatory uncertainties*

Kosovo currently has district heating (DH) systems in three major cities: Pristina (Termokos), Gjakova and Mitrovica (Termomit), all of which are state-owned enterprises administered by the KTA. A small state-owned system also operates in Zvecan. Total rated installed heat capacity amounts to 228 MW from 12 boilers, providing about 5% of the heat demand (the Pristina system accounts for 70% of total DH capacity). District heating in Kosovo is fuelled mainly by heavy fuel oil. As in the electricity sector, district heating is plagued by high technical and economic losses, an obsolete generation infrastructure, and low supply reliability in the distribution network.

Improving DH quality, reliability and accessibility is a priority within the *Energy Strategy,* which outlines specific actions to this end. To improve existing DH systems, the plan calls for technical upgrading[325] of DH in Pristina and Gjakova. In addition, existing pipes in concrete ducts should be replaced with pre-insulated pipes and options to use solar energy to pre-heat water for district heating should be explored. Once these measures have been taken, effort should be directed toward connecting new DH consumers and installing hot water supply meters. Finally, district heating should be expanded by developing heat supply to Pristina from Kosovo B.

Discussion

The rehabilitation project in Pristina demonstrates the validity of district heating for densely populated areas. At present, district heating provides only a marginal share in Kosovo's heat. In addition to the technical issues described above, the current DH system is made more ineffective by the pricing system, with creates little incentive for saving energy. To increase the viability of district heating, it will be necessary to implement effective metering of heat consumption and an effective billing system to increase revenue collection.

Future development of district heating and the heat market in Kosovo must be supported by the adoption of relevant legislation. In addition, ownership of DH companies should be transferred to municipalities.

325. Reducing the supply and return temperature from the present high level (135 to 110/75°C) to a more moderate and sustainable level (90/50°C).

Renewable energy

Key issues

- ***Insufficient potential assessment***
- ***Low electricity tariffs and payment***
- ***Deforestation***
- ***Water resources***

The use of renewable energy sources for electricity generation is limited to one small HPP. Fuelwood is used intensively, but raises sustainability and environmental concerns. MEM values the potential of renewables, which are covered in the *Energy Strategy*.

Wood is Kosovo's most important renewable energy source, and is already widely used by households and industries. The total forested area covers more than 4 300 km^2, supplying a wood stock of about 32 Mcm. Annual growth of the wood stock is 600 000 m^3, of which 400 000 m^3 is used as fuel. The risk of deforestation is rising in Kosovo: in addition to the illegal cutting mentioned above, there is a serious lack of effective forest management and significant additional timber is now being cut for the booming construction sector (see also section on Energy and Environment).

Hydropower is the second most important renewable energy source. One HPP of 38 MW capacity is in operation. Its future use depends, in part, on decisions regarding proposed projects to build new capacity. The most important proposal is to build a large HPP (292 MW or 400 GWh) in Zhur; the feasibility of this project still needs to be assessed. Another proposal identifies 18 small-scale HPP projects, with total capacity of 63 MW (294 GWh). Four existing small HPPs, with total capacity of 3.2 MW, need to be rehabilitated (rehabilitation procedures and selection criteria are under preparation).

Use of agricultural solid wastes (biomass) is currently very limited. However, it could play an important role in the future – that is, if the agricultural sector is revitalised through effective implementation of the *National Economic Development Strategy*. The biodegradable part of urban waste also has a valuable energy content that can be used for methanisation processes. Its future use will depend largely on a solid waste management policy, which is not yet in place.

Other renewables that could contribute to energy supply in Kosovo are in the earliest stages of development and utilisation. Geothermal energy is available in some regions (*e.g.* Malisheva and Kllokot) but its true potential is not yet determined. Initial studies on wind energy show some potential, but a wind atlas and more detailed assessments are needed. Meteorological data suggests that modern solar water heaters could provide approximately 300 W/m^2 (360 kWh/m^2 per year) when operating at peak production capacity in summer months.

Discussion

To make wood a sustainable fuel, Kosovo needs to implement effective and co-ordinated forest management policies and promote more efficient use of this resource. Creating a local market for wood and biomass would help to reduce price volatility and modernise domestic production.

Hydropower accounts for only a limited share in the electricity mix; its potential is constrained by water resource problems.

It is vital that Kosovo investigate the use of other renewable energy sources. The MEM has submitted to donors a project proposal to assess the potential of sources such as biomass, solar and wind energy. However, high investment costs and low electricity tariffs constrain the feasibility of renewables. The Kosovo public authorities need to develop an effective policy and regulatory framework, as well as incentive systems, for renewable energy sources. This should be done in conjunction with policies on energy efficiency.

Toward this end, the MEM drafted indicative targets for electricity production and co-generation. It also approved incentive measures for attracting investments in hydropower. These important efforts need to be co-ordinated with the introduction of cost-reflective energy tariffs and an efficient process for tariff collection.

OVERALL RECOMMENDATIONS

In addition to the recommendations and key findings included in the Overview and in the regional chapters, the relevant public authorities in Kosovo may consider the following recommendations useful.

Institutions and overall strategy

- Ensure that policy design and implementation are balanced between supply and demand, with sufficient focus on demand-side management; make energy efficiency a policy priority, particularly in electricity generation and transmission, and in residential sectors (*e.g.* building insulation and efficient stoves).
- Increase co-ordination between energy and other government policies, in particular economic, environmental, physical planning, transport, housing and social policies.
- Ensure that regulators (ERO and ICMM) have sufficient independence, power and resources; ensure effective co-operation between the two regulators in issuing licences.
- Make publicly available energy policy and policy implementation monitoring reports; ensure quality of statistics and forecasts (on both the supply and demand sides) in compliance with international standards.

- Establish appropriate legal and institutional frameworks to promote least and global cost approaches in future development of the energy sector; undertake comparative feasibility studies.
- Ensure efficient and transparent use of international aid and finance.

Market reforms and regulation

- Ensure cost-reflective tariffs, as well as effective billing and recovery of payment; pursue direct and targeted social support that focuses on energy saving.
- Establish the market rules needed to encourage private investments; facilitate gradual third-party access and customer choice to extend the number of eligible customers.
- Ensure adoption, implementation and enforcement of laws in related sectors.
- Continue an effective unbundling of monopoly activities in the coal and electricity sectors to ensure fair access to energy networks and promote competition.

Energy security

- Adopt policies aiming at a comprehensive energy security system to gradually include a strategic reserve of oil products.
- Continue to support use of LPG and consider ways to import natural gas to diversify energy resources and reduce environmental impact of extensive lignite and fuelwood use.

Energy efficiency

- Implement and monitor the *Programme for Energy Efficiency and Renewable Energy Resources* (for the period 2007-09) in all sectors by creating a National Energy Efficiency Agency, backed by a specific fund.
- Ensure the drafting and adoption of the *Energy Efficiency Law* in compliance with EU regulations and standards (including energy labelling for buildings and appliances).
- Develop public awareness campaigns to accompany tariff increases, thereby informing consumers about how to save energy (particularly electricity used for heating).
- Promote pilot projects for energy efficiency and link energy-efficiency initiatives with energy poverty programmes at the Kosovo and municipal levels.
- Ensure that demand-side measures are adequately considered in least-cost plans, particularly in plans for future development of the energy infrastructure.

Energy and environment

- Ensure implementation of environmental protection targets as defined in the *Environmental Strategy*.
- Ensure implementation of the EU Directive on large combustion plants, for both existing and new power and heat plants; focus implementation efforts on improving the

environmental performance of the Kosovo A power plant and minimising pollution from mine fires and ash dumps.

- Ensure that environmental costs are factored in least-cost supply plans and comparative feasibility studies.
- Ensure that operation licenses are issued only to projects meeting all relevant environmental standards and regulations.
- Ensure regular monitoring of pollution sources and continuous monitoring of local pollution in the most affected areas.
- Implement emission fees for major pollutants according to the "polluter pays" principle to create an environmental fund.
- Develop a long-term strategy for coal mining areas; introduce fees for mining companies to cover all direct and indirect costs.
- Disseminate information on seasonality and proper use of fuelwood; facilitate wood drying through waste heat or solar sources to increase energy efficiency and reduce air pollution.

Lignite and electricity

- Ensure sustainability of mining, particularly in terms of exploitation and extension plans, relocation of population, reclamation of affected areas and environmental damages.
- Ensure that lignite prices cover all direct and indirect costs, as well as liabilities.
- Ensure environmental remediation by creating fees to support future reclamation activities.
- Enforce, as a priority, full metering and bill collection by KEK; ensure a reliable supply to regularly paying customers.
- Ensure implementation of the least-cost supply plan; consider earlier closure of the least efficient and most polluting units (*e.g.* units of Kosovo A).
- Develop sufficient incentives to encourage network operators to rehabilitate and extend the distribution and transmission networks (based on a least-cost plan and a reduction of technical losses).
- Ensure that new investments are based on a viable demand and business model, and are financed by equity and commercial loans.
- Undertake a comprehensive and long-term cost/benefit analysis and environmental impact assessment of the Kosovo C project, in accordance with international standards.
- Consider the full range of power sources and technologies to diversify the generation mix and provide adequate supply.
- Strengthen transmission and interconnection capacities for electricity export and exchange; upgrade electricity distribution systems to reduce losses and improve reliability of supply.

Oil products

- Ensure that oil product importers and traders comply with regulations; favour re-structuring of the retail network; enhance the LPG distribution network.
- Enhance effective competition for wholesale and retail oil products, based on market tools and legislation for liberalisation; empower the Petroleum Sector Council to oversee these reforms.
- Improve motor fuel quality and modernise the vehicle fleet to reduce air pollution and improve efficiency; promote low emission fuels (*e.g.* LPG).

Natural gas

- Develop and implement a coherent and comprehensive plan to introduce natural gas, taking into account market potential, tariffs and payment guarantees, technical constraints, seasonality and the most appropriate market model.

Heat

- Ensure sustainability of existing district heating by rehabilitating heat production and distribution (notably energy efficiency and environmental performance and implementing full revenue collection).
- Ensure the approval and enforcement of the *Law on District Heating*.
- Assess technical feasibility and financial viability of new district heating (particularly co-generation) as a means of attracting investments.
- Build capacity for managing district heating at the municipal level in preparation for the transfer of ownership.

Renewable energy

- Ensure a realistic and ambitious share of renewable energy in the energy mix, supported by an action plan, resources and specific regulations.
- Protect forests against uncontrolled logging; promote efficient and clean use of biomass waste and fuelwood through adequate equipment.
- Consider the implementation of an incentive system to promote renewable energy sources (*e.g.* feed-in tariffs, purchase obligations, green certificates and tax exemptions).
- Promote the creation of a biomass market to improve consumer access; promote legal and sustainable biomass production.

ANNEXES

I. ENERGY BALANCES AND KEY STATISTICAL DATA

II. INTERNATIONAL ENERGY AGENCY SHARED GOALS

III. LIST OF ACRONYMS AND UNIT ABBREVIATIONS

IV. REFERENCES

ANNEX I

ALBANIA. ENERGY BALANCES AND KEY STATISTICAL DATA

Unit: Mtoe

SUPPLY		1990	1993	1995	1997	2000	2003	2005
TOTAL PRODUCTION		**2.45**	**1.33**	**1.24**	**1.10**	**0.99**	**1.05**	**1.17**
Coal[1]		0.49	0.05	0.02	0.01	0.01	0.02	0.02
Oil		1.15	0.58	0.52	0.36	0.31	0.37	0.44
Gas		0.20	0.07	0.02	0.02	0.01	0.01	0.01
Comb. Renewables & Waste[2]		0.36	0.35	0.32	0.29	0.26	0.20	0.23
Nuclear		-	-	-	-	-	-	-
Hydro		0.24	0.29	0.36	0.43	0.40	0.44	0.46
Geothermal		-	-	-	-	-	-	-
Solar/Wind/Other[3]		-	-	-	-	0.00	0.00	0.00
TOTAL NET IMPORTS[4]		**0.17**	**0.00**	**0.09**	**0.11**	**0.83**	**1.09**	**1.23**
Coal[1]	Exports	0.05	0.00	-	-	-	-	-
	Imports	0.20	-	-	-	0.01	0.00	0.00
	Net Imports	0.14	-0.00	-	-	0.01	0.00	0.00
Oil	Exports	0.06	0.02	-	-	-	0.07	-
	Imports	0.07	0.04	0.10	0.12	0.74	1.08	1.19
	Bunkers	-	-	-	-	-	-	-
	Net Imports	0.01	0.02	0.10	0.12	0.74	1.01	1.19
Gas	Exports	-	-	-	-	-	-	-
	Imports	-	-	-	-	-	-	-
	Net Imports	-	-	-	-	-	-	-
Electricity	Exports	0.01	0.01	0.01	0.07	0.02	0.03	-
	Imports	0.03	-	-	0.06	0.11	0.11	0.03
	Net Imports	0.02	-0.01	-0.01	-0.01	0.09	0.08	0.03
TOTAL STOCK CHANGES		**0.04**	**-0.00**	**-**	**-**	**-**	**-**	**-**
TOTAL SUPPLY (TPES)		**2.66**	**1.33**	**1.33**	**1.21**	**1.82**	**2.14**	**2.40**
Coal[1]		0.63	0.05	0.02	0.01	0.02	0.02	0.02
Oil		1.20	0.59	0.61	0.48	1.05	1.38	1.64
Gas		0.20	0.07	0.02	0.02	0.01	0.01	0.01
Comb. Renewables & Waste[2]		0.36	0.35	0.32	0.29	0.26	0.20	0.23
Nuclear		-	-	-	-	-	-	-
Hydro		0.24	0.29	0.36	0.43	0.40	0.44	0.46
Geothermal		-	-	-	-	-	-	-
Solar/Wind/Other[3]		-	-	-	-	0.00	0.00	0.00
Electricity Trade[5]		0.02	-0.01	-0.01	-0.01	0.09	0.08	0.03
Shares (%)								
Coal		*23.7*	*3.7*	*1.4*	*0.8*	*0.9*	*1.0*	*1.0*
Oil		*45.2*	*44.5*	*46.2*	*39.3*	*57.9*	*64.7*	*68.1*
Gas		*7.6*	*5.2*	*1.7*	*1.3*	*0.5*	*0.5*	*0.6*
Comb. Renewables & Waste		*13.6*	*26.1*	*23.8*	*23.8*	*14.2*	*9.3*	*9.6*
Nuclear		-	-	-	-	-	-	-
Hydro		*9.2*	*21.5*	*27.3*	*35.8*	*21.7*	*20.8*	*19.2*
Geothermal		-	-	-	-	-	-	-
Solar/Wind/Other		-	-	-	-	*0.1*	*0.1*	*0.1*
Electricity Trade		*0.7*	*-0.9*	*-0.5*	*-0.9*	*4.7*	*3.7*	*1.3*

0 is negligible, - is nil, .. is not available.

Unit: Mtoe

DEMAND							
FINAL CONSUMPTION BY SECTOR	**1990**	**1993**	**1995**	**1997**	**2000**	**2003**	**2005**
TFC	**2.24**	**1.07**	**1.02**	**0.88**	**1.54**	**1.86**	**2.13**
Coal[1]	0.58	0.05	0.02	0.01	0.01	0.01	0.02
Oil	0.90	0.43	0.48	0.40	0.96	1.30	1.57
Gas	0.20	0.07	0.02	0.00	0.00	-	-
Comb. Renewables & Waste[2]	0.36	0.35	0.32	0.29	0.26	0.20	0.23
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
Electricity	0.14	0.14	0.17	0.18	0.31	0.34	0.31
Heat	0.06	0.04	0.01	0.01	0.00	0.00	0.00
Shares (%)							
Coal	*25.8*	*4.2*	*1.8*	*1.0*	*0.7*	*0.8*	*0.9*
Oil	*39.9*	*40.2*	*47.0*	*45.0*	*62.1*	*70.0*	*73.7*
Gas	*9.0*	*6.4*	*2.3*	*0.2*	*0.1*	-	-
Comb. Renewables & Waste	*16.2*	*32.3*	*30.9*	*32.7*	*16.7*	*10.7*	*10.8*
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
Electricity	*6.4*	*13.2*	*17.0*	*20.6*	*20.2*	*18.3*	*14.6*
Heat	*2.6*	*3.7*	*1.1*	*0.6*	*0.2*	*0.2*	-
TOTAL INDUSTRY[6]	**0.94**	**0.29**	**0.25**	**0.15**	**0.32**	**0.33**	**0.40**
Coal[1]	0.17	-	-	-	0.01	0.01	0.01
Oil	0.56	0.21	0.19	0.11	0.16	0.22	0.31
Gas	0.16	0.04	0.02	-	0.00	-	-
Comb. Renewables & Waste[2]	-	-	-	-	0.07	0.03	0.01
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
Electricity	0.04	0.04	0.04	0.03	0.08	0.06	0.06
Heat	-	-	-	-	-	-	-
Shares (%)							
Coal	*18.0*	-	-	-	*2.8*	*3.6*	*3.6*
Oil	*60.1*	*71.1*	*74.8*	*77.0*	*50.8*	*68.2*	*78.2*
Gas	*17.4*	*15.1*	*7.7*	-	*0.3*	-	-
Comb. Renewables & Waste	-	-	-	-	*21.2*	*9.8*	*2.5*
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
Electricity	*4.4*	*13.8*	*17.6*	*23.0*	*24.8*	*18.4*	*15.6*
Heat	-	-	-	-	-	-	-
TRANSPORT[7]	**0.24**	**0.17**	**0.21**	**0.17**	**0.53**	**0.69**	**0.87**
TOTAL OTHER SECTORS[8]	**1.07**	**0.61**	**0.56**	**0.56**	**0.70**	**0.84**	**0.86**
Coal[1]	0.41	0.05	0.02	0.01	0.00	0.00	0.00
Oil	0.10	0.05	0.08	0.11	0.27	0.39	0.38
Gas	0.04	0.02	0.00	0.00	-	-	-
Comb. Renewables & Waste[2]	0.36	0.35	0.32	0.29	0.19	0.17	0.22
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
Electricity	0.10	0.10	0.13	0.15	0.23	0.28	0.25
Heat	0.06	0.04	0.01	0.01	0.00	0.00	0.00
Shares (%)							
Coal	*38.3*	*7.5*	*3.3*	*1.6*	*0.3*	*0.4*	*0.5*
Oil	*9.0*	*8.3*	*14.4*	*20.0*	*38.3*	*46.2*	*44.8*
Gas	*3.7*	*4.0*	*0.7*	*0.2*	-	-	-
Comb. Renewables & Waste	*33.9*	*57.1*	*56.3*	*51.0*	*27.4*	*19.7*	*25.7*
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
Electricity	*9.6*	*16.7*	*23.3*	*26.1*	*33.6*	*33.3*	*28.9*
Heat	*5.5*	*6.6*	*1.9*	*0.9*	*0.4*	*0.5*	*0.1*

Unit: Mtoe

DEMAND							
ENERGY TRANSFORMATION AND LOSSES	**1990**	**1993**	**1995**	**1997**	**2000**	**2003**	**2005**
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**0.41**	**0.38**	**0.41**	**0.47**	**0.46**	**0.48**	**0.51**
OUTPUT (Mtoe)	**0.28**	**0.30**	**0.38**	**0.45**	**0.41**	**0.45**	**0.47**
(TWh gross)	3.20	3.48	4.41	5.18	4.74	5.23	5.44
Output Shares (%)							
Coal	-	-	-	-	-	-	-
Oil	*10.9*	*4.8*	*4.8*	*3.0*	*3.0*	*1.2*	*1.3*
Gas	-	-	-	-	-	-	-
Comb. Renewables & Waste	-	-	-	-	-	-	-
Nuclear	-	-	-	-	-	-	-
Hydro	*89.1*	*95.2*	*95.2*	*97.0*	*97.0*	*98.8*	*98.7*
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
TOTAL LOSSES	**0.42**	**0.31**	**0.30**	**0.33**	**0.28**	**0.29**	**0.31**
of which:							
Electricity and Heat Generation[10]	0.07	0.04	0.02	0.02	0.03	0.03	0.04
Other Transformation	0.12	0.04	0.02	0.01	0.01	0.03	0.02
Own Use and Losses	0.23	0.23	0.26	0.30	0.24	0.23	0.25
Statistical Differences	**-**	**-0.06**	**-**	**-**	**-0.01**	**-0.01**	**-0.03**
INDICATORS	**1990**	**1993**	**1995**	**1997**	**2000**	**2003**	**2005**
GDP (billion 2000 USD)	3.22	2.37	2.83	2.77	3.69	4.29	4.79
Population (millions)	3.29	3.22	3.13	3.08	3.06	3.09	3.13
TPES/GDP[11]	0.83	0.56	0.47	0.44	0.49	0.50	0.50
Energy Production/TPES	0.92	1.00	0.93	0.91	0.54	0.49	0.49
Per Capita TPES[12]	0.81	0.41	0.42	0.39	0.59	0.69	0.77
Oil Supply/GDP[11]	0.37	0.25	0.22	0.17	0.29	0.32	0.34
TFC/GDP[11]	0.70	0.45	0.36	0.32	0.42	0.43	0.44
Per Capita TFC[12]	0.68	0.33	0.33	0.29	0.50	0.60	0.68
Energy-related CO_2 Emissions (Mt CO_2)[13]	6.3	2.2	1.9	1.4	3.2	4.0	4.6
CO_2 Emissions from Bunkers (Mt CO_2)	..	..	..	..	0.1	0.1	0.2
GROWTH RATES (% PER YEAR)	**90-93**	**93-95**	**95-97**	**97-00**	**00-03**	**03-05**	**90-05**
TPES	**-20.7**	**0.0**	**-4.5**	**14.6**	**5.6**	**5.9**	**-0.7**
Coal	-57.5	-37.7	-30.2	23.2	7.2	8.0	-19.4
Oil	-21.2	2.0	-11.9	30.3	9.5	8.8	2.1
Gas	-30.4	-41.8	-18.8	-16.2	9.1	11.0	-16.2
Comb. Renewables & Waste	-1.5	-4.5	-4.6	-3.6	-8.4	7.8	-3.0
Nuclear	-	-	-	-	-	-	-
Hydro	5.2	12.6	9.4	-3.0	4.0	2.0	4.3
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	22.2	-	-
TFC	**-21.8**	**-2.4**	**-7.3**	**20.6**	**6.4**	**7.0**	**-0.4**
Electricity Consumption	-0.6	10.8	1.9	19.9	2.9	-4.6	5.2
Energy Production	-18.5	-3.5	-5.6	-3.6	2.0	5.9	-4.8
Net Oil Imports	16.9	137.5	10.8	84.1	11.1	8.6	36.9
GDP	-9.6	9.2	-1.0	10.0	5.2	5.7	2.7
Growth in the TPES/GDP Ratio	-12.3	-8.4	-3.5	4.2	0.4	0.2	-3.3
Growth in the TFC/GDP Ratio	-13.5	-10.6	-6.3	9.6	1.2	1.2	-3.0

Please note: Rounding may cause totals to differ from the sum of the elements.

ALBANIA. ENERGY BALANCE 2005

Thousand tonnes of oil equivalent

SUPPLY AND CONSUMPTION	Coal	Crude Oil	Petroleum Products	Gas	Nuclear	Hydro	Geotherm. Solar etc.	Combust. Renew. & Waste	Electricity	Heat	Total
Indigenous Production	22	443	-	14	-	462	2	230	-	-	1173
Imports	3	-	1194	-	-	-	-	-	32	-	1229
Exports	-	-	-	-	-	-	-	-	-	-	-
Intl. Marine Bunkers	-	-	-	-	-	-	-	-	-	-	-
Stock changes	-	-	-	-	-	-	-	-	-	-	-
TPES	**25**	**443**	**1194**	**14**	**-**	**462**	**2**	**230**	**32**	**-**	**2402**
Electricity and CHP Plants	-	-	-44	-	-	-462	-	-	468	2	-36
Petroleum Refineries	-	-443	425	-	-	-	-	-	-	-	-18
Other Transformation*	-6	-	-7	-14	-	-	-2	-	-190	-1	-222
TFC	**18**	**-**	**1568**	**-**	**-**	**-**	**-**	**230**	**310**	**1**	**2127**
INDUSTRY SECTOR	**14**	**-**	**121**	**-**	**-**	**-**	**-**	**10**	**62**	**-**	**207**
Iron and Steel	-	-	27	-	-	-	-	-	7	-	34
Chemical and Petrochemical	-	-	15	-	-	-	-	-	3	-	18
Non-Metallic Minerals	-	-	5	-	-	-	-	-	4	-	9
Non-specified	14	-	74	-	-	-	-	10	48	-	146
TRANSPORT SECTOR	**-**	**-**	**874**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**874**
Aviation	-	-	73	-	-	-	-	-	-	-	73
Road	-	-	738	-	-	-	-	-	-	-	738
Non-specified	-	-	63	-	-	-	-	-	-	-	63
OTHER SECTORS	**4**	**-**	**383**	**-**	**-**	**-**	**-**	**220**	**248**	**1**	**856**
Residential	4	-	84	-	-	-	-	207	235	1	531
Comm. and Publ. Services	-	-	133	-	-	-	-	10	4	-	147
Agriculture/Forestry	-	-	78	-	-	-	-	3	4	-	85
Non-specified**	-	-	89	-	-	-	-	-	4	-	93
NON-ENERGY USE	**-**	**-**	**189**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**189**
Electricity Generated - GWh	-	-	*70*	-	-	*5373*	-	-	-	-	*5443*
Heat Generated - TJ	*50*	-	*92*	-	-	-	*84*	-	-	-	*226*

** Includes Transfers, Statistical Differences, Own Use and Distribution Losses.*

*** Includes Fishing.*

BOSNIA AND HERZEGOVINA. ENERGY BALANCES AND KEY STATISTICAL DATA

Unit: Mtoe

SUPPLY		**1990**	**1993**	**1995**	**1997**	**2000**	**2003**	**2005**
TOTAL PRODUCTION		**4.60**	**3.13**	**0.82**	**2.15**	**2.94**	**3.11**	**3.34**
Coal[1]		4.18	2.76	0.35	1.58	2.32	2.46	2.69
Oil		-	-	-	-	-	-	-
Gas		-	-	-	-	-	-	-
Comb. Renewables & Waste[2]		0.16	0.16	0.16	0.16	0.18	0.18	0.18
Nuclear		-	-	-	-	-	-	-
Hydro		0.26	0.20	0.31	0.40	0.44	0.46	0.47
Geothermal		-	-	-	-	-	-	-
Solar/Wind/Other[3]		-	-	-	-	-	-	-
TOTAL NET IMPORTS[4]		**2.43**	**0.62**	**0.72**	**0.60**	**1.08**	**1.25**	**1.56**
Coal[1]	Exports	-	-	-	-	-	-	-
	Imports	-	-	-	-	-	-	-
	Net Imports	-	-	-	-	-	-	-
Oil	Exports	-	-	-	-	-	-	-
	Imports	2.04	0.48	0.59	0.63	0.94	1.08	1.32
	Bunkers	-	-	-	-	-	-	-
	Net Imports	2.04	0.48	0.59	0.63	0.94	1.08	1.32
Gas	Exports	-	-	-	-	-	-	-
	Imports	0.39	0.12	0.12	0.12	0.23	0.27	0.37
	Net Imports	0.39	0.12	0.12	0.12	0.23	0.27	0.37
Electricity	Exports	-	0.01	0.06	0.23	0.22	0.27	0.31
	Imports	-	0.03	0.07	0.08	0.13	0.17	0.19
	Net Imports	-	0.02	0.01	-0.15	-0.09	-0.10	-0.12
TOTAL STOCK CHANGES		**-**	**-**	**-**	**-**	**-**	**0.07**	**0.06**
TOTAL SUPPLY (TPES)		**7.04**	**3.74**	**1.54**	**2.74**	**4.02**	**4.43**	**4.96**
Coal[1]		4.18	2.76	0.35	1.58	2.32	2.53	2.75
Oil		2.04	0.48	0.59	0.63	0.94	1.08	1.32
Gas		0.39	0.12	0.12	0.12	0.23	0.27	0.37
Comb. Renewables & Waste[2]		0.16	0.16	0.16	0.16	0.18	0.18	0.18
Nuclear		-	-	-	-	-	-	-
Hydro		0.26	0.20	0.31	0.40	0.44	0.46	0.47
Geothermal		-	-	-	-	-	-	-
Solar/Wind/Other[3]		-	-	-	-	-	-	-
Electricity Trade[5]		-	0.02	0.01	-0.15	-0.09	-0.10	-0.12
Shares (%)								
Coal		*59.4*	*73.7*	*22.6*	*57.6*	*57.7*	*57.1*	*55.3*
Oil		*29.0*	*12.8*	*38.4*	*22.9*	*23.4*	*24.5*	*26.6*
Gas		*5.5*	*3.1*	*8.0*	*4.5*	*5.8*	*6.0*	*7.4*
Comb. Renewables & Waste		*2.3*	*4.4*	*10.1*	*6.0*	*4.5*	*4.1*	*3.7*
Nuclear		-	-	-	-	-	-	-
Hydro		*3.7*	*5.4*	*20.3*	*14.6*	*10.9*	*10.5*	*9.5*
Geothermal		-	-	-	-	-	-	-
Solar/Wind/Other		-	-	-	-	-	-	-
Electricity Trade		-	*0.5*	*0.6*	*-5.6*	*-2.3*	*-2.2*	*-2.4*

0 is negligible, - is nil, .. is not available.

Unit: Mtoe

DEMAND							
FINAL CONSUMPTION BY SECTOR	**1990**	**1993**	**1995**	**1997**	**2000**	**2003**	**2005**
TFC	**5.16**	**2.40**	**1.33**	**1.50**	**2.15**	**2.63**	**3.05**
Coal[1]	2.14	1.41	0.18	0.21	0.37	0.61	0.66
Oil	1.61	0.40	0.52	0.55	0.83	0.93	1.15
Gas	0.34	0.12	0.12	0.07	0.13	0.15	0.20
Comb. Renewables & Waste[2]	0.16	0.16	0.16	0.16	0.18	0.18	0.18
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
Electricity	0.87	0.24	0.31	0.42	0.50	0.60	0.66
Heat	0.03	0.05	0.04	0.08	0.14	0.16	0.20
Shares (%)							
Coal	*41.5*	*59.0*	*13.4*	*13.9*	*17.0*	*23.0*	*21.5*
Oil	*31.2*	*16.8*	*39.1*	*36.9*	*38.6*	*35.4*	*37.7*
Gas	*6.6*	*4.9*	*9.3*	*4.6*	*5.9*	*5.6*	*6.6*
Comb. Renewables & Waste	*3.2*	*6.8*	*11.7*	*11.0*	*8.4*	*7.0*	*6.0*
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
Electricity	*16.9*	*10.2*	*23.3*	*28.0*	*23.5*	*22.9*	*21.7*
Heat	*0.6*	*2.2*	*3.1*	*5.6*	*6.5*	*6.1*	*6.5*
TOTAL INDUSTRY[6]	**2.45**	**0.74**	**0.26**	**0.24**	**0.37**	**0.53**	**0.62**
Coal[1]	0.86	0.57	0.07	0.08	0.15	0.21	0.23
Oil	0.76	0.04	0.04	0.05	0.07	0.08	0.11
Gas	0.31	0.09	0.10	0.02	0.05	0.05	0.07
Comb. Renewables & Waste[2]	-	-	-	-	-	-	-
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
Electricity	0.52	0.04	0.05	0.08	0.10	0.19	0.20
Heat	-	-	-	-	-	-	-
Shares (%)							
Coal	*34.9*	*76.8*	*26.9*	*35.5*	*39.8*	*39.0*	*37.3*
Oil	*31.0*	*5.0*	*16.7*	*20.0*	*19.6*	*15.7*	*18.4*
Gas	*12.7*	*12.8*	*37.2*	*10.5*	*12.6*	*10.1*	*11.9*
Comb. Renewables & Waste	-	-	-	-	-	-	-
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
Electricity	*21.3*	*5.4*	*19.2*	*34.0*	*28.0*	*35.3*	*32.4*
Heat	-	-	-	-	-	-	-
TRANSPORT[7]	**0.77**	**0.32**	**0.37**	**0.40**	**0.61**	**0.69**	**0.87**
TOTAL OTHER SECTORS[8]	**1.94**	**1.34**	**0.69**	**0.86**	**1.17**	**1.41**	**1.56**
Coal[1]	1.28	0.85	0.11	0.13	0.22	0.40	0.43
Oil	0.08	0.05	0.10	0.11	0.15	0.16	0.17
Gas	0.03	0.02	0.02	0.04	0.08	0.09	0.13
Comb. Renewables & Waste[2]	0.16	0.16	0.16	0.16	0.18	0.18	0.18
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
Electricity	0.35	0.20	0.26	0.34	0.40	0.42	0.46
Heat	0.03	0.05	0.04	0.08	0.14	0.16	0.20
Shares (%)							
Coal	*66.1*	*63.2*	*15.5*	*14.5*	*18.7*	*28.4*	*27.2*
Oil	*4.1*	*3.7*	*14.8*	*12.6*	*12.9*	*11.1*	*10.7*
Gas	*1.6*	*1.8*	*3.6*	*5.0*	*6.9*	*6.6*	*8.2*
Comb. Renewables & Waste	*8.4*	*12.2*	*22.5*	*19.1*	*15.3*	*13.0*	*11.7*
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
Electricity	*18.1*	*15.2*	*37.6*	*39.2*	*34.2*	*29.6*	*29.5*
Heat	*1.7*	*4.0*	*6.0*	*9.6*	*12.0*	*11.4*	*12.8*

Unit: Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES	**1990**	**1993**	**1995**	**1997**	**2000**	**2003**	**2005**
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**2.67**	**1.63**	**0.56**	**1.90**	**2.61**	**2.66**	**2.90**
OUTPUT (Mtoe)	**1.26**	**0.29**	**0.38**	**0.75**	**0.90**	**0.97**	**1.09**
(TWh gross)	14.63	3.33	4.40	8.77	10.43	11.25	12.72
Output Shares (%)							
Coal	*71.8*	*28.9*	*16.4*	*46.5*	*50.7*	*50.9*	*56.0*
Oil	*7.3*	-	*0.8*	*0.4*	*0.5*	*1.1*	*1.1*
Gas	-	-	-	-	-	-	-
Comb. Renewables & Waste	-	-	-	-	-	-	-
Nuclear	-	-	-	-	-	-	-
Hydro	*20.9*	*71.1*	*82.8*	*53.1*	*48.8*	*48.0*	*42.9*
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
TOTAL LOSSES	**1.87**	**1.35**	**0.21**	**1.25**	**1.87**	**1.80**	**1.92**
of which:							
Electricity and Heat Generation[10]	1.38	1.29	0.14	1.07	1.57	1.53	1.60
Other Transformation	0.11	-	-	-	-	-	-
Own Use and Losses	0.38	0.06	0.08	0.18	0.30	0.27	0.31
Statistical Differences	**0.00**	**-**	**-**	**-**	**-**	**-**	**-**
INDICATORS	**1990**	**1993**	**1995**	**1997**	**2000**	**2003**	**2005**
GDP (billion 2000 USD)	1.27	1.17	1.51	3.78	5.05	5.77	6.44
Population (millions)	4.31	3.73	3.42	3.49	3.85	3.92	3.91
TPES/GDP[11]	5.55	3.20	1.02	0.73	0.80	0.77	0.77
Energy Production/TPES	0.65	0.84	0.53	0.78	0.73	0.70	0.67
Per Capita TPES[12]	1.63	1.01	0.45	0.79	1.04	1.13	1.27
Oil Supply/GDP[11]	1.61	0.41	0.39	0.17	0.19	0.19	0.21
TFC/GDP[11]	4.07	2.05	0.88	0.40	0.43	0.46	0.47
Per Capita TFC[12]	1.20	0.64	0.39	0.43	0.56	0.67	0.78
Energy-related CO_2 Emissions (Mt CO_2)[13]	23.7	13.2	3.5	8.6	12.8	14.1	15.9
CO_2 Emissions from Bunkers (Mt CO_2)	0.1	..	..	..	..	..	..
GROWTH RATES (% PER YEAR)	**90-93**	**93-95**	**95-97**	**97-00**	**00-03**	**03-05**	**90-05**
TPES	**-19.0**	**-35.8**	**33.4**	**13.6**	**3.3**	**5.9**	**-2.3**
Coal	-12.9	-64.5	113.0	13.6	2.9	4.3	-2.8
Oil	-38.3	11.0	3.1	14.4	4.8	10.3	-2.9
Gas	-32.9	2.3	0.3	23.3	4.6	17.4	-0.4
Comb. Renewables & Waste	-	-2.5	3.0	2.9	0.6	-0.1	0.7
Nuclear	-	-	-	-	-	-	-
Hydro	-8.2	24.1	13.0	3.1	2.0	0.5	3.9
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
TFC	**-22.6**	**-25.5**	**6.1**	**12.8**	**7.0**	**7.6**	**-3.5**
Electricity Consumption	-34.7	12.8	16.2	6.4	6.2	4.6	-1.8
Energy Production	-12.1	-48.9	62.1	11.0	1.9	3.8	-2.1
Net Oil Imports	-38.3	11.0	3.1	14.4	4.8	10.3	-2.9
GDP	-2.6	13.7	58.1	10.2	4.6	5.6	11.4
Growth in the TPES/GDP Ratio	-16.8	-43.6	-15.6	3.1	-1.2	0.3	-12.3
Growth in the TFC/GDP Ratio	-20.5	-34.5	-32.8	2.4	2.3	1.9	-13.4

Please note: Rounding may cause totals to differ from the sum of the elements.

BOSNIA AND HERZEGOVINA. ENERGY BALANCE 2005

Thousand tonnes of oil equivalent

SUPPLY AND CONSUMPTION	Coal	Crude Oil	Petroleum Products	Gas	Nuclear	Hydro	Geotherm. Solar etc.	Combust. Renew. & Waste	Electricity	Heat	Total
Indigenous Production	2691	-	-	-	-	469	-	182	-	-	3343
Imports	-	-	1319	366	-	-	-	-	187	-	1873
Exports	-	-	-	-	-	-	-	-	-308	-	-308
Intl. Marine Bunkers	-	-	-	-	-	-	-	-	-	-	-
Stock changes	-	-	-	-	-	-	-	-	-	-	56
TPES	**2747**	**443**	**1319**	**366**	**-**	**469**	**-**	**182**	**- 121**	**-**	**4963**
Electricity and CHP Plants	-2092	-	-48	-	-	-469	-	-	1094	-	-1515
Petroleum Refineries	-	-	-	-	-	-	-	-	-	-	-
Other Transformation*	-	-	-125	-165	-	-	-	-	-312	199	-402
TFC	**655**	**-**	**1147**	**201**	**-**	**-**	**-**	**182**	**660**	**199**	**3046**
INDUSTRY SECTOR	**230**	**-**	**113**	**73**	**-**	**-**	**-**	**-**	**200**	**-**	**617**
Iron and Steel	-	-	32	-	-	-	-	-	-	-	32
Chemical and Petrochemical	-	-	-	-	-	-	-	-	-	-	-
Non-Metallic Minerals	-	-	-	-	-	-	-	-	-	-	-
Non-specified	230	-	81	73	-	-	-	-	200	-	585
TRANSPORT SECTOR	**-**	**-**	**866**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**866**
Aviation	-	-	89	-	-	-	-	-	-	-	89
Road	-	-	771	-	-	-	-	-	-	-	771
Non-specified	-	-	6	-	-	-	-	-	-	-	6
OTHER SECTORS	**425**	**-**	**167**	**128**	**-**	**-**	**-**	**182**	**460**	**199**	**1563**
Residential	-	-	-	128	-	-	-	182	351	-	662
Comm. and Publ. Services	-	-	-	-	-	-	-	-	109	-	109
Agriculture/Forestry	-	-	-	-	-	-	-	-	-	-	-
Non-specified**	425	-	167	-	-	-	-	-	-	199	792
NON-ENERGY USE	-	-	-	-	-	-	-	-	-	-	-
Electricity Generated - GWh	*7119*	-	*144*	-	-	*5455*	-	-	-	-	*12718*
Heat Generated - TJ	-	-	*3517*	*4831*	-	-	-	-	-	-	*8348*

* *Includes Transfers, Statistical Differences, Own Use and Distribution Losses.*

** *Includes Fishing.*

CROATIA. ENERGY BALANCES AND KEY STATISTICAL DATA

Unit: Mtoe

SUPPLY		**1990**	**1993**	**1995**	**1997**	**2000**	**2003**	**2005**
TOTAL PRODUCTION		**5.15**	**4.56**	**4.19**	**4.12**	**3.58**	**3.74**	**3.80**
Coal[1]		0.10	0.07	0.05	0.03	-	-	-
Oil		2.79	2.20	1.81	1.84	1.35	1.16	1.03
Gas		1.62	1.67	1.61	1.40	1.35	1.79	1.86
Comb. Renewables & Waste[2]		0.31	0.24	0.27	0.40	0.37	0.38	0.36
Nuclear		-	-	-	-	-	-	-
Hydro		0.33	0.37	0.45	0.45	0.51	0.42	0.54
Geothermal		-	-	-	-	-	-	-
Solar/Wind/Other[3]		-	-	-	-	-	-	0.00
TOTAL NET IMPORTS[4]		**3.82**	**2.51**	**2.89**	**3.71**	**4.10**	**4.90**	**5.17**
Coal[1]	Exports	0.27	0.25	0.00	0.00	0.01	0.01	-
	Imports	0.89	0.53	0.16	0.16	0.49	0.65	0.61
	Net Imports	0.61	0.27	0.16	0.16	0.48	0.65	0.61
Oil	Exports	3.44	2.52	2.32	1.83	1.81	1.81	1.95
	Imports	5.54	3.91	4.56	4.21	4.20	5.10	5.54
	Bunkers	0.05	-	0.03	0.02	0.02	0.02	0.02
	Net Imports	2.06	1.39	2.21	2.36	2.37	3.26	3.56
Gas	Exports	-	-	-	-	-	0.28	0.36
	Imports	0.58	0.65	0.22	0.85	0.90	0.93	0.93
	Net Imports	0.58	0.65	0.22	0.85	0.90	0.65	0.56
Electricity	Exports	0.07	0.11	0.08	0.06	0.03	0.05	0.31
	Imports	0.65	0.31	0.38	0.40	0.38	0.39	0.75
	Net Imports	0.58	0.20	0.30	0.34	0.34	0.33	0.44
TOTAL STOCK CHANGES		**0.10**	**-0.17**	**0.05**	**0.04**	**0.09**	**0.14**	**-0.09**
TOTAL SUPPLY (TPES)		**9.07**	**6.90**	**7.12**	**7.88**	**7.77**	**8.78**	**8.89**
Coal[1]		0.82	0.35	0.18	0.26	0.43	0.65	0.67
Oil		4.84	3.51	3.98	4.18	3.91	4.64	4.50
Gas		2.19	2.22	1.93	2.25	2.21	2.36	2.38
Comb. Renewables & Waste[2]		0.31	0.24	0.27	0.40	0.37	0.38	0.36
Nuclear		-	-	-	-	-	-	-
Hydro		0.33	0.37	0.45	0.45	0.51	0.42	0.54
Geothermal		-	-	-	-	-	-	-
Solar/Wind/Other[3]		-	-	-	-	-	-	0.00
Electricity Trade[5]		0.58	0.20	0.30	0.34	0.34	0.33	0.44
Shares (%)								
Coal		*9.0*	*5.1*	*2.6*	*3.3*	*5.6*	*7.4*	*7.5*
Oil		*53.4*	*50.8*	*56.0*	*53.1*	*50.3*	*52.8*	*50.7*
Gas		*24.2*	*32.2*	*27.2*	*28.5*	*28.4*	*26.8*	*26.7*
Comb. Renewables & Waste		*3.4*	*3.5*	*3.7*	*5.1*	*4.8*	*4.3*	*4.0*
Nuclear		-	-	-	-	-	-	-
Hydro		*3.6*	*5.4*	*6.4*	*5.8*	*6.5*	*4.8*	*6.1*
Geothermal		-	-	-	-	-	-	-
Solar/Wind/Other		-	-	-	-	-	-	-
Electricity Trade		*6.4*	*2.9*	*4.2*	*4.3*	*4.4*	*3.8*	*4.9*

0 is negligible, - is nil, .. is not available.

Unit: Mtoe

DEMAND							
FINAL CONSUMPTION BY SECTOR	**1990**	**1993**	**1995**	**1997**	**2000**	**2003**	**2005**
TFC	**6.57**	**4.95**	**5.34**	**5.96**	**6.07**	**6.71**	**7.09**
Coal[1]	0.52	0.15	0.12	0.10	0.07	0.12	0.14
Oil	3.18	2.24	2.51	2.74	2.94	3.33	3.47
Gas	1.26	1.28	1.36	1.53	1.46	1.52	1.63
Comb. Renewables & Waste[2]	0.31	0.24	0.26	0.40	0.37	0.38	0.35
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
Electricity	1.14	0.80	0.85	0.95	1.02	1.11	1.24
Heat	0.16	0.23	0.25	0.24	0.21	0.25	0.26
Shares (%)							
Coal	*7.9*	*2.9*	*2.2*	*1.7*	*1.2*	*1.8*	*2.0*
Oil	*48.4*	*45.4*	*46.9*	*46.0*	*48.5*	*49.6*	*48.9*
Gas	*19.2*	*25.9*	*25.4*	*25.6*	*24.0*	*22.6*	*23.0*
Comb. Renewables & Waste	*4.7*	*4.8*	*4.9*	*6.7*	*6.1*	*5.7*	*5.0*
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
Electricity	*17.3*	*16.2*	*15.9*	*15.9*	*16.7*	*16.6*	*17.5*
Heat	*2.5*	*4.7*	*4.7*	*4.1*	*3.5*	*3.8*	*3.6*
TOTAL INDUSTRY[6]	**2.96**	**2.08**	**2.09**	**2.23**	**2.07**	**2.15**	**2.29**
Coal[1]	0.39	0.12	0.10	0.09	0.06	0.10	0.13
Oil	0.98	0.69	0.73	0.72	0.69	0.77	0.83
Gas	1.00	0.91	0.92	1.01	0.95	0.87	0.92
Comb. Renewables & Waste[2]	-	-	-	0.07	0.05	0.06	0.05
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
Electricity	0.54	0.26	0.24	0.26	0.26	0.29	0.30
Heat	0.05	0.10	0.09	0.08	0.06	0.05	0.05
Shares (%)							
Coal	*13.1*	*5.6*	*4.9*	*3.9*	*2.9*	*4.8*	*5.8*
Oil	*33.3*	*33.0*	*35.2*	*32.3*	*33.2*	*35.8*	*36.2*
Gas	*33.6*	*43.6*	*44.2*	*45.3*	*45.9*	*40.5*	*40.2*
Comb. Renewables & Waste	-	-	-	*3.4*	*2.6*	*2.8*	*2.3*
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
Electricity	*18.3*	*12.7*	*11.3*	*11.7*	*12.6*	*13.7*	*13.1*
Heat	*1.8*	*5.0*	*4.4*	*3.4*	*2.8*	*2.4*	*2.3*
TRANSPORT[7]	**1.43**	**1.07**	**1.22**	**1.43**	**1.56**	**1.81**	**1.95**
TOTAL OTHER SECTORS[8]	**2.17**	**1.80**	**2.04**	**2.30**	**2.44**	**2.76**	**2.85**
Coal[1]	0.13	0.03	0.01	0.01	0.01	0.02	0.01
Oil	0.81	0.50	0.57	0.62	0.71	0.78	0.72
Gas	0.26	0.37	0.44	0.51	0.50	0.65	0.71
Comb. Renewables & Waste[2]	0.31	0.24	0.26	0.32	0.32	0.32	0.30
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
Electricity	0.55	0.52	0.59	0.67	0.73	0.79	0.91
Heat	0.11	0.13	0.16	0.17	0.15	0.20	0.20
Shares (%)							
Coal	*6.0*	*1.6*	*0.6*	*0.5*	*0.6*	*0.5*	*0.3*
Oil	*37.3*	*28.1*	*28.1*	*26.7*	*29.3*	*28.2*	*25.1*
Gas	*12.2*	*20.8*	*21.4*	*22.3*	*20.6*	*23.5*	*25.0*
Comb. Renewables & Waste	*14.3*	*13.3*	*13.0*	*14.1*	*13.1*	*11.7*	*10.5*
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
Electricity	*25.3*	*29.0*	*29.1*	*29.1*	*30.0*	*28.8*	*31.9*
Heat	*5.0*	*7.2*	*7.7*	*7.3*	*6.4*	*7.3*	*7.1*

Unit: Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES	**1990**	**1993**	**1995**	**1997**	**2000**	**2003**	**2005**
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**1.81**	**1.85**	**1.58**	**1.79**	**1.86**	**2.38**	**2.15**
OUTPUT (Mtoe)	**0.79**	**0.80**	**0.76**	**0.83**	**0.91**	**1.08**	**1.06**
(TWh gross)	9.22	9.34	8.86	9.67	10.59	12.56	12.35
Output Shares (%)							
Coal	*6.8*	*5.1*	*2.7*	*5.3*	*14.6*	*19.1*	*18.8*
Oil	*31.6*	*28.9*	*27.8*	*27.9*	*15.1*	*24.7*	*15.0*
Gas	*20.2*	*19.5*	*10.1*	*12.1*	*14.8*	*17.3*	*14.7*
Comb. Renewables & Waste	*0.1*	-	-	-	-	-	*0.1*
Nuclear	-	-	-	-	-	-	-
Hydro	*41.3*	*46.5*	*59.4*	*54.7*	*55.5*	*38.8*	*51.3*
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	*0.1*
TOTAL LOSSES	**2.51**	**1.95**	**1.77**	**1.91**	**1.72**	**2.10**	**1.80**
of which:							
Electricity and Heat Generation[10]	0.84	0.74	0.51	0.64	0.68	0.99	0.77
Other Transformation	0.07	0.01	0.01	0.08	-0.07	-0.09	-0.06
Own Use and Losses	1.59	1.20	1.26	1.19	1.11	1.20	1.09
Statistical Differences	**-0.01**	**0.00**	**0.00**	**0.01**	**-0.02**	**-0.03**	**-**
INDICATORS	**1990**	**1993**	**1995**	**1997**	**2000**	**2003**	**2005**
GDP (billion 2000 USD)	21.51	13.78	15.58	17.63	18.43	21.39	23.16
Population (millions)	4.78	4.64	4.67	4.57	4.50	4.44	4.44
TPES/GDP[11]	0.42	0.50	0.46	0.45	0.42	0.41	0.38
Energy Production/TPES	0.57	0.66	0.59	0.52	0.46	0.43	0.43
Per Capita TPES[12]	1.90	1.49	1.52	1.72	1.73	1.98	2.00
Oil Supply/GDP[11]	0.23	0.25	0.26	0.24	0.21	0.22	0.19
TFC/GDP[11]	0.31	0.36	0.34	0.34	0.33	0.31	0.31
Per Capita TFC[12]	1.37	1.07	1.14	1.30	1.35	1.51	1.60
Energy-related CO_2 Emissions (Mt CO_2)[13]	21.7	15.8	15.9	17.4	17.8	21.1	20.8
CO_2 Emissions from Bunkers (Mt CO_2)	0.3	0.1	0.3	0.3	0.2	0.1	0.2
GROWTH RATES (% PER YEAR)	**90-93**	**93-95**	**95-97**	**97-00**	**00-03**	**03-05**	**90-05**
TPES	**-8.7**	**1.6**	**5.2**	**-0.4**	**4.1**	**0.6**	**-0.1**
Coal	-24.6	-27.9	18.9	18.8	14.6	1.3	-1.4
Oil	-10.2	6.6	2.4	-2.2	5.9	-1.5	-0.5
Gas	0.4	-6.7	7.8	-0.6	2.2	0.4	0.5
Comb. Renewables & Waste	-8.0	4.7	22.3	-2.2	0.7	-3.5	0.9
Nuclear	-	-	-	-	-	-	-
Hydro	4.5	10.1	0.2	3.6	-6.0	14.0	3.5
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
TFC	**-9.0**	**3.9**	**5.6**	**0.6**	**3.4**	**2.8**	**0.5**
Electricity Consumption	-10.9	3.0	5.6	2.3	3.1	5.4	0.6
Energy Production	-4.0	-4.1	-0.8	-4.6	1.5	0.7	-2.0
Net Oil Imports	-12.2	25.9	3.5	0.1	11.2	4.5	3.7
GDP	-13.8	6.3	6.4	1.5	5.1	4.0	0.5
Growth in the TPES/GDP Ratio	5.9	-4.5	-1.1	-1.9	-0.9	-3.3	-0.6
Growth in the TFC/GDP Ratio	5.6	-2.3	-0.7	-0.8	-1.6	-1.2	0.0

Please note: Rounding may cause totals to differ from the sum of the elements.

CROATIA. ENERGY BALANCE 2005

Thousand tonnes of oil equivalent

SUPPLY AND CONSUMPTION	Coal	Crude Oil	Petroleum Products	Gas	Nuclear	Hydro	Geotherm. Solar	Combust. Renew.	Electricity	Heat	Total
Production	-	1034	-	1865	-	545	1	355	-	-	3800
Imports	608	4344	1196	926	-	-	-	-	752	-	7827
Exports	-	-	-1952	-365	-	-	-	-	-313	-	-2629
Intl. Marine Bunkers	-	-	-25	-	-	-	-	-	-	-	-25
Stock Changes	58	42	-138	-50	-	-	-	-	-	-	-88
TPES	**666**	**5421**	**-918**	**2376**	**-**	**545**	**1**	**355**	**440**	**-**	**8886**
Transfers	-	-194	195	-	-	-	-	-	-	-	1
Statistical Differences	-	-	-	-	-	-	-	-	-	-	-
Electricity Plants	-520	-	-276	-30	-	-545	-1	-3	858	-	-516
CHP Plants	-5	-	-204	-460	-	-	-	-1	205	235	-230
Heat Plants	-	-	-45	-59	-	-	-	-	-	83	-21
Gas Works	-	-	-14	12	-	-	-	-	-	-	-2
Petroleum Refineries	-	-5227	5287	-	-	-	-	-	-	-	60
Coal Transformation	-	-	-	-	-	-	-	-	-	-	-
Liquefaction Plants	-	-	-	-	-	-	-	-	-	-	-
Other Transformation	-	-	-	-	-	-	-	-	-	-	-
Own Use	-	-	-560	-155	-	-	-	-	-82	-21	-817
Distribution Losses	-	-	-	-51	-	-	-	-	-183	-40	-274
TFC	**142**	**-**	**3467**	**1633**	**-**	**-**	**-**	**352**	**1237**	**257**	**7087**
INDUSTRY SECTOR	**132**	**-**	**503**	**530**	**-**	**-**	**-**	**53**	**301**	**54**	**1572**
Iron and Steel	3	-	6	12	-	-	-	-	15	1	38
Chemical and Petrochemical	-	-	56	126	-	-	-	-	41	15	237
Non-Ferrous Metals	-	-	6	1	-	-	-	-	8	-	15
Non-Metallic Minerals	106	-	188	159	-	-	-	-	59	-	511
Transport Equipment	2	-	8	2	-	-	-	-	16	1	28
Machinery	-	-	8	20	-	-	-	-	21	4	52
Mining and Quarrying	-	-	10	3	-	-	-	-	5	-	18
Food and Tobacco	21	-	47	132	-	-	-	-	46	11	256
Paper Pulp and Printing	-	-	16	42	-	-	-	3	27	13	101
Wood and Wood Products	-	-	3	12	-	-	-	18	13	-	46
Construction	-	-	139	-	-	-	-	-	21	-	161
Textile and Leather	-	-	15	17	-	-	-	-	15	2	49
Non-specified	1	-	2	4	-	-	-	31	16	7	60
TRANSPORT SECTOR	**-**	**-**	**1921**	**-**	**-**	**-**	**-**	**-**	**26**	**-**	**1947**
International Aviation	-	-	42	-	-	-	-	-	-	-	42
Domestic Aviation	-	-	59	-	-	-	-	-	-	-	59
Road	-	-	1756	-	-	-	-	-	-	-	1756
Rail	-	-	32	-	-	-	-	-	20	-	52
Pipeline Transport	-	-	-	-	-	-	-	-	2	-	2
Domestic Navigation	-	-	33	-	-	-	-	-	-	-	33
Non-specified	-	-	-	-	-	-	-	-	4	-	4
OTHER SECTORS	**10**	**-**	**717**	**712**	**-**	**-**	**-**	**299**	**910**	**204**	**2852**
Residential	9	-	346	568	-	-	-	299	545	164	1931
Comm. and Publ. Services	-	-	150	126	-	-	-	-	360	40	676
Agriculture/Forestry	-	-	221	19	-	-	-	-	6	-	245
Fishing	-	-	-	-	-	-	-	-	-	-	-
Non-specified	-	-	-	-	-	-	-	-	-	-	-
NON-ENERGY USE	**-**	**-**	**325**	**390**	**-**	**-**	**-**	**-**	**-**	**-**	**716**
in Industry/Transf./Energy	-	-	298	390	-	-	-	-	-	-	689
of which: Feedstocks	-	-	78	390	-	-	-	-	-	-	469
in Transport	-	-	26	-	-	-	-	-	-	-	26
in Other Sectors	-	-	1	-	-	-	-	-	-	-	1
Electr. Generated - GWh	***2328***	**-**	***1855***	***1814***	**-**	***6333***	***10***	***14***	**-**	**-**	***12354***
Electricity Plants	*2310*	-	*1185*	*122*	-	*6333*	*10*	*11*	-	-	*9971*
CHP Plants	*18*	-	*670*	*1692*	-	-	-	*3*	-	-	*2383*
Heat Generated - TJ	**-**	**-**	***4646***	***8679***	**-**	**-**	**-**	**-**	**-**	**-**	***13325***
CHP Plants	-	-	*3157*	*6690*	-	-	-	-	-	-	*9847*
Heat Plants	-	-	*1489*	*1989*	-	-	-	-	-	-	*3478*

FORMER YUGOSLAV REPUBLIC OF MACEDONIA.
ENERGY BALANCES AND KEY STATISTICAL DATA

Unit: Mtoe

SUPPLY		1990	1993	1995	1997	2000	2003	2005
TOTAL PRODUCTION		**1.45**	**1.72**	**1.81**	**1.70**	**1.53**	**1.57**	**1.46**
Coal[1]		1.41	1.47	1.54	1.42	1.21	1.25	1.17
Oil		-	-	-	-	-	-	-
Gas		-	-	-	-	-	-	-
Comb. Renewables & Waste[2]		-	0.19	0.19	0.19	0.21	0.18	0.15
Nuclear		-	-	-	-	-	-	-
Hydro		0.04	0.04	0.07	0.08	0.10	0.12	0.13
Geothermal		-	0.01	0.01	0.01	0.02	0.01	0.01
Solar/Wind/Other[3]		-	-	-	-	-	-	-
TOTAL NET IMPORTS[4]		**1.23**	**1.32**	**1.07**	**1.14**	**1.11**	**1.05**	**1.24**
Coal[1]	Exports	0.03	0.00	0.00	-	0.00	0.01	0.00
	Imports	0.15	0.09	0.08	0.07	0.10	0.12	0.11
	Net Imports	0.12	0.09	0.08	0.07	0.10	0.11	0.11
Oil	Exports	0.26	0.01	0.05	0.01	0.22	0.33	0.33
	Imports	1.36	1.18	1.03	1.07	1.17	1.12	1.26
	Bunkers	-	-	-	-	-	-	-
	Net Imports	1.10	1.18	0.98	1.06	0.95	0.79	0.93
Gas	Exports	-	-	-	-	-	-	-
	Imports	-	-	-	-	0.05	0.07	0.06
	Net Imports	-	-	-	-	0.05	0.07	0.06
Electricity	Exports	0.04	0.00	-	-	-	-	-
	Imports	0.04	0.05	0.01	0.01	0.01	0.08	0.14
	Net Imports	0.01	0.05	0.01	0.01	0.01	0.08	0.14
TOTAL STOCK CHANGES		**0.03**	**-0.05**	**-0.11**	**-**	**0.06**	**0.04**	**0.03**
TOTAL SUPPLY (TPES)		**2.71**	**2.99**	**2.77**	**2.84**	**2.71**	**2.66**	**2.74**
Coal[1]		1.56	1.52	1.65	1.50	1.34	1.34	1.33
Oil		1.10	1.17	0.84	1.06	0.97	0.87	0.91
Gas		-	-	-	-	0.05	0.07	0.06
Comb. Renewables & Waste[2]		-	0.19	0.19	0.19	0.21	0.17	0.15
Nuclear		-	-	-	-	-	-	-
Hydro		0.04	0.04	0.07	0.08	0.10	0.12	0.13
Geothermal		-	0.01	0.01	0.01	0.02	0.01	0.01
Solar/Wind/Other[3]		-	-	-	-	-	-	-
Electricity Trade[5]		0.01	0.05	0.01	0.01	0.01	0.08	0.14
Shares (%)								
Coal		*57.6*	*50.9*	*59.7*	*52.6*	*49.6*	*50.3*	*48.7*
Oil		*40.6*	*39.0*	*30.2*	*37.4*	*35.9*	*32.8*	*33.2*
Gas		-	-	-	-	*2.0*	*2.5*	*2.3*
Comb. Renewables & Waste		-	*6.5*	*6.7*	*6.6*	*7.8*	*6.4*	*5.6*
Nuclear		-	-	-	-	-	-	-
Hydro		*1.6*	*1.5*	*2.5*	*2.7*	*3.7*	*4.4*	*4.7*
Geothermal		-	*0.4*	*0.5*	*0.4*	*0.6*	*0.5*	*0.4*
Solar/Wind/Other		-	-	-	-	-	-	-
Electricity Trade		*0.3*	*1.7*	*0.4*	*0.2*	*0.4*	*3.1*	*5.0*

0 is negligible, - is nil, .. is not available.

Unit: Mtoe

DEMAND							
FINAL CONSUMPTION BY SECTOR	**1990**	**1993**	**1995**	**1997**	**2000**	**2003**	**2005**
TFC	**1.56**	**1.76**	**1.55**	**1.74**	**1.61**	**1.62**	**1.70**
Coal[1]	0.15	0.17	0.15	0.12	0.10	0.10	0.11
Oil	0.91	0.78	0.66	0.85	0.68	0.70	0.73
Gas	-	-	-	-	0.01	0.03	0.03
Comb. Renewables & Waste[2]	-	0.19	0.19	0.19	0.20	0.17	0.15
Geothermal	-	0.01	0.01	0.01	0.01	0.01	0.01
Solar/Wind/Other	-	-	-	-	-	-	-
Electricity	0.40	0.43	0.43	0.46	0.45	0.49	0.54
Heat	0.10	0.17	0.11	0.11	0.15	0.13	0.13
Shares (%)							
Coal	*9.6*	*9.6*	*9.7*	*6.9*	*6.5*	*6.0*	*6.4*
Oil	*58.2*	*44.4*	*42.6*	*48.9*	*42.2*	*43.0*	*43.1*
Gas	-	-	-	-	*0.4*	*1.9*	*2.0*
Comb. Renewables & Waste	-	*11.0*	*12.0*	*10.7*	*12.7*	*10.2*	*8.9*
Geothermal	-	*0.6*	*0.8*	*0.6*	*0.9*	*0.7*	*0.6*
Solar/Wind/Other	-	-	-	-	-	-	-
Electricity	*25.9*	*24.7*	*27.5*	*26.4*	*27.8*	*30.2*	*31.5*
Heat	*6.3*	*9.8*	*7.2*	*6.4*	*9.5*	*7.9*	*7.5*
TOTAL INDUSTRY[6]	**0.86**	**0.71**	**0.56**	**0.58**	**0.55**	**0.50**	**0.58**
Coal[1]	0.14	0.16	0.14	0.11	0.10	0.09	0.10
Oil	0.46	0.23	0.18	0.23	0.20	0.16	0.20
Gas	-	-	-	-	0.01	0.03	0.03
Comb. Renewables & Waste[2]	-	-	-	-	0.00	0.00	0.01
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
Electricity	0.22	0.19	0.17	0.18	0.13	0.15	0.18
Heat	0.03	0.13	0.07	0.07	0.10	0.06	0.06
Shares (%)							
Coal	*16.2*	*22.3*	*24.6*	*18.4*	*18.2*	*18.0*	*17.4*
Oil	*54.0*	*31.8*	*32.1*	*38.9*	*36.9*	*32.9*	*33.7*
Gas	-	-	-	-	*1.3*	*6.1*	*5.6*
Comb. Renewables & Waste	-	-	-	-	*0.3*	*0.2*	*0.8*
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
Electricity	*26.1*	*27.2*	*31.3*	*31.1*	*24.6*	*30.4*	*31.6*
Heat	*3.7*	*18.7*	*12.1*	*11.6*	*18.7*	*12.5*	*10.8*
TRANSPORT[7]	**0.27**	**0.51**	**0.34**	**0.53**	**0.36**	**0.35**	**0.35**
TOTAL OTHER SECTORS[8]	**0.43**	**0.54**	**0.66**	**0.63**	**0.70**	**0.77**	**0.77**
Coal[1]	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Oil	0.18	0.05	0.15	0.09	0.12	0.19	0.19
Gas	-	-	-	-	-	-	0.00
Comb. Renewables & Waste[2]	-	0.19	0.19	0.19	0.20	0.16	0.15
Geothermal	-	0.01	0.01	0.01	0.01	0.01	0.01
Solar/Wind/Other	-	-	-	-	-	-	-
Electricity	0.18	0.24	0.25	0.28	0.31	0.34	0.35
Heat	0.07	0.04	0.04	0.04	0.05	0.07	0.06
Shares (%)							
Coal	*2.5*	*1.9*	*2.1*	*2.2*	*0.7*	*0.9*	*1.0*
Oil	*40.9*	*8.7*	*22.4*	*15.0*	*16.6*	*24.3*	*24.3*
Gas	-	-	-	-	-	-	*0.1*
Comb. Renewables & Waste	-	*36.1*	*28.3*	*29.7*	*28.9*	*21.2*	*19.2*
Geothermal	-	*1.8*	*2.0*	*1.7*	*2.1*	*1.6*	*1.4*
Solar/Wind/Other	-	-	-	-	-	-	-
Electricity	*41.1*	*44.4*	*38.3*	*44.2*	*44.5*	*43.5*	*45.6*
Heat	*15.5*	*7.1*	*6.8*	*7.1*	*7.3*	*8.5*	*8.4*

Unit: Mtoe

DEMAND							
ENERGY TRANSFORMATION AND LOSSES	**1990**	**1993**	**1995**	**1997**	**2000**	**2003**	**2005**
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**1.52**	**1.59**	**1.66**	**1.58**	**1.64**	**1.53**	**1.52**
OUTPUT (Mtoe)	**0.50**	**0.45**	**0.53**	**0.58**	**0.59**	**0.58**	**0.60**
(TWh gross)	5.76	5.18	6.13	6.73	6.81	6.74	6.94
Output Shares (%)							
Coal	*89.7*	*88.2*	*86.3*	*85.6*	*76.5*	*79.3*	*78.3*
Oil	*1.8*	*1.7*	*0.6*	*1.0*	*6.3*	*0.3*	*0.2*
Gas	-	-	-	-	*0.0*	-	-
Comb. Renewables & Waste	-	-	-	-	-	-	-
Nuclear	-	-	-	-	-	-	-
Hydro	*8.5*	*10.1*	*13.1*	*13.4*	*17.2*	*20.4*	*21.5*
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
TOTAL LOSSES	**1.06**	**1.17**	**1.14**	**1.04**	**1.10**	**1.04**	**1.04**
of which:							
Electricity and Heat Generation[10]	0.91	0.94	1.00	0.87	0.88	0.80	0.77
Other Transformation	0.04	0.13	0.01	0.02	0.05	0.04	0.04
Own Use and Losses	0.11	0.10	0.13	0.15	0.18	0.20	0.22
Statistical Differences	**0.09**	**0.06**	**0.08**	**0.07**	**-0.00**	**0.01**	**0.00**
INDICATORS	**1990**	**1993**	**1995**	**1997**	**2000**	**2003**	**2005**
GDP (billion 2000 USD)	3.93	3.19	3.10	3.18	3.59	3.55	3.84
Population (millions)	1.91	1.94	1.96	1.98	2.01	2.03	2.03
TPES/GDP[11]	0.69	0.94	0.89	0.89	0.76	0.75	0.71
Energy Production/TPES	0.54	0.57	0.65	0.60	0.57	0.59	0.53
Per Capita TPES[12]	1.42	1.54	1.41	1.43	1.35	1.31	1.35
Oil Supply/GDP[11]	0.28	0.37	0.27	0.33	0.27	0.25	0.24
TFC/GDP[11]	0.40	0.55	0.50	0.55	0.45	0.46	0.44
Per Capita TFC[12]	0.82	0.91	0.79	0.88	0.80	0.80	0.84
Energy-related CO_2 Emissions (Mt CO_2)[13]	9.2	9.1	8.8	8.9	8.5	8.2	8.3
CO_2 Emissions from Bunkers (Mt CO_2)	0.0	0.1	0.1	0.1	0.1	0.0	0.0
GROWTH RATES (% PER YEAR)	**90-93**	**93-95**	**95-97**	**97-00**	**00-03**	**03-05**	**90-05**
TPES	**3.3**	**-3.7**	**1.3**	**-1.6**	**-0.6**	**1.4**	**0.1**
Coal	-0.8	4.2	-4.9	-3.5	-0.1	-0.3	-1.1
Oil	1.9	-15.3	12.8	-2.9	-3.6	2.1	-1.3
Gas	-	-	-	-	7.1	-2.0	-
Comb. Renewables & Waste	-	-1.7	-	4.4	-7.0	-5.0	-
Nuclear	-	-	-	-	-	-	-
Hydro	2.1	23.9	6.0	9.1	5.5	4.2	7.7
Geothermal	-	15.5	-8.5	8.3	-5.5	-4.7	-
Solar/Wind/Other	-	-	-	-	-	-	-
TFC	**4.1**	**-6.1**	**5.9**	**-2.6**	**0.2**	**2.5**	**0.6**
Electricity Consumption	2.5	-0.8	3.7	-0.8	3.0	4.5	1.9
Energy Production	5.7	2.6	-3.1	-3.4	0.8	-3.5	0.0
Net Oil Imports	2.3	-8.8	4.2	-3.8	-5.8	8.6	-1.1
GDP	-6.7	-1.4	1.3	4.1	-0.3	4.0	-0.2
Growth in the TPES/GDP Ratio	10.8	-2.3	-0.0	-5.5	-0.3	-2.5	0.2
Growth in the TFC/GDP Ratio	11.6	-4.7	4.5	-6.4	0.5	-1.5	0.7

Please note: Rounding may cause totals to differ from the sum of the elements.

FORMER YUGOSLAV REPUBLIC OF MACEDONIA. ENERGY BALANCE 2005

Thousand tonnes of oil equivalent

SUPPLY AND CONSUMPTION	Coal	Crude Oil	Petroleum Products	Gas	Nuclear	Hydro	Geotherm. Solar	Combust. Renew.	Electricity	Heat	Total
Indigenous Production	1170	-	-	-	-	128	12	151	-	-	1461
Imports	111	981	283	63	-	-	-	-	138	-	1576
Exports	-	-	-332	-	-	-	-	-1	-	-	-333
Intl. Marine Bunkers	-	-	-	-	-	-	-	-	-	-	-
Stock changes	52	-14	-8	-	-	-	-	4	-	-	34
TPES	**1332**	**967**	**57**	**64**	**-**	**128**	**12**	**154**	**138**	**-**	**2738**
Electricity and CHP Plants	-1211	-	-14	-2	-	-128	-	-	597	13	-745
Petroleum Refineries	-	-1213	1184	-	-	-	-	-	-	-	-29
Other Transformation*	-12	246	-379	-28	-	-	-1	-3	-199	114	-263
TFC	**109**	**-**	**733**	**33**	**-**	**-**	**11**	**151**	**536**	**127**	**1701**
INDUSTRY SECTOR	**102**	**-**	**161**	**33**	**-**	**-**	**-**	**5**	**184**	**63**	**547**
Iron and Steel	101	-	50	31	-	-	-	3	133	9	327
Chemical and Petrochemical	-	-	-	1	-	-	-	-	4	5	10
Non-Metallic Minerals	-	-	92	-	-	-	-	-	12	5	110
Non-specified	1	-	19	1	-	-	-	2	35	44	100
TRANSPORT SECTOR	**-**	**-**	**350**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**352**
Aviation	-	-	6	-	-	-	-	-	-	-	6
Road	-	-	342	-	-	-	-	-	-	-	342
Non-specified	-	-	2	-	-	-	-	-	2	-	4
OTHER SECTORS	**8**	**-**	**186**	**1**	**-**	**-**	**11**	**147**	**349**	**64**	**765**
Residential	3	-	41	-	-	-	-	140	257	43	485
Comm. and Publ. Services	4	-	121	1	-	-	2	5	90	21	244
Agriculture/Forestry	-	-	24	-	-	-	9	1	2	-	37
Non-specified**	-	-	-	-	-	-	-	-	-	-	-
NON-ENERGY USE	**-**	**-**	**36**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**36**
Electricity Generated - GWh	*5435*	-	*15*	-	-	*1492*	-	-	-	-	*6942*
Heat Generated - TJ	*364*	-	*4583*	*1035*	-	-	-	*100*	-	-	*6082*

** Includes Transfers, Statistical Differences, Own Use and Distribution Losses.*

*** Includes Fishing.*

SERBIA AND MONTENEGRO. ENERGY BALANCES AND KEY STATISTICAL DATA*

Unit: Mtoe

SUPPLY		**1990**	**1993**	**1995**	**1997**	**2000**	**2003**	**2005**
TOTAL PRODUCTION		**13.40**	**11.37**	**12.19**	**12.48**	**11.43**	**11.41**	**11.41**
Coal[1]		9.80	7.86	8.64	9.16	7.91	8.57	8.63
Oil		1.09	1.17	1.09	1.01	1.00	0.79	0.62
Gas		0.53	0.68	0.68	0.48	0.62	0.29	0.23
Comb. Renewables & Waste[2]		1.17	0.75	0.74	0.74	0.87	0.90	0.90
Nuclear		-	-	-	-	-	-	-
Hydro		0.81	0.90	1.05	1.10	1.03	0.85	1.03
Geothermal		-	-	-	-	-	-	-
Solar/Wind/Other[3]		-	-	-	-	-	-	-
TOTAL NET IMPORTS[4]		**6.09**	**1.34**	**1.43**	**4.70**	**1.91**	**4.78**	**5.25**
Coal[1]	Exports	-	-	0.09	0.08	0.00	0.03	0.13
	Imports	-	-	0.08	0.05	0.32	0.38	0.16
	Net Imports	-	-	-0.01	-0.03	0.32	0.35	0.03
Oil	Exports	-	-	-	0.09	-	0.30	0.20
	Imports	4.21	0.70	0.81	3.07	0.49	3.05	3.98
	Bunkers	-	-	-	-	-	-	-
	Net Imports	4.21	0.70	0.81	2.98	0.49	2.76	3.78
Gas	Exports	-	-	-	-	-	-	-
	Imports	2.06	0.72	0.67	1.67	0.91	1.52	1.71
	Net Imports	2.06	0.72	0.67	1.67	0.91	1.52	1.71
Electricity	Exports	0.21	0.09	0.12	0.17	0.16	0.15	0.75
	Imports	0.03	-	0.09	0.24	0.42	0.39	0.58
	Net Imports	-0.17	-0.09	-0.03	0.07	0.26	0.24	-0.17
TOTAL STOCK CHANGES		**-**	**-**	**-**	**-**	**-**	**-**	**-**
TOTAL SUPPLY (TPES)		**19.49**	**12.70**	**13.63**	**17.17**	**13.35**	**16.18**	**16.66**
Coal[1]		9.80	7.86	8.63	9.13	8.23	8.93	8.65
Oil		5.29	1.87	1.90	3.99	1.49	3.55	4.40
Gas		2.59	1.41	1.35	2.15	1.53	1.82	1.94
Comb. Renewables & Waste[2]		1.17	0.75	0.74	0.74	0.80	0.80	0.80
Nuclear		-	-	-	-	-	-	-
Hydro		0.81	0.90	1.05	1.10	1.03	0.85	1.03
Geothermal		-	-	-	-	-	-	-
Solar/Wind/Other[3]		-	-	-	-	-	-	-
Electricity Trade[5]		-0.17	-0.09	-0.03	0.07	0.26	0.24	-0.17
Shares (%)								
Coal		*50.3*	*61.8*	*63.3*	*53.2*	*61.7*	*55.2*	*51.9*
Oil		*27.1*	*14.7*	*13.9*	*23.2*	*11.2*	*21.9*	*26.4*
Gas		*13.3*	*11.1*	*9.9*	*12.5*	*11.5*	*11.2*	*11.6*
Comb. Renewables & Waste		*6.0*	*5.9*	*5.4*	*4.3*	*6.0*	*5.0*	*4.8*
Nuclear		-	-	-	-	-	-	-
Hydro		*4.2*	*7.1*	*7.7*	*6.4*	*7.7*	*5.2*	*6.2*
Geothermal		-	-	-	-	-	-	-
Solar/Wind/Other		-	-	-	-	-	-	-
Electricity Trade		*-0.9*	*-0.7*	*-0.3*	*0.4*	*1.9*	*1.5*	*-1.0*

0 is negligible, - is nil, .. is not available.

** 1990-2005 data include Montenegro until 2004 and Kosovo until 1999. 2005 data on Serbia are based on the official submission of the Ministry of Mining and Energy of Serbia.*

Unit: Mtoe

DEMAND							
FINAL CONSUMPTION BY SECTOR	**1990**	**1993**	**1995**	**1997**	**2000**	**2003**	**2005**
TFC	**12.33**	**6.86**	**6.25**	**10.00**	**7.21**	**9.56**	**9.66**
Coal[1]	0.96	1.13	0.52	0.83	1.25	1.48	1.09
Oil	4.51	1.66	1.49	3.95	1.23	3.20	3.67
Gas	2.36	0.90	0.89	1.62	1.16	1.16	1.28
Comb. Renewables & Waste[2]	1.17	0.75	0.74	0.74	0.80	0.80	0.80
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
Electricity	2.78	1.94	2.17	2.38	2.35	2.41	2.21
Heat	0.55	0.48	0.45	0.48	0.42	0.51	0.62
Shares (%)							
Coal	*7.8*	*16.4*	*8.2*	*8.3*	*17.4*	*15.5*	*11.3*
Oil	*36.6*	*24.2*	*23.8*	*39.5*	*17.0*	*33.5*	*37.9*
Gas	*19.1*	*13.2*	*14.2*	*16.2*	*16.1*	*12.1*	*13.3*
Comb. Renewables & Waste	*9.5*	*11.0*	*11.8*	*7.4*	*11.1*	*8.4*	*8.3*
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
Electricity	*22.6*	*28.2*	*34.7*	*23.8*	*32.6*	*25.2*	*22.8*
Heat	*4.5*	*7.0*	*7.3*	*4.8*	*5.8*	*5.3*	*6.4*
TOTAL INDUSTRY[6]	**5.07**	**2.12**	**1.78**	**3.56**	**2.42**	**3.37**	**3.34**
Coal[1]	0.39	0.46	0.22	0.37	0.70	0.86	0.56
Oil	2.49	0.48	0.37	1.42	0.32	0.97	1.19
Gas	0.78	0.67	0.66	1.21	0.86	0.96	1.07
Comb. Renewables & Waste[2]	-	-	-	-	-	-	-
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
Electricity	1.19	0.50	0.52	0.57	0.54	0.57	0.52
Heat	0.22	-	-	-	-	-	-
Shares (%)							
Coal	*7.7*	*21.8*	*12.5*	*10.3*	*28.9*	*25.5*	*16.6*
Oil	*49.1*	*22.8*	*20.7*	*39.8*	*13.1*	*28.8*	*35.6*
Gas	*15.4*	*31.7*	*37.3*	*33.9*	*35.6*	*28.6*	*32.2*
Comb. Renewables & Waste	-	-	-	-	-	-	-
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
Electricity	*23.5*	*23.7*	*29.6*	*16.0*	*22.5*	*17.1*	*15.6*
Heat	*4.4*	-	-	-	-	-	-
TRANSPORT[7]	**1.70**	**0.95**	**0.98**	**2.24**	**0.84**	**1.73**	**2.26**
TOTAL OTHER SECTORS[8]	**5.57**	**3.79**	**3.50**	**4.19**	**3.95**	**4.46**	**4.07**
Coal[1]	0.57	0.66	0.29	0.46	0.55	0.62	0.53
Oil	0.36	0.25	0.16	0.31	0.09	0.52	0.24
Gas	1.58	0.23	0.23	0.41	0.30	0.20	0.21
Comb. Renewables & Waste[2]	1.17	0.75	0.74	0.74	0.80	0.80	0.80
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
Electricity	1.55	1.41	1.62	1.79	1.78	1.82	1.67
Heat	0.33	0.48	0.45	0.48	0.42	0.51	0.62
Shares (%)							
Coal	*10.3*	*17.5*	*8.4*	*11.0*	*14.0*	*13.9*	*13.1*
Oil	*6.5*	*6.7*	*4.6*	*7.5*	*2.3*	*11.6*	*5.9*
Gas	*28.4*	*6.1*	*6.5*	*9.9*	*7.5*	*4.4*	*5.1*
Comb. Renewables & Waste	*21.0*	*19.9*	*21.0*	*17.5*	*20.3*	*18.0*	*19.7*
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
Electricity	*27.9*	*37.3*	*46.4*	*42.6*	*45.1*	*40.7*	*40.9*
Heat	*5.9*	*12.6*	*13.0*	*11.4*	*10.7*	*11.4*	*15.2*

Unit: Mtoe

DEMAND							
ENERGY TRANSFORMATION AND LOSSES	**1990**	**1993**	**1995**	**1997**	**2000**	**2003**	**2005**
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**9.93**	**8.10**	**9.29**	**9.88**	**8.29**	**8.78**	**9.25**
OUTPUT (Mtoe)	**3.52**	**2.79**	**2.96**	**3.22**	**2.94**	**3.04**	**3.14**
(TWh gross)	40.95	32.40	34.48	37.46	34.14	35.37	36.47
Output Shares (%)							
Coal	*69.1*	*65.5*	*62.9*	*62.9*	*62.8*	*69.9*	*64.1*
Oil	*4.6*	*0.9*	*0.7*	*1.5*	*0.9*	*0.8*	*1.7*
Gas	*3.2*	*1.1*	*1.0*	*1.5*	*1.1*	*1.5*	*1.2*
Comb. Renewables & Waste	-	-	-	-	-	-	-
Nuclear	-	-	-	-	-	-	-
Hydro	*23.1*	*32.4*	*35.4*	*34.1*	*35.1*	*27.9*	*33.0*
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
TOTAL LOSSES	**6.86**	**5.88**	**6.95**	**7.27**	**5.96**	**6.48**	**6.84**
of which:							
Electricity and Heat Generation[10]	5.77	4.84	5.87	6.18	4.94	5.23	5.50
Other Transformation	0.44	0.28	0.32	0.18	0.17	0.38	0.58
Own Use and Losses	0.65	0.76	0.76	0.91	0.85	0.87	0.76
Statistical Differences	**0.30**	**-0.03**	**0.42**	**-0.09**	**0.18**	**0.14**	**0.15**
INDICATORS*	**1990**	**1993**	**1995**	**1997**	**2000**	**2003**	**2005**
GDP (billion 2000 USD)	8.55	7.89	8.58	9.75	8.60	9.69	10.87
Population (millions)	10.53	10.49	10.55	10.60	8.14	8.10	8.06
TPES/GDP[11]	2.28	1.61	1.59	1.76	1.55	1.67	1.53
Energy Production/TPES	0.69	0.89	0.89	0.73	0.86	0.70	0.69
Per Capita TPES[12]	1.85	1.21	1.29	1.62	1.64	2.00	2.07
Oil Supply/GDP[11]	0.62	0.24	0.22	0.41	0.17	0.37	0.40
TFC/GDP[11]	1.44	0.87	0.73	1.03	0.84	0.99	0.89
Per Capita TFC[12]	1.17	0.65	0.59	0.94	0.89	1.18	1.20
Energy-related CO_2 Emissions (Mt CO_2)[13]	58.8	40.1	41.5	53.4	40.4	49.5	50.4
CO_2 Emissions from Bunkers (Mt CO_2)	0.4	0.1	0.1	0.2	0.1	0.2	0.1
GROWTH RATES (% PER YEAR)	**90-93**	**93-95**	**95-97**	**97-00**	**00-03**	**03-05**	**90-05**
TPES	**-13.3**	**3.6**	**12.3**	**-8.1**	**6.6**	**1.5**	**-1.0**
Coal	-7.1	4.8	2.9	-3.4	2.7	-1.5	-0.8
Oil	-29.3	0.7	44.9	-28.0	33.5	11.4	-1.2
Gas	-18.4	-2.1	26.2	-10.7	5.9	3.1	-1.9
Comb. Renewables & Waste	-13.6	-1.1	-	2.9	-	-	-2.5
Nuclear	-	-	-	-	-	-	-
Hydro	3.5	7.8	2.3	-2.0	-6.4	10.5	1.6
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	-	-	-
TFC	**-17.8**	**-4.5**	**26.4**	**-10.3**	**9.9**	**0.5**	**-1.6**
Electricity Consumption	-11.4	5.9	4.7	-0.5	0.9	-4.4	-1.5
Energy Production	-5.3	3.6	1.1	-2.9	-0.1	0.0	-1.1
Net Oil Imports	-45.0	7.6	91.9	-45.2	77.7	17.1	-0.7
GDP	-2.7	4.3	6.6	-4.1	4.1	5.9	1.6
Growth in the TPES/GDP Ratio	-10.9	-0.7	5.3	-4.1	2.5	-4.2	-2.6
Growth in the TFC/GDP Ratio	-15.5	-8.4	18.6	-6.5	5.6	-5.1	-3.2

Please note: Rounding may cause totals to differ from the sum of the elements.

** Data for GDP, population, and all derived indicators include Montenegro for all years.*

SERBIA. ENERGY BALANCE 2005*

Thousand tonnes of oil equivalent

SUPPLY AND CONSUMPTION	Coal	Crude Oil	Petroleum Products	Gas	Nuclear	Hydro	Geotherm. Solar	Combust. Renew.	Electricity	Heat	Total
Production	8626	622	-	228	-	1035	1	903	-	-	11414
Imports	157	3544	439	1707	-	-	-	-	581	-	6427
Exports	-129	-	-205	-	-	-	-100	-748	-	-	-1182
Intl. Marine Bunkers	-	-	-	-	-	-	-	-	-	-	-
Stock Changes	-	-	-	-	-	-	-	-	-	-	-
TPES	**8654**	**4166**	**235**	**1935**	**-**	**1035**	**-**	**802**	**-167**	**-**	**16659**
Transfers	-	-	-	-	-	-	-	-	-	-	-
Statistical Differences	-154	-	-	-	-	-	-	-	-	-	-154
Electricity Plants	-7211	-	-161	-131	-	-1035	-	-	3137	-	-5401
CHP Plants	-3	-	-	-	-	-		-	-	-	-3
Heat Plants	-68	-	-118	-524	-	-		-	-	617	-92
Gas Works	-	-	-	-	-	-		-	-	-	-
Petroleum Refineries	-	-4166	3710	-	-	-		-	-	-	-456
Coal Transformation	-128	-	-	-	-	-		-	-	-	-128
Liquefaction Plants	-	-	-	-	-	-		-	-	-	-
Other Transformation	-	-	-	-	-	-		-	-	-	-
Own Use	-	-	-	-	-	-		-	-303	-	-303
Distribution Losses	-	-	-	-	-	-		-	-460	-	-460
TFC	**1090**	**-**	**3665**	**1281**	**-**	**-**		**802**	**2207**	**617**	**9663**
INDUSTRY SECTOR	**555**	**-**	**1062**	**770**	**-**	**-**		**-**	**521**	**-**	**2907**
Iron and Steel	-	-	-	-	-	-		-	79	-	79
Chemical and Petrochemical	-	-	334	-	-	-		-	72	-	407
Non-Ferrous Metals	8	-	-	-	-	-		-	30	-	38
Non-Metallic Minerals	27	-	-	-	-	-		-	58	-	85
Transport Equipment	-	-	-	-	-	-		-	58	-	58
Machinery	-	-	-	-	-	-		-	37	-	37
Mining and Quarrying	-	-	-	-	-	-		-	31	-	31
Food and Tobacco	1	-	-	-	-	-		-	75	-	76
Paper Pulp and Printing	-	-	-	-	-	-		-	7	-	7
Wood and Wood Products	-	-	-	-	-	-		-	5	-	5
Construction	-	-	-	-	-	-		-	26	-	26
Textile and Leather	-	-	-	-	-	-		-	13	-	13
Non-specified	519	-	727	770	-	-		-	31	-	2047
TRANSPORT SECTOR	**-**	**-**	**2238**	**-**	**-**	**-**		**-**	**21**	**-**	**2259**
International Aviation	-	-	50	-	-	-		-	-	-	50
Domestic Aviation	-	-	-	-	-	-		-	-	-	-
Road	-	-	2188	-	-	-		-	-	-	2188
Rail	-	-	-	-	-	-		-	21	-	21
Pipeline Transport	-	-	-	-	-	-		-	-	-	-
Domestic Navigation	-	-	-	-	-	-		-	-	-	-
Non-specified	-	-	-	-	-	-		-	-	-	-
OTHER SECTORS	**535**	**-**	**240**	**208**	**-**	**-**		**802**	**1665**	**617**	**4068**
Residential	400	-	24	208	-	-		802	1220	373	3027
Comm. and Publ. Services	-	-	-	-	-	-		-	426	-	426
Agriculture/Forestry	60	-	-	-	-	-		-	19	54	133
Fishing	-	-	-	-	-	-		-	-	-	-
Non-specified	75	-	216	-	-	-		-	-	191	482
NON-ENERGY USE	**-**	**-**	**126**	**303**	**-**	**-**		**-**	**-**	**-**	**428**
in Industry/Transf./Energy	-	-	126	303	-	-		-	-	-	428
of which: Feedstocks	-	-	-	303	-	-		-	-	-	303
in Transport	-	-	-	-	-	-		-	-	-	-
in Other Sectors	-	-	-	-	-	-		-	-	-	-
Electr. Generated - GWh	***23375***	**-**	***626***	***441***	**-**	***12032***		**-**	**-**	**-**	***36474***
Electricity Plants	*23375*	-	*626*	*441*	-	*12032*		-	-	-	*36474*
CHP Plants	-	-	-	-	-	-		-	-	-	-
Heat Generated - TJ	***1215***	**-**	***475***	***24162***	**-**	**-**		**-**	**-**	**-**	***25852***
CHP Plants	-	-	-	-	-	-		-	-	-	-
Heat Plants	*1215*	-	*475*	*24162*	-	-		-	-	-	*25852*

** 2005 data on Serbia is based on the official submission of the Ministry of Mining and Energy of Serbia.*

Notes to Energy Balances and Key Statistical Data

The IEA does not currently collect data for Montenegro and for Kosovo. Plans are to do so in the future. For the purposes of this Survey, data directly from the administrations in Montenegro and Kosovo were used.

[1] Coal includes lignite.

[2] Combustible renewables and waste comprises solid biomass, liquid biomass, biogas, industrial waste and municipal waste. Data are often based on partial surveys and may not be comparable between countries.

[3] Other includes tide, wave and ambient heat used in heat pumps.

[4] In addition to coal, oil, gas and electricity, total net imports also include combustible renewables and waste and trade of heat.

[5] Total supply of electricity represents net trade. A negative number in the share of TPES indicates that exports are greater than imports.

[6] Industry includes non-energy use.

[7] Transport is predominantly oil with less than 1% non-oil fuels.

[8] Other sectors includes residential, commercial, public services, agriculture, forestry, fishing and other non-specified sectors.

[9] Inputs to electricity generation include inputs to electricity, CHP and heat plants. Output refers only to electricity generation.

[10] Losses arising in the production of electricity and heat at main activity producer utilities and auto-producers. For non-fossil fuel electricity generation, theoretical losses are shown based on plant efficiencies of approximately 33% for nuclear, 10% for geothermal and 100% for hydro, wind and photovoltaic.

[11] toe per thousand US dollars at year 2000 prices and exchange rates.

[12] toe per person.

[13] "Energy-related CO_2 emissions" have been estimated using the Tier I Sectoral Approach of the Intergovernmental Panel on Climate Change (IPCC). In accordance with the IPCC methodology, emissions from international marine and aviation bunkers are not included in national totals.

ANNEX II

INTERNATIONAL ENERGY AGENCY "SHARED GOALS"

The member countries of the International Energy Agency (IEA) seek to create conditions in which the energy sectors of their economies can make the fullest possible contribution to sustainable economic development and to the well-being of their people and of the environment. In formulating energy policies, the establishment of free and open markets is a fundamental point of departure, though energy security and environmental protection need to be given particular emphasis by governments. IEA countries recognise the significance of increasing global interdependence in energy. They therefore seek to promote the effective operation of international energy markets and encourage dialogue with all participants.

In order to secure their objectives, member countries therefore aim to create a policy framework consistent with the following goals:

Diversity, efficiency and flexibility within the energy sector are basic conditions for longer-term energy security: the fuels used within and across sectors and the sources of those fuels should be as diverse as practicable. Non-fossil fuels, particularly nuclear and hydro power, make a substantial contribution to the energy supply diversity of IEA countries as a group.

Energy systems should have **the ability to respond promptly and flexibly to energy emergencies**. In some cases this requires collective mechanisms and action: IEA countries co-operate through the Agency in responding jointly to oil supply emergencies.

The environmentally sustainable provision and use of energy are central to the achievement of these shared goals. Decision-makers should seek to minimise the adverse environmental impacts of energy activities, just as environmental decisions should take account of the energy consequences. Government interventions should respect the Polluter Pays Principle where practicable.

More environmentally acceptable energy sources need to be encouraged and developed. Clean and efficient use of fossil fuels is essential. The development of economic non-fossil sources is also a priority. A number of IEA member countries wish to retain and improve the nuclear option for the future, at the highest available safety standards, because nuclear energy does not emit carbon dioxide. Renewable sources will also have an increasingly important contribution to make.

Improved energy efficiency can promote both environmental protection and energy security in a cost-effective manner. There are significant opportunities for greater energy efficiency at all stages of the energy cycle from production to consumption. Strong efforts by governments and all energy users are needed to realise these opportunities.

Continued research, development and market deployment of new and improved energy technologies make a critical contribution to achieving the objectives outlined above. Energy technology policies should complement broader energy policies. International co-operation in the development and dissemination of energy technologies, including industry participation and co-operation with non-member countries, should be encouraged.

Undistorted energy prices enable markets to work efficiently. Energy prices should not be held artificially below the costs of supply to promote social or industrial goals. To the extent necessary and practicable, the environmental costs of energy production and use should be reflected in prices.

Free and open trade and a secure framework for investment contribute to efficient energy markets and energy security. Distortions to energy trade and investment should be avoided.

Co-operation among all energy market participants helps to improve information and understanding, and encourages the development of efficient, environmentally acceptable and flexible energy systems and markets worldwide. These are needed to help promote the investment, trade and confidence necessary to achieve global energy security and environmental objectives.

The "Shared Goals" were adopted by IEA Ministers at their 4 June 1993 meeting in Paris.

ANNEX III

LIST OF ACRONYMS AND UNIT ABBREVIATIONS

Acronyms

BSREC	Black Sea Regional Energy Centre
CCGT	Combined-cycle gas turbine
CDM	Clean development mechanism of the Kyoto Protocol
CEER	Council of European Energy Regulators; www.energy-regulators.eu
CERA	Croatian Energy Regulatory Agency; www.hera.hr
CHP	Combined-heat and power; sometimes, when referring to industrial CHP, the term “co-generation” is used
CIS	Commonwealth of Independent States
CLRTAP	Convention on Long-Range Trans-boundary Air Pollution
CNG	Compressed natural gas
CO	Carbon monoxide
CO_2	Carbon dioxide
DERK	State Electricity Regulatory Commission (Bosnia and Herzegovina); www.derk.ba
DH	District heating
DNA	Designated national authority under the Kyoto Protocol
DSM	Demand side management: refers to actions taken on the customer’s side to increase energy efficiency and/or to reduce peak demand
DSO	Distribution system operator
EAR	European Agency for Reconstruction; www.ear.europa.eu
EAS	Energy Agency of Serbia; www.aers.org.yu

EBRD	European Bank for Reconstruction and Development www.ebrd.com
EC	European Commission; www.ec.europa.eu
ECSec	Energy Community Secretariat; www.energy-community.org
EIA	Environmental impact assessment
EIB	European Investment Bank; www.eib.org
EIHP	Energy Institute Hrvoje Požar (Croatia); www.eihp.hr
EPBiH	Elektroprivreda Bosne i Hercegovine (electricity company based in Sarajevo, Bosnia and Herzegovina); www.elektroprivreda.ba
EPCG	ElektroPrivreda Crne Gore (electricity company of Montenegro); ww.epcg.cg.yu
EPCM	Electric Power Company of Macedonia; www.elem.com.mk
EPHZHB	Elektroprivreda Hrvatske Zajednice Herceg Bosne (electricity company based in Mostar, Bosnia and Herzegovina) www.ephzhb.ba
EPR	Environmental performance review
EPRS	Elektroprivreda Republike Srpske (electricity company based in Trebinje, RS, Bosnia and Herzegovina); www.ers.ba
EPS	Elektroprivreda Srbije (electricity company of Serbia) www.eps.co.yu
ERA	Energy Regulatory Agency (Montenegro); http://regagen.cg.yu
ERC	Energy Regulatory Commission (FYR Macedonia) www.erc.org.mk
ERE	Electricity Regulatory Authority (Albania); www.ere.gov.al
ERO	Energy Regulatory Office (Kosovo); www.ero-ks.org
ERRA	Energy Regulator Regional Association; www.erranet.org
EU	European Union; http://europa.eu
EU CARDS	Community Assistance for Reconstruction, Development and Security
EU ETS	European Union Emission Trading Scheme

EUR	Euro, currency of the European Union
ESCO	Energy service company: develops, installs, and finances projects to improve energy efficiency and reduce operations and maintenance costs for customer facilities
ETSO	European Transmission System Operators; www.etso-net.org
FBiH	Federation of Bosnia and Herzegovina
FDI	Foreign direct investment
FEC	Final electricity consumption
FERK	FBiH Regulatory Commission for Electricity (Bosnia and Herzegovina); www.ferk.ba
FYR	Former Yugoslav Republic (of Macedonia)
GDP	Gross domestic product
GEF	Global Environment Facility; www.gefweb.org
GHG	Greenhouse gas
GIS	Generation Investment Study
HEP	Hrvatska elektroprivreda (electricity company of Croatia) www.hep.hr
HPP	Hydropower plant
IAS	International accounting standards
IEA	International Energy Agency; www.iea.org
IFC	International Finance Corporation; www.ifc.org
IFI	International financial institutions
IGA	Intergovernmental Agreement
IMF	International Monetary Fund; www.imf.org
INA	Industrija nafte (oil and gas company Croatian); www.ina.hr
IPC	International project company
IPPs	Independent power producers
ISO	Independent system oOperator

JSC	Joint-stock company
KEK	Korporata Energjetike e Kosovës (electricity company of Kosovo); www.kek-energy.com
KESH	Korporata Elektroenergjetike Shqiptare (power company of Albanian); www.kesh.com.al
KfW	Kreditanstalt für Wiederaufbau (Germany); www.kfw.de
LCIP	Least-cost investment plan
LNG	Liquified natural gas
LPG	Liquified petroleum gas
LSMS	Living standards measurement survey
MDGs	Millennium Development Goals
MED-ES	Ministry of Economic Development – Energy Sector (Montenegro); www.vlada.cg.yu/eng/minekon
MELE	Ministry of Economy, Labour and Entrepreneurship (Croatia); www.mingorp.hr
MEM	Ministry of Energy and Mining (Kosovo); www.mem-ks.com
MENA	Middle East and North Africa
METE	Ministry of Economy, Trade and Energy (Albania) www.mete.gov.al
MME	Ministry of Mining and Energy (Serbia); www.mem.sr.gov.yu
MOFTER	Ministry of Foreign Trade and Economic Relations (Bosnia and Herzegovina); www.mvteo.gov.ba
MOL	Magyar Olaj-és Gázipari, Rt. (Hungarian oil and gas company); www.mol.hu
MONSTAT	Statistical Office of Montenegro
MoU	Memorandum of Understanding
n/a	Not available
NATO	North Atlantic Treaty Organisation; www.nato.int
NEPs	National energy programmes

NGO	Non-governmental organization
NGV	Natural gas vehicle
NIS	Naftna Industrija Srbije (Oil Industry of Serbia); www.nis.yu
NMVOC	Non-matter volatile organic compounds
NOx	Nitrogen oxides
NPP	Nuclear power plant
NTC	Net transmission capacity
OECD	Organisation for Economic Co-operation and Development; www.oecd.org
OECD Europe	OECD Europe comprises all European member countries of the OECD, i.e. Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, United Kingdom
OHR	Office of the High Representative (Bosnia and Herzegovina)
PEEREA	Protocol on Energy Efficiency and Related Environmental Aspects (Energy Charter)
PEOP	Pan-European Oil Pipeline
PHARE	EU technical assistance programme for Central and Eastern Europe
PM	Particulate matter
PPP	Purchasing power parity: the rate of currency conversion that equalises the purchasing power of diverse currencies – *i.e.* estimates the differences in price levels between countries
PRS	Poverty Reduction Strategy
PRSP	Poverty Reduction Strategy Paper
R&D	Research and development, especially in energy technology; may also include the demonstration and dissemination phases
REERS	RS Regulatory Commission for Electricity (Bosnia and Herzegovina); www.reers.ba
RELEEL	Renewable Energy Legislation and Energy Efficiency Labelling (Croatia)

RENEUER	Regional Network for Efficient Use of Energy and Water Resources for Southeastern Europe
RES	Renewable energy sources
RON	Research octane number for gasoline
RS	Republika Srpska (Bosnia and Herzegovina)
SAVE	EU energy support programme for energy efficiency
SCADA	Supervisory control and data acquisition
SECI	Southeast Co-operation Initiative
SEE	Southeast Europe
SEE-REDP	Southeast Europe Regional Energy Demand Planning
SEEEP-WG	Southeast Europe Energy Policy Working Group
SEERECON	Economic Reconstruction and Development in Southeast Europe
SEETEC	Southeastern Europe Electrical System Technical Support Project; www.seetec-balkans.org
SEMRM	Sector for Energy and Mineral Raw Materials (FYR Macedonia's Ministry of Economy); www.economy.gov.mk/MEKEnergetika/default-en.asp
SFR	Socialist Federal Republic (of Yugoslavia)
SIDA	Swedish International Development Agency
SO_2	Sulphur dioxide
TAP	Trans-Adriatic Pipeline
TASED	EU Technical Assistance program to Support the Energy Department (Bosnia and Herzegovina)
TEN	Trans-European Network (European Union); http://ec.europa.eu/ten/energy/index_en.htm
TFC	Total final consumption; TFC is the sum of consumption by the different end-use sectors. Backflows from the petrochemical industry are not included in final consumption
TGII	Turkey-Greece-Italy Interconnector (gas pipeline)
TPA	Third-party access

TPES	Total primary energy supply; TPES is made up of indigenous production + imports – exports – international marine bunkers + or – stock changes
TPP	Thermal power plant
TSO	Transmission system operator
UCTE	Union for the Co-ordination of Transmission of Electricity; association of TSOs in continental Europe; www.ucte.org
UGS	Underground gas storage
UNDP	United Nations Development Program; www.undp.org
UNECE	United Nations Economic Commission for Europe www.unece.org
UNFAO	United Nations Food and Agriculture Organisation www.fao.org
UNFCCC	United Nations Framework Convention on Climate Change; http://unfccc.int
UNMIK	United Nations Interim Administration in Kosovo www.unmikonline.org
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs; www.unocha.org
USAID	United States Agency for International Development www.usaid.gov
USD	United States dollar
VAT	Value-added tax
WEC	World Energy Council; www.worldenergy.org
WTO	World Trade Organisation; www.wto.org

Units

bcm	billion cubic metre
bcm/y	billion cubic metres per year
Bl	barrel of oil; equivalent to 159 litres or 41.868 GJ

Dwt	deadweight tonnes
GJ	gigajoule, or 1 joule x 10^9; equivalent to 0.0238 toe[326]
GW	gigawatt, or 1 watt x 10^9
km	kilometre
kV	kilovolt
kWh	kilowatt-hour = one kilowatt x one hour, or one watt x one hour x 10^3; equivalent to 0.0859 toe or 3.6 GJ
kt	kilo tonnes or thousand tonnes
kt	kilo tonnes of oil equivalent
L	litre
M	million
m^3	cubic metre
Mb	million barrels
Mb/d	million barrels per day
Mcm	million cubic meters
Mt	million tonnes
Mtoe	millions of tonnes of oil equivalent, see toe
Mt/y	million tonnes per year
MW	megawatt of electricity or 1 Watt x 10^6
MWh	megawatt-hour = one megawatt x one hour, or one watt x one hour x 10^6
MWt	megawatt of heat or one Watt x 10^6
ppm	parts per million
TJ	TeraJoule
TW	terawatt, or one watt x 10^{12}
TWh	terawatt-hour= one terawatt x one hour, or one watt x one hour x 10^{12}

326. Online unit converter: www.iea.org/Textbase/stats/index.asp

ANNEX IV

REFERENCES

PART I: Regional perspectives

Energy co-operation and trade

Bank Watch (2005), *Arrested Development in the Balkans: Energy Efficiency and Renewables*, Bank Watch, Prague, May 2005, www.bankwatch.org/newsroom/documents/shtml?x=260179.

Bank Watch (2008), *NGO Letter of concern regarding priority projects approved by the Ministerial Council of the South East Europe Energy Community Treaty*, Bank Watch, Prague, 26 February 2008, www.bankwatch.org/project.shtml?apc=162059-----1&x=2079627&d=c.i.

Bergasse, E. (2003), "What Energy Policy for Southeast Europe" in *Public Service Review*, PSCA International Ltd, Spring 2003, Newcastle-under-Lyme, United Kingdom.

CEER (Council of European Energy Regulators) (2006), "Survey of Capacity Support Mechanisms in SEE", paper presented at the 8th Athens Forum, Athens, 22-23 June 2006.

EBRD (European Bank for Reconstruction and Development) (2006), *Study on Regional Energy Trading in South East Europe for the EBRD*, EBRD, London.

EBRD (Renewable Energy Development Initiative) (2005), Country Profiles, http://ebrdrenewables.com.

Energy Community (2006a), *Statement on Security of Supply*, Energy Community, Vienna, www.energy-community.org.

Energy Community (2006b), *Regional and National Priority Projects in the Energy Sector*, Energy Community, Vienna, 12 June 2006.

European Commission (2004), *Regional Energy Approach in West Balkans – Environmental Acquis*, CARDS Supply of Services No. 2004/83816, Final Report, European Commission, Brussels.

European Transmission System Operators (ETSO) (2006), "Congestion Management: Co-ordinated Explicit Flow Based Auction of the Cross Border Transmission Capacity (Dry Run in SEE Region): Experiences and Next Steps", paper presented at the 8th Athens Forum, Athens, 22-23 June 2006.

IEA (International Energy Agency) (2007a), *Fossil Fuel-Fired Power Generation – Case Studies of Recently Constructed Coal and Gas-Fired Power Plants*, IEA/OECD, Paris.

IEA (2007b), *Energy Balances of Non-OECD Countries (2004 – 2005)*, IEA/OECD, Paris.

IEA (2007c), *Oil Information*, IEA/OECD, Paris.

IEA (2005), *Coming in from the Cold: Improving District Heating Policy in Transition Economies*, IEA/OECD, Paris.

Papakonstantinou, D. (2006), "Market Transparency in SEE", paper presented at the 8th Athens Forum, Athens, 22-23 June 2006.

UNDP (United Nations Development Program) (2004), *Stuck in the Past- Energy, Environment and Poverty in Serbia and Montenegro*, UNDP Serbia, Belgrade, www.undp.org.yu/energy_environment/stuckinthepast/stuckinthepast.html.

UNDP (2004a), *Environmental Governance Sourcebook: Challenges, Laws, Instruments and Institutions*, UNDP, Bratislava, Slovakia, www.undp.sk.

UNDP (2007), *Environmental Policy in South Eastern Europe*, UNDP, Bratislava, October 2007.

UNECE (United Nations Economic Commission for Europe) (2002-2007), *Environmental Performance Reviews of Albania, Bosnia and Herzegovina, FYR Macedonia, Montenegro and Serbia*, UNECE, Geneva, www.unece.org/env/epr/welcome.htm.

SEETEC (Southeastern Europe Electrical System Technical Support Project) (2006), *Obstacles to Trade and Compatibility of Market Rules*, SEETEC, www.seetec-balkans.org.

SEETEC (2006), "Obstacles to Trade and Compatibility of Market Rules in Southeast Europe, (Findings/ Recommendations of SEETEC Final Draft Report)", REM-1202-47RP-I-0006, paper presented at the Athens Forum, 22 June 2006.

Stariradev, V. (2003), *Bulgaria Energy Sector*, Bulgarian Ministry of Energy and Natural Resources, Sofia.

USAID (United States Agency for International Development) (2007), *Labor Transition in the Coal Sector: Southeast Europe*, USAID, Washington.

WIIW (Vienna Institute for International Economic Studies) (2006), *Handbooks of Statistics*, WIIW, Vienna.

WEC (World Energy Council) (2004), *District Heating Systems in Economies in Transition*, WEC, London.

Oil and gas transportation in Southeast Europe

Bank Watch (2007), *Balkan Energy Future*, Bank Watch, Prague, ww.bankwatch.org/balkan_energy.

European Commission (2007), *An Energy Policy for Europe*, COM (2007) 1 final, European Commission, Brussels, www.ec.europa.eu/dgs/energy_transport/index_en.html.

European Commission/High Representative (2006), *An External Policy to Serve Europe's Energy Interests*, S160/06, European Commission, Brussels, June 2006.

European Commission (2006), *External Energy Relations - From Principles to Action*, COM (2006), 590, European Commission, Brussels.

Energy Charter Secretariat (2006), *Report on the Investment Climate and Market Structure in the Energy Sector of Turkey*, Energy Charter Secretariat, Brussels, www.encharter.org.

Energy Community (2006), *Regional and National Priority Projects in the Energy Sector*, Energy Community, Vienna, 12 June 2006.

Gheorghe, S. (2007), *Outlining the Role of Romania in the European Gas Transit Chain: Current Status and Prospective*, Transgaz/Gas Dispatch Centre of Romania, Bucharest.

IEA (2007), *The Natural Gas Market Review*, IEA/OECD, Paris.

IEA (2006), *World Energy Outlook*, IEA/OECD, Paris.

IEA and Energy Charter Secretariat (2004), "Gas Transit Projects in the Black Sea Region," paper presented at the IEA and Energy Charter Secretariat Seminar on Natural Gas in South East Europe, Investment, Transit and Trade Seminar, Istanbul, 5-6 May 2004.

Kovacevic, A. (2007), *The Potential Contribution of Natural Gas to Sustainable Development*, Oxford Institute for Energy Studies, Oxford.

OECD (Organisation for Economic Co-operation and Development) and IEA (2003), *Regulatory Authorities in South East Europe*, OECD/IEA, Paris.

Platts Energy in East Europe (2007), Platts Energy, London, 23 November 2007.

Platts Energy (2007), *The Turkish Gate: Energy Transit and Security Issues*, Turkish Policy Quarterly, Vol. 3 No.4, Platts Energy, Winter 2004, London, www.esiweb.org/turkey/tpq2004winter.php.

RFERL (Radio Free Europe/Radio Liberty) (2007), "Putin Outlines Plans for Energy Cooperation in Balkans", comments by Viktor Khristenko (Russian Minister of Industry and Energy), in the margins of the Balkan Energy Cooperation Summit, Zagreb, reported on 24 June 2007, www.rferl.org.

Vesti (2007), comments by Alexandar Medvedev (Gazprom's Chairman of the Board of Directors), reported on www.vesti.ru/doc.html?id=127600.

World Bank (2007), *SEE Regional Gasification Study*, Interim Report, World Bank, Washington, April 2007.

Energy and poverty

Buzar, S. (2005), *The 'Hidden' Geographies of Energy Poverty in Post-Socialism: Between Institutions and Households*, Oxford University Centre for the Environment, Oxford.

IEA (2005), *Coming in from the Cold: Improving District Heating Policy in Transition Economies*, IEA/OECD, Paris.

International Monetary Fund (IMF) (2001-2007), *Poverty Reduction Strategy Papers* (PRSPs) for various countries in Western Balkans, IMF, Washington.

UNDP (2004), *Stuck in the Past: Energy, Environment and Poverty in Serbia and Montenegro*, UNDP Serbia, Belgrade, www.UNDP.org/energy/stuckpast.htm.

World Bank (2003), *Albania Poverty Assessment*, Report No. 26213-AL, World Bank, Washington, November 2003.

PART II: Energy policy surveys

All energy policy surveys

EBRD Renewable Energy Development Initiative (2005), Country Profiles, http://ebrdrenewables.com.

Energy Community (2006), *Statement on Security of Supply*, Energy Community, Vienna.

European Institute (2004), *Regional Review of Energy Sector in the Western Balkans Countries*, European Institute, Sofia, www.western-balkans.info.

EVA (Austrian Energy Agency) (2006-2007), *Energy Profiles of Central and Eastern European Countries*, EVA, Vienna, www.eva.ac.at/enercee.

IEA (2007a), *Energy Balances of Non-OECD Countries (2004–2005)*, IEA/OECD, Paris.

IEA (2007b), *CO_2 Emissions from Fuel Combustion (1971–2005)*, IEA/OECD, Paris.

Albania

Energy Charter Secretariat (2007), *Regular Review of Albania*, Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects-PEEREA, Energy Charter Secretariat, Brussels, www.encharter.org.

World Bank (2003), *Albania Poverty Assessment*, Report No. 26213-AL, World Bank, Washington, November 2003.

Bosnia and Herzegovina

Bank Watch (2005), *Arrested Development in the Balkans: Energy Efficiency and Renewables*, Bank Watch, Prague, May 2005.

Federal Statistical Office (2000), *Statistical Yearbook of FB&H (1993-1998)*, Federal Statistical Office, Mostar.

GTZ (German Technical Cooperation) (2003), *Forestry Sector in B&H and Energy-Policy Framework Conditions for Electricity Markets and Renewable Energies-21 Country Analyses*, GTZ, Eschborn, www2.gtz.de/dokumente/bib/04-0110.pdf.

Jenko, J. (2007), "Background Paper on Power Sector Development", paper presented at the 4th World Bank Poverty Reduction Strategies Forum, Athens, 26-27 June 2007.

Vestreng, V. *et al* (2007), *Twenty-five Years of SO_2 Emission Reduction in Europe* in Atmospheric Chemistry and Physics, Copernicus Publications, Katlenburg-Lindau (Germany), 12 July 2007, www.atmos-chem-phys.net/7/3663/2007/acp-7-3663-2007.pdf.

World Bank (2004), *Bosnia and Herzegovina, Infrastructure and Energy Strategy*, No. 29023-BA, World Bank, Washington, 15 June 2004.

World Bank (2007), *SEE Regional Gasification Study*, Interim Report, World Bank, Washington, April 2007.

Croatia

Energy Charter Secretariat (2005), *In-depth Review of Energy Efficiency Policies and Programmes of the Republic of Croatia*, Energy Charter Secretariat, Brussels, www.encharter.org.

Ministry of Economy, Labour and Entrepreneurship (MELE) (2005), *Energy in Croatia 2005*, MELE, Zagreb.

FYR Macedonia

Energy Charter Secretariat (2006), FYROM: *In-depth Review of the Investment Climate and Market Structure in the Energy Sector*, Energy Charter Secretariat, Brussels.

Energy Charter Secretariat (2007), *In-depth Review of the Energy Efficiency Policy of FYR Macedonia*, Energy Charter Secretariat, October 2007, Brussels.

Dimitro, K. and O. Dimitrov (2000), "Geothermal District Heating Schemes in the Republic of Macedonia", paper presented at the World Geothermal Congress, Kyushu-Tuhoku, Japan, 2000.

UNDP (2005), FYROM's *Preparation for the Use of the Kyoto Clean Development Mechanism*, UNDP, Skopje.

Montenegro

University of Montenegro (2007), "A Brief Background Note on the Power Sector Reforms in Montenegro", paper prepared for the public debate on the energy strategy of Montenegro, Podgorica, June 2007.

Government of Montenegro (2007), *Montenegro Draft Energy Strategy*, document made available for the public debate on the energy strategy of Montenegro.

UNDP and the Government of Montenegro (2007), *Draft Strategic Environmental Assessment Report of the Montenegro Draft Energy Strategy*, UNDP Montenegro, Podgorica, August 2007.

Serbia

BBC (British Broadcasting Corporation) (2008), *EU Warns Serbs on Russia Gas Deal*, BBC, London, 10 January 2008.

Djokovic, V. and G. Radosavljevic (2005), *Energy Sector Issues and Poverty in Serbia*, Center for Advanced Studies, Belgrade.

ECB (Energy Centre Bratislava) (2006), *Preparation of Model Solutions for Energy Utilisation of Biomass, and Action Plan on Biomass Market Development in Bosnia and Herzegovina*, Kyrgyz Republic, Montenegro and Serbia, ECB, Bratislava, September 2006.

FAO (Food and Agriculture Organization) (2002), *Report on Forest Sector Development in Serbia*, FAO, Rome.

Financial Times (2007), "Alarm at Gazprom's Serbia Move", Financial Times, London, 30 December 2007.

Kovacevic, A. (2004), *Re-Thinking Obrenovac-Kolubara Lignite Complex*, UNECE, Geneva.

Maximov, O. and V. Nesterov (2008), *Serbia joins South Stream, paves way for Gazprom Neft deal*, Troika Dialog, Moscow, 28 January 2008.

MME (Ministry of Mining and Energy) (2005), *Energy Sector Development Strategy of Republic of Serbia to 2015*, MME, Belgrade.

MME (2005a), *Energy Sector Development Strategy Implementation Programme for the Period 2007-2012*, MME, Belgrade.

Nikolic, G., *et al.* (1992), *Forestry Study of Serbia*, Association of Engineers and Technicians in Forestry and Wood Industry of Serbia, Belgrade.

SENCO (Sustainable Environment Consultants) (2000), *The Worst and the Best: Atmospheric Emissions from Large Point Sources in Europe*, Swedish NGO Secretariat on Acid Rain), Göteborg, http://www.acidrain.org/pages/publications/reports/APC17.pdf.

University of Belgrade (2003), *Use of Crop Residues for Fuel*, Faculty of Agriculture, University of Belgrade, Belgrade.

UNDP (2004), *Stuck in the Past- Energy, Environment and Poverty in Serbia and Montenegro*, UNDP Serbia, Belgrade.

UNOCHA (United Nations Office for the Coordination of Humanitarian Affairs) (2002), Serbian Lignite Mining, UNOCHA, Geneva.

USAID (2007), *Labor Transition in the Coal Sector: Southeast Europe*, USAID, Washington.

WEC (2004), *DH Systems in Economies in Transition*, WEC, London.

World Bank (2007), *Serbia: Analyses of Policies to Increase Renewable Energy Use*, World Bank, Washington.

World Bank (2003), *Public Expenditures and Institutional Review in Serbia*, World Bank, Washington.

Kosovo

Forum 2015 for the Kosovo Foundation for Open Society and Riinvest Institute (2007), *A Modern Tale: Kosovo C 2100-Lignite Power in Kosovo - Limits of Sustainability*, Forum 2015 for the Kosovo Foundation for Open Society and Riinvest Institute, Pristina, www.forumi2015.org.

IEA (2005), *Projected Costs of Generating Electricity*, IEA/OECD, Paris.

MEM (Ministry of Energy and Mining) (2005), *Energy Strategy of Kosovo 2005-2015*, MEM, Pristina.

World Bank (2007), *Kosovo Energy Sector: Heat Market Study*, World Bank, Washington, March 2007.

IEA PUBLICATIONS, 9, rue de la Fédération, 75739 PARIS CEDEX 15
PRINTED IN FRANCE BY CORLET
(61 2008 05 1P1) ISBN : 978-92-64-04218-6 - 2008