INTERNATIONAL ENERGY AGENCY

Energy Policies of IEA Countries

THE CZECH REPUBLIC

2005 Review

OECD

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-six of the OECD's 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 assist in the integration of environmental and energy policies.

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

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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.

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REVIEW TEAM

The 2005 IEA in-depth review of the energy policies of the Czech Republic was undertaken by a team of energy specialists drawn from IEA member countries. The team visited Prague from 10 to 16 October 2004 to meet with government officials, energy suppliers and energy consumers. This report was drafted on the basis of those meetings and the government's official response to the IEA's policy questionnaire. The team greatly appreciates the openness and co-operation shown by everyone it met.

The members of the team were:

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ORGANISATIONS VISITED

The team held discussions with the following:

- Ministry of Industry and Trade
- Ministry of Transport

- Energy Regulatory Office
- Ministry of Environment
- Czech Energy Agency
- National Fund for the Environment
- State Energy Inspection Board
- ČEZ, a.s.
- ČEPS, a.s.
- Power Market Operator (OTE)
- Association for District Heating
- State Office for Nuclear Safety
- Administration of State Material Reserves
- Czech Association of Oil Industry and Trade
- Transgas, a.s.
- Union of Employers in Industry and Transport
- International Power, plc
- Office for the Protection of Competition
- Union of Employers in the Coal Mining Industry
- Hnutí DUHA (Rainbow Movement) – Friends of the Earth of the Czech Republic

REVIEW CRITERIA

The IEA *Shared Goals*, which were adopted by the IEA Ministers at their 4 June 1993 meeting in Paris, provide the evaluation criteria for the in-depth reviews conducted by the IEA. The *Shared Goals* are set out in Annex B.

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

The Czech Republic has undergone a major transformation in the last fifteen years. The country has changed from an economy guided by central planning and intensive government involvement to one driven by market forces and the individual choices made by producers and consumers. This transformation has proceeded smoothly during the break from the previous regime in the "Velvet Revolution" and the separation with what is now the Slovak Republic in the "Velvet Divorce". Despite large budget deficits, the country has seen strong economic growth in recent years and most forecasts project that this expansion will continue. On 1 May 2004, the Czech Republic, along with nine other countries, joined the European Union (EU).

The energy sector has also changed substantially over this period. Energy efficiency for supply and consumption has improved, with the national energy intensity (unit of primary energy supply per unit of GDP) decreasing by 17% from 1990 to 2002. Emissions have also fallen, with CO_2 emissions from fuel combustion decreasing by 24% from 1990 to 2003. The government has privatised almost the entire natural gas sector and market reforms in the gas and electricity sectors have introduced competition and compliance with the relevant EU directives. The framework for reform is sound and includes a timetable for gradual market opening with fixed dates for complete opening, non-discriminatory open access to all networks, elimination of subsidies for different customer classes and the establishment of an energy regulator. The Energy Regulatory Office (ERO) was established in January 2001. The government is to be commended for this work and is encouraged to continue with the process. New entrants to the electricity sector now capture 30% of the wholesale market in competition with the incumbent. In 2003, a new nuclear power plant was brought on line (Temelín) allowing the country to become a major electricity exporter. In March 2004, the government released its new State Energy Policy (SEP) with long-term targets and strategies through 2030. The aim of the SEP is consistent with the IEA *Shared Goals*, seeking to achieve the three Es of energy policy: Energy security, Economic growth and Environmental sustainability.

Despite these many positive developments, substantial challenges remain for the Czech Republic. One such challenge involves the implementation and practice of market reform in the gas and electricity sectors. The largest impediment the country is facing in transiting to competition may be the

market power of the incumbent utilities. On the gas side, one company (RWE), the near-exclusive gas importer, owns and operates the transportation pipeline network and controls distribution companies which together have 83% of the retail market share. On the electricity side, one company (ČEZ) has a 70% wholesale market share and controls companies which themselves have a 66% share of the retail market. While maintaining powerful national companies may be attractive in certain respects, the government is encouraged to envision how such market concentration will impede competition (and its benefits) and which tools can be used to overcome this obstacle. One means of addressing market concentration is through imports (or the threat of imports) into the Czech market. The government should take all steps to ensure that any restrictions (*e.g.* with the infrastructure or regulations) are removed and that such cross-border trade is encouraged.

Another related challenge for the government is to strengthen the institutions that will be required in a competitive market. These are primarily the regulator, the ERO, and the competition authority, the Office for the Protection of Competition. There have been questions raised about the independence and strength of the ERO, particularly following the dismissal of its chairman in August 2004. The Office for the Protection of Competition has ruled on a number of important cases regarding market power concentration in the energy sector but the power of its edicts has not been thoroughly established. While it would appear that the expertise and intentions of these two groups are sufficient for their important role in the reformed markets, their independence and authority need to be more explicitly established.

As customers are given the right of supplier choice in the gas and electricity markets, they will no longer have recourse to a regulated tariff and must take gas and electricity at prices and terms offered by market players. While this may not be a problem for larger industrial customers who have the resources and motivation to pursue alternative suppliers, the smaller customers will generally not be so motivated and thus accept the terms that the incumbent offers. Given the initial state of concentration in the Czech gas and electricity markets, the government should take steps to ensure that newly contestable customers are able to access a regulated transitional tariff until such time as a mature competitive market develops.

Given the Czech Republic's central position in Eastern Europe, its relatively small size and its lack of oil and gas deposits, it is not surprising that the country has many different types of international energy connections. It is the second-largest electricity exporter in Europe (after France) and displays a commendable gas supply diversity with more than 25% of imports coming from non-Russian sources. This international scope should be maintained and even expanded further as appropriate. This would include: removal of any constraints on international electricity trade in order to mitigate domestic market power and boost security of supply and consideration of a regional

power pool as a longer-term project; maintained gas import supply diversity; use of international flexible mechanisms to benefit from the comparatively low GHG emissions; and international co-operation with energy research and development such as through the IEA's Implementing Agreements (IA).

As mentioned above, the SEP contains generally prudent strategies and objectives that move the country in the right direction. However, the review team felt that some of the targets were overly ambitious and would thus be very difficult to achieve. For example, the SEP called for a decrease in liquid fuel use with consumption in 2030 below current levels. Since liquid fuel use includes the transport sector, and transport demand has risen strongly in countries that improve their per capita income, this objective may be too ambitious. The energy target of 8% of electricity coming from renewables by 2010 is also ambitious. Given the reach of some of these targets, cost-benefit analyses of the plans could be highly useful. The SEP also includes target ranges for the shares of fuel for primary energy supplies through 2030. Given the trends observed in most other European countries, it seems unlikely that the share of gas consumption out of total primary energy supply would stagnate at around 20%. While such an energy portfolio can provide guidance to sector participants, the government should refrain from direct interventions with the goal of meeting the fuel supply targets. Such a supply mix should be achieved by market instruments and the decisions of individual producers and consumers. Excessive government intervention could deter efficient private-sector investment in energy infrastructure and services.

The SEP rightly makes energy efficiency the primary focus of the new energy strategy. Even though progress has been made in this area over the last fifteen years, this improvement lags behind that of neighbouring countries. While energy intensity has fallen by more than 17% in the Czech Republic from 1990 to 2002, it has fallen by 23% in Hungary, 27% in Slovakia and 39% in Poland. This suggests that substantial energy efficiency potential remains in the Czech Republic. The government is encouraged to follow up its work in the SEP with concrete policies and measures to improve efficiency which the review team felt was lacking in the new plan. Improving the efficiency of the transport sector and the building sector should be the government's highest priority.

Currently, renewable energy does not play a major role in the Czech Republic, accounting in 2002 for 2.5% of primary energy supply and 4.2% of electricity generation. As noted above, the SEP calls for a substantial increase in renewable energy, with its share in electricity generation rising to 8% by 2010 and that of primary energy supply rising to 16.8% in 2030. While renewable energy is one important means to achieve multiple energy policy objectives, it is not an objective in itself and care should be taken that overly ambitious targets do not put an excessive burden on the economy. The government is currently revamping its renewable energy support scheme. This is a prudent

undertaking since the previous scheme was a complicated two-tiered approach of investment subsidies and feed-in tariffs. The proposed new scheme will constitute either a continuation of the feed-in tariff (with discontinuation of the investment subsidies) or a green certificate programme with quotas. While feed-in tariffs have proven effective in delivering installed capacity, the tariffs should be regularly reduced to motivate greater efficiency and thus reduce costs to the consumer. If green certificates are chosen, the government may draw on the experiences of other countries in designing an effective trading system that could also accommodate regional certificate trading. Regardless of the renewable support scheme ultimately chosen, care should be taken to avoid overlap with any other support schemes, whether domestic or international (*e.g.* the EU-ETS).

The Czech government often groups energy efficiency and environmental policy together. These two topic areas are often discussed together in policy papers, pursued by the same organisations and have budgets that are difficult to separate. Even though both efficiency and renewables can deliver decreased emissions and reduce reliance on imported fuels, their application and implementation are substantially different from one another. While it is commendable that the energy policy implementation reflects environmental realities, the government may consider taking a more distinct and separate approach to efficiency and renewables from an organisational point of view. It appears that government funding for energy efficiency has fallen in recent years while funding for renewable energy has risen. This is not consistent with the ambitious targets for energy efficiency improvement in the SEP. If energy demand can be reduced at a lower cost than production of useful energy through renewable means, more attention and resources should be directed towards energy efficiency, and vice versa. Historical and geographical factors indicate that the potential for energy efficiency in the Czech Republic is greater than that for renewable energy. The finite budget resources of the government should be allocated accordingly.

Regarding Czech environmental performance, emissions from fuel combustion have fallen substantially in the last ten or so years. As noted, CO_2 emissions from fuel combustion have fallen by 24% from 1990 to 2003 and other energy-related emissions (*e.g.* SO_2 and NO_x) have declined even further. These reductions have proceeded from economic developments and, in the case of SO_2, from specific government policies. Nevertheless, almost all energy-related emissions (per unit of GDP) remain well above the average for the EU. The country is expected to easily meet both its commitment under the Kyoto Protocol to reduce greenhouse gas (GHG) emissions by 8% below 1990 levels by 2008-2012 and a more stringent internal target of 20% below 1990 levels by 2005. As a result, the government has not actively designed or executed an emissions control strategy despite the potential to achieve further reductions from current high levels at relatively low cost. This lack of a comprehensive GHG strategy is unfortunate because the country can benefit

substantially by selling or otherwise transferring its emission rights to other countries, primarily through the EU Emissions Trading Scheme. It should be borne in mind that the country could face more demanding targets in the future. The Czech Republic is encouraged to introduce and implement a strengthened climate change strategy with plans to benefit the country by transferring emission rights abroad.

Coal is the most important energy supply for the Czech Republic accounting in 2003 for 47% of total primary energy supply (TPES). While coal's share of TPES has been falling steadily – it was more than 63% in 1991 – and is expected to fall further according to most forecasts, it will remain a crucial part of the Czech energy sector in the foreseeable future. Coal is a relatively low and stable priced fuel from domestic sources. The government makes payments to defunct coal mines to restore mine sites and pay for former miners. The mines receiving these payments had been producing uneconomic coal under the previous regime. Such payments are appropriate given the historical legacy and responsibility. Nevertheless, efforts should be made to reduce these payments as much as possible and ensure they do not become a *de facto* subsidy to operating mines which might discourage them from making sufficient financial provisions for their future closure expenses. In particular, the government should set transparent criteria for future payments, payments to mines currently under operation and a fixed date by which all such payments are terminated. At present, the mining industry does not appear overly concentrated, but the government is advised to monitor the situation closely because of the substantial merger and acquisition activity in the sector.

The Czech Republic has two nuclear power plants which in 2003 provided 15% of TPES and 31% of total electricity generation. According to international organisations, the safety and technical performance of both operating nuclear power plants have been satisfactory. The government has established funds to handle waste disposal. While the levels in these funds and provisions for future funding appear sufficient for their purposes, the government is encouraged to monitor this situation and regularly review the adequacy of these provisions, especially given the uncertain nature of post-operation liabilities. Attempts to create a domestic final waste disposal site have been thus far unsuccessful, primarily because of local opposition to those sites deemed geologically suitable. The government is urged to develop a framework for expanded and more consultative dialogue with local groups to see if a solution is not ultimately possible. In 2004, the Czech Republic continued to produce uranium from its Dolní Rožínka mine although the cost of ore from this site is substantially above market rates. The Czech government decided to close the Dolní Rožínka mine in 2005. The government is urged to shut down this mine, as it has said it would on previous occasions.

RECOMMENDATIONS

The government of the Czech Republic should:

General Energy Policy

- *Examine the feasibility and cost of achieving the national targets such as energy efficiency, renewable and fuel mix goals.*
- *Supplement work in strategy with detailed action plans and with sub-targets to ensure progress across all areas.*
- *Follow through on the intention to conduct a three-year review of strategy by developing an analytical framework to assess progress.*
- *Develop a regulatory, fiscal and market structure that seeks to reflect environmental externalities in energy prices.*
- *Enhance involvement of all stakeholders, including consumers, when developing energy policies and disseminate information widely.*
- *Ensure the independence of the Energy Regulatory Office from political and industry influence.*
- *Enable the anti-monopoly authority to monitor energy markets in depth, promote a competitive environment and prevent possible abuse of market power, and act where appropriate.*
- *Consider means of improving the efficiencies of the still-regulated components of the liberalising energy sector, including domestic and international benchmarking and regulatory incentives.*

Energy and the Environment

- *Consider developing a plan for reducing GHG emissions with targets on overall and sectoral level; regularly update GHG projections and take measures if necessary.*
- *Monitor and evaluate the cost-effectiveness of the policies and measures in the State Environmental Policy and the National Plan to Mitigate Climate Change.*
- *Define clear responsibilities of relevant ministries and strengthen co-ordination among different ministries.*
- *Examine and institute means of profiting from continued emissions reduction through the use of flexible mechanisms such as emissions trading and/or Joint Implementation.*
- *Continue to reduce the level of emissions of local pollution.*

Energy Efficiency and Renewable Energy

- *Develop sectoral targets supported by concrete measures to achieve the national target of improving energy efficiency, and closely monitor progress.*
- *Define clear responsibilities of relevant ministries and strengthen co-ordination among different ministries to improve energy efficiency in each sector.*
- *Consider expanding efforts to capture the energy-saving potential of medium- and small-size energy users.*
- *Address energy demand growth in the transport sector by:*
  - *Further fostering more energy-efficient modes such as public transport.*
  - *Providing economic and regulatory incentives (*e.g. *fuel taxation, vehicle taxation, car inspection system) for the choice of more fuel-efficient vehicles and for the accelerated retirement of old and inefficient vehicles (vehicle taxation, car inspection system, etc.).*
  - *Enhancing measures to control the volume of road traffic such as park and ride and road pricing.*
- *Enhance policies to encourage renovation of existing energy-inefficient buildings.*
- *Define the role of combined heat and power (CHP) in achieving national energy policy objectives and target the support scheme for CHP plants with higher efficiency.*
- *Pursue renewable energy policy that is cost-effective with elements of incentives for cost reduction. Consider a market-oriented approach such as green certificates.*
- *Enhance measures to promote renewable energy use in the heat and transport sectors.*
- *Review prioritisation of state budget allocation between energy efficiency improvement and renewable energy promotion based on its cost-effectiveness.*

Fossil Fuels

Natural Gas

- *Continue to monitor overall supply source decisions made by private gas importers to ensure a continued sufficiency of supply diversity and continued adequacy of plans to deal with emergency situations.*
- *Review the static demand projection of gas use presented in the SEP.*
- *Refrain from any policy intervention to discourage gas growth to meet the static demand projections used as the basis for the SEP.*

- *Remove barriers to entry for new competitors in the supply, distribution and retail aspects of the liberalised gas market.*
- *Closely monitor the gas market and prevent possible abuses of dominant position.*
- *Ensure that consumers given supplier choice are provided protection from excessive prices in the transitional phase towards a competitive market.*
- *Develop best practice principles for negotiated third-party access to gas storage so as not to disadvantage new entrants or consumers seeking competitively provided gas supplies.*

Coal

- *Search for a sustainable solution for using coal resources, including consultative processes (*e.g. *facilitating community consultations and environmental impact statements).*
- *Monitor concentration of mining interests to maintain diversity in the market.*
- *Continue to reduce government payments to defunct coal companies while maintaining responsibility for environmental rehabilitation and former workers.*

Oil

- *Sustain efforts to increase the utilisation of the IKL pipeline with further diversification of import sources.*
- *Promote sufficient demand for biofuels to stimulate increased investment in bioethanol production facilities.*
- *Continue to maintain a consistent record of meeting the IEA stockholding obligation.*

Electricity

- *Closely monitor the electricity market and prevent possible abuses of dominant position.*
- *Consider possible impediments to competition resulting from ČEZ's horizontal and vertical integration in the electricity sector, and maintain a robust approach to eliminating any anti-competitive behaviour.*
- *Ensure non-discriminatory access to the grid.*
- *Work with industry and international partners to remove any remaining constraints on international electricity trade to help enhance energy security*

and reduce the dominant position of the incumbent; consider the advantages of a regional power pool as a longer-range project.

- *Seek to expand the Electricity Market Operator's (OTE) wholesale market in order to create a viable reference price and increase market transparency.*
- *Ensure that consumers given supplier choice are provided protection from excessive prices in the transitionary phase towards a competitive market.*
- *Maintain a transparently arm's length relationship with ČEZ and clarify the various roles it plays with regard to ČEZ.*

Nuclear Power

- *Maintain the nuclear option while ensuring that additional units would be built in an open market situation.*
- *Continue regular monitoring of nuclear safety in both Dukovany and Temelín nuclear power plants.*
- *Assure an atmosphere and a solid framework for open discussions on nuclear waste management issues to involve the public in the decision-making process.*
- *Continue to assure that the fund generated is in compliance with the costs of fuel backend and decommissioning.*
- *Pursue final nuclear waste storage solution.*
- *Pursue the closure and clean-up of the Dolní Rožínka uranium mine.*

Energy Research and Development

- *Examine the effect that reduced government R&D spending could have on meeting the country's energy objectives.*
- *Incorporate more fully the government energy policy into the formulation of energy R&D strategy by targeting those technologies that can help the country achieve its specific energy goals.*
- *Develop a more comprehensive qualitative and quantitative picture of current energy R&D efforts and a vision for the future.*
- *Examine possibilities for greater international co-operation in energy R&D given budget constraints and the opportunities offered by the country's participation in international entities such as the IEA and the EU.*
- *Investigate private-public partnerships to ensure continued energy R&D efforts by energy companies in the competitive market.*

COUNTRY BACKGROUND

The Czech Republic is a landlocked country situated in Eastern Europe, sharing borders with Germany, Poland, Slovakia and Austria. It has a land mass of 78 900 square kilometres and a population of 10.2 million people. The climate is temperate with mild summers and cold, humid winters. The Bohemia region in the west consists of rolling plains, while Moravia in the east is very hilly. The country's highest point is 1 602 metres at Snezka. Coal is the country's most significant natural resource.

Following World War I, the closely related Czechs and Slovaks of the former Austro-Hungarian Empire merged to form Czechoslovakia. After World War II, a truncated Czechoslovakia fell within the Soviet sphere of influence. In 1968, liberalisation efforts by the country's leaders resulted in an invasion of Warsaw Pact troops and demonstrations the following year led to a period of repression. Following the dissolution of Soviet authority in 1989, Czechoslovakia regained its freedom through the peaceful "Velvet Revolution" and on 1 January 1993, the country underwent the "Velvet Divorce" when its two national components, the Czech Republic and Slovakia, divided into separate countries. Since 1989, the Czech Republic has transited from a largely state-owned, centrally planned economy to one with greater market orientation.

The Czech Republic (along with nine other countries) joined the European Union in May 2004. The move to accession and the continuing efforts to conform to EU requirements constitute a major reform effort. The country is now obligated to adopt the euro as a currency but cannot do so until the Maastricht criteria are met. In 2003, the government ran a budget deficit equal to 12.9% of GDP, the highest of any EU country, although it has pledged to bring its deficit below 3% of GDP by 2008. Economic growth in the Czech Republic has slowed in recent years but still remains more robust than that seen in the euro zone economies. In 2003, Czech GDP growth was 3.1% in contrast to a rate of 0.5% for the 12 countries using the euro. Forecasts project 3.5% Czech GDP growth in 2004 and 4.1% in 2005. In 2002, the Czech GDP per capita (in 1995 dollars, PPP) was US$ 13 600.

SUPPLY – DEMAND OVERVIEW

ENERGY SUPPLY

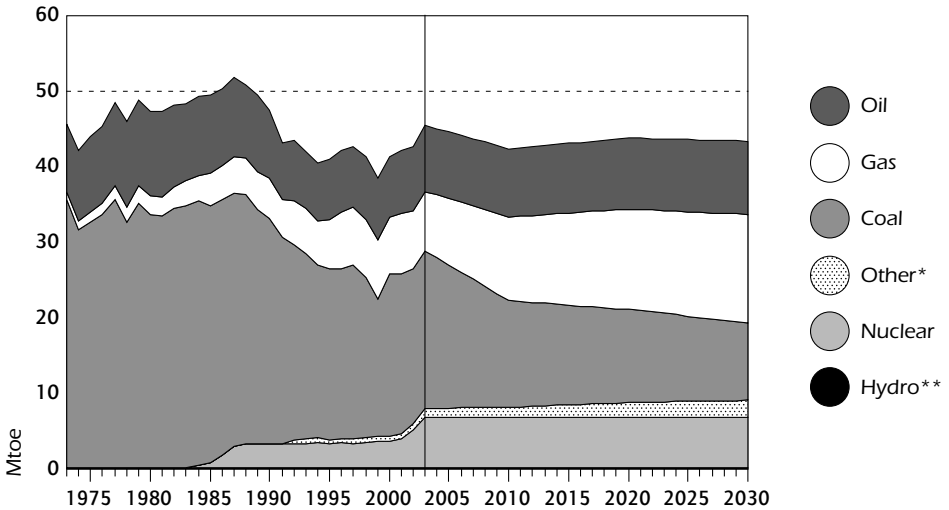
In 2003, Czech total primary energy supply (TPES) was 44.1 million tonnes of oil equivalent (Mtoe). This represents an increase in TPES of 5.7% from 2002.

From 1998 to 2003, TPES growth averaged 1.6%, while from 1990 to 2003, TPES decreased by a total of 6.9%. This decrease resulted from the dramatic restructuring of the Czech economy over that time and the related reduction of energy intensity. By way of comparison, TPES for all of the IEA European countries rose by 12.2% from 1990 to 2002[1].

Coal has been and continues to be the country's dominant primary fuel. In 2003, coal accounted for 47.3% of Czech TPES, followed by oil (19.9%), natural gas (17.8%), nuclear power (15.3%), biomass (2.6%) and hydropower (0.3%). Wind power contributed trace amounts accounting for less than 0.0008% of TPES. In 2003, the Czech Republic had net electricity exports equal to 15% of domestic generation, and gross exports equal to 27.5% of domestic generation. By way of comparison, oil was by far the largest TPES contributor amongst IEA countries as a whole in 2002[2] with 40% of the total, followed by gas (22%), coal (20%), nuclear (12%), biomass (3%), hydropower (2%), geothermal (0.4%), and solar, wind and other sources (0.15% combined).

Figure 1

Total Primary Energy Supply, 1973 to 2030

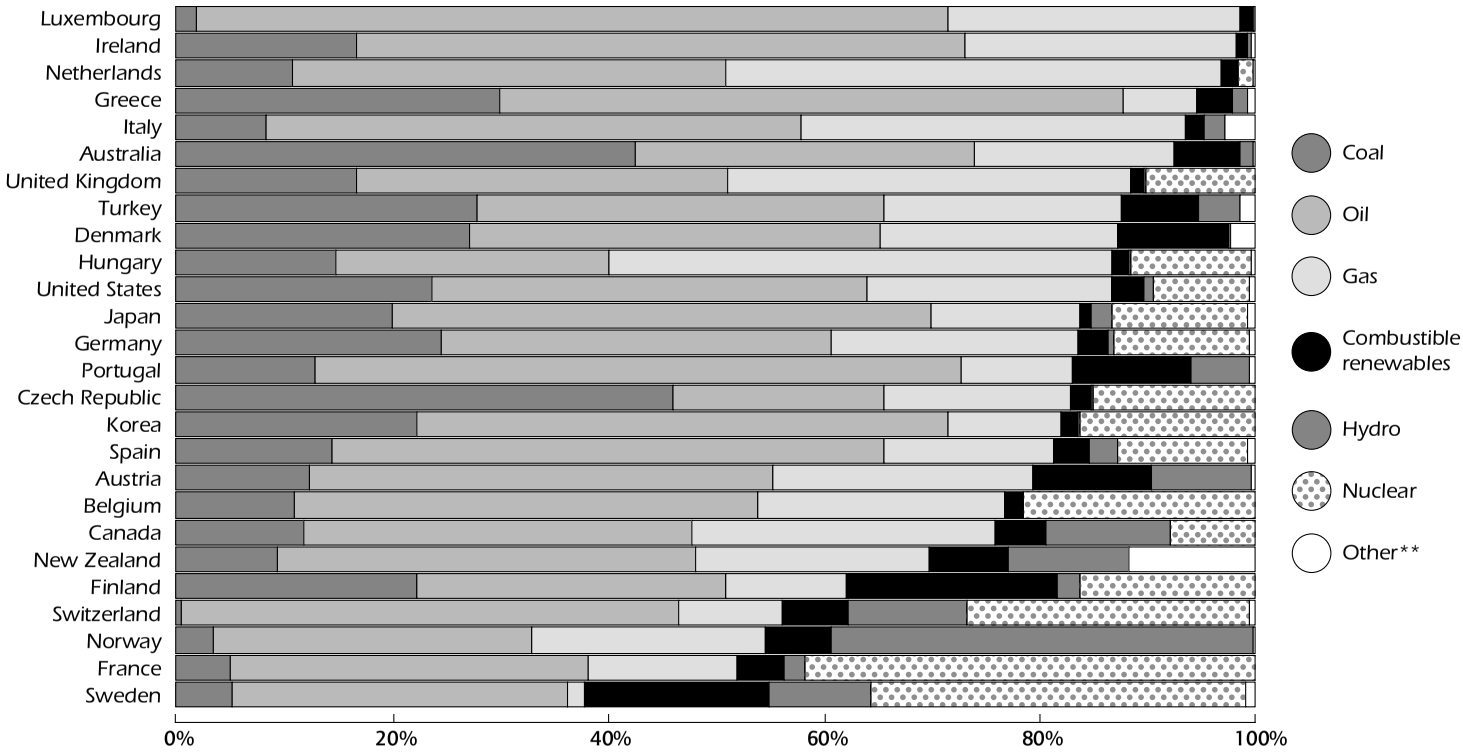


* includes solar, wind, combustible renewables and waste.
** negligible.
Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2005; and country submission.

1. Complete TPES for the entire IEA not yet available for 2003.
2. Complete TPES for all IEA countries not yet available for 2003.

Figure 2

Total Primary Energy Supply in IEA Countries, 2003*



* preliminary data.

** includes geothermal, solar, wind and ambient heat production.

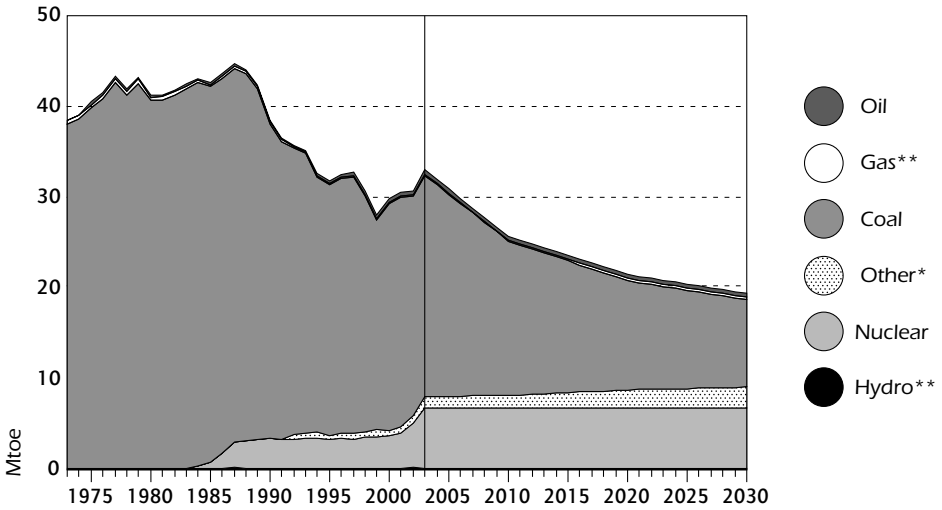
Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2005.

Over the last ten years, coal's use as a primary energy supply has decreased from just above 60% of TPES to just below 50%. This decrease has been largely compensated by an increase in natural gas use, whose share of TPES rose from 11.1% in 1990 to 17.8% in 2003. Nuclear also increased its share of TPES over that period, rising from 6.9% to 15.3%. The Czech government forecasts that these fuel supply trends will continue under the "business as usual" case scenario. Coal use is expected to fall by more than 30% in absolute terms from 2003 to 2010 to reach 33.5% of TPES. Under the "business as usual" forecast, the difference will be made up with a mixture of gas, nuclear power and, to a lesser extent, oil.

Coal mining dominates domestic energy production. In 2003, Czech mines produced 24.33 Mtoe. Of this amount 4.90 Mtoe were exported against 1.29 Mtoe of imports for net exports of 3.61 Mtoe. There are minor oil and gas production sites in the country equal to 5.3% and 1.7% respectively of primary supply of these fuels. As nuclear is considered a domestic fuel, imports accounted for 25.2% of TPES in 2003. The Czech government projects that the import share will rise to 39% in 2010 and 51% in 2020, mostly as a result of declining domestic coal production.

Figure 3

Energy Production by Source, 1973 to 2030



* includes solar, wind, combustible renewables and waste.

** negligible.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2005; and country submission.

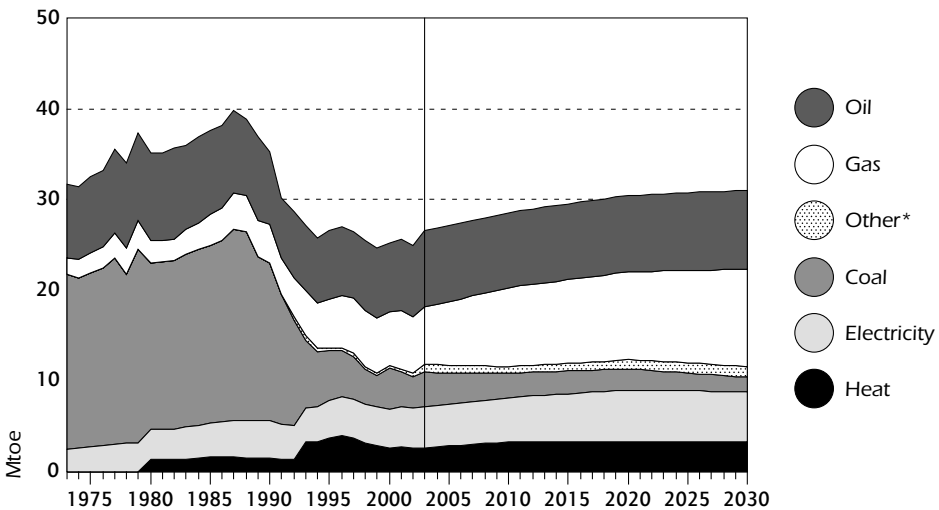
ENERGY DEMAND

In 2003, Czech total final consumption (TFC) of energy was 26.53 Mtoe. From 1998 to 2003, TFC rose by an average annual rate of 0.1% and from 1990 to 2003 by a total of 12.7%. This decrease represents both the drop in economic activity following the dissolution of the previous government, a shift towards less energy-intensive economic activity and increases in energy efficiency across industry and society in general. By way of comparison, TFC for the IEA European countries as a whole rose by 12.1% from 1990 to 2002[3]. Over the longer term, from 1973 to 2003, Czech TFC has fallen at an annual average rate of 0.6%. The TFC of all IEA European countries rose at an average annual rate of 0.9% from 1973 to 2002.

In 2003, oil was the most important energy source for final consumption, accounting for 31.6% of TFC. This was followed by natural gas (23.8%), electricity (17.0%), coal (14.3%), heat (10.0%) and biomass (3.3%). These fuel percentage shares represent a dramatic departure from historical trends. In 1973, coal was clearly the dominant final energy source with 60.8% of TFC. Even as recently as 1988, coal accounted for 54.5% of TFC. The decrease in its use coincided with government policies that no longer viewed coal as

Figure 4

Total Final Consumption by Source, 1973 to 2030



* includes solar, wind, combustible renewables and waste.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2005; and country submission.

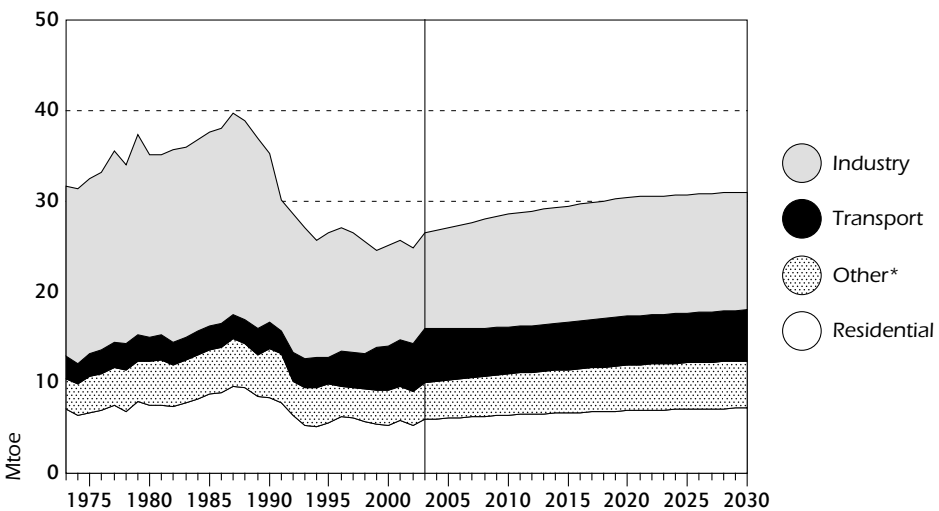
3. Complete TFC for all IEA countries not yet available for 2003.

economically viable (the cost of continued subsidies to inefficient operations) and environmental reasons (the carbon dioxide and local pollution from emissions). Natural gas use has increased significantly to make up for the decrease in coal use, as have the percentage shares of oil, electricity and heat. In IEA Europe, oil is the dominant end-use fuel, accounting for 50% of TFC in 2002, followed by natural gas (22%), electricity (19%), biomass (3.9%), coal (3.4%), heat (2.4%) and others (0.2%).

The industrial sector is the largest final energy user in the Czech Republic, accounting for 39.9% of TFC in 2003. Residences and transport were the next two biggest sectors, each with 22.5% of TFC, while other sectors, mostly commercial, accounted for 15.1%. In the transport sector, road transport was the dominant factor with 20.4% of TFC. Over the long term, the share of the industrial sector fell, while the share of the road transport sector rose. In 1973, industry accounted for 55.6% of TFC while road transport accounted for just 5.8%. This trend has continued in recent years with road transport energy use nearly doubling from the early 1990s to 2003. More recent indications are that road transport energy sector use has not abated and may even have accelerated. For the IEA European countries as a whole in 2002, the industrial sector accounted for 33% of final energy consumption, followed by transport (30%), residential (24%) and other sectors, mostly commercial (13%).

Figure 5

Total Final Consumption by Sector, 1973 to 2030



* includes commercial, public service and agricultural sectors.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2005; and country submission.

GENERAL ENERGY POLICY

ENERGY POLICY OBJECTIVES

A new State Energy Policy (SEP), formulated by the Ministry of Industry and Trade, was approved by Government Decision No. 211 of 10 March 2004. The policy is intended to reflect the State's responsibility for creating conditions for reliable and permanently safe supplies of energy at acceptable prices and for efficient energy use that will not threaten the environment and will comply with the principles of sustainable development.

The SEP specifies the State's priorities and determines the objectives the State wishes to achieve in influencing the energy sector over the next 30 years. The SEP has been developed on the basis of: *i)* analyses of the previous development and the current situation of the Czech Republic; *ii)* an evaluation of the fulfilment of the 2000 energy policy targets; *iii)* a view to foreign experience; *iv)* European Union procedures and standards; *v)* obligations of the Czech Republic resulting from international treaties in the sphere of energy and environmental protection; and *vi)* energy scenarios of possible future developments until 2030.

The fulfilment of priorities and objectives in the SEP will be evaluated by the Ministry of Industry and Trade at three-year intervals. The ministry will inform the government of the results of these evaluations and submit, if necessary, proposals for changes to the energy policy.

The SEP defines the basic priorities for the long-term development of the Czech energy sector:

Independence

a. Independence from foreign energy sources.

b. Independence from energy sources in risky regions.

Safety

a. Safety of energy sources, including nuclear safety.

b. Reliability of supplies of all kinds of energy.

c. Reasonable decentralisation of all energy sources.

Sustainable development

a. Environmental protection.

b. Economic and social development.

The SEP's goals to serve these priorities are divided into the four categories described below:

Maximising Energy Efficiency

Energy efficiency is the SEP's primary goal. The government considers increasing energy efficiency as the cheapest, safest and fastest way to achieve the priorities and goals of the State Energy Policy. It ensures reduced energy intensity, emissions of pollutants and the risks of growth in energy import dependence. It also prolongs the life of indigenous resources of non-renewable energy sources, increases the competitiveness of the energy sector and the whole Czech economy, and positively influences other energy sector parameters. The SEP calls for energy efficiency improvements spread over a wide range of energy uses and energy conversion methods through the activities of companies, the public sector and the population as a whole.

The three main goals for energy efficiency are:

- Annual improvement in the energy intensity of GDP at 2.6% by 2005, and between 3.0% and 3.5% (indicative target) as a long-term goal.
- Stabilisation in the absolute value of primary energy supplies. Economic growth should be achieved primarily through increased energy efficiency.
- Annual improvement in the electricity intensity of GDP at 2.0% by 2005, and between 1.4% and 2.4% (indicative target) as a long-term goal.

Amount and Structure of Primary Energy Supply

The SEP postulates that a sufficiently diversified and permanently stable provision of primary energy and electricity generation will help meet the basic priorities of independence, safety and sustainable development. This ambition is also aimed at increasing the energy system's robustness and ability to operate in states of emergency such as energy supply failures and large-scale disasters. The three major objectives included in meeting this target are: *i)* promotion of electricity and heat from renewable energy sources, *ii)* optimised use of indigenous energy sources, and *iii)* optimised use of renewable energy sources.

The government considers the present energy supply structure sufficiently diverse. The stability of foreign energy supplies has also been reinforced by increasing the territorial diversification of suppliers of imported liquid and gas fuels. The overall extent of the Czech Republic's dependence on energy imports is quite favourable for the time being, yet its structure is unbalanced. The dependence on imports of oil, natural gas and nuclear fuel is virtually total. Energy commodities represent approximately 9% of total Czech imports at present, with a trade balance deficit in energy commodities of CZK 70-80 billion[4].

4. On average in 2004, CZK 1 = US$ 0.039.

To ensure the continued diversity and reliability of supply, the government has established the following short- and long-term objectives for fuel supply percentage shares.

Table 1

Targeted Fuel Supply in SEP

Fuel	*2005*	*2030*
Solid fuel	42 - 44 %	30 - 32%
Gas fuel	20 - 22 %	20 - 22%
Liquid fuel	15 - 16 %	11 - 12%
Nuclear fuel	16 - 17 %	20 - 22%
Renewable sources	5 - 6 %	15 - 16%

Source: State Energy Policy (2004).

In addition, indicative targets for degrees of fuel import dependence were set out.

- in 2010 maximum: 45%
- in 2020 maximum: 50%
- in 2030 maximum: 60%

Environmental Protection

Environmental protection is to be based on an efficient primary energy structure and on advanced methods of electricity and heat generation. The partial objectives of this priority will focus on reducing the impacts of energy processes on the environment and are listed below in order of importance.

1. Minimising environmentally harmful emissions.
2. Minimising greenhouse gas (GHG) emissions.
3. Minimising long-term environmental burdens (*e.g.* nuclear waste).
4. Minimising existing environmental burdens.

In order to meet these goals, the SEP outlines a list of short-term and long-term targets:

Targets to be achieved by 2005:

- Full transposition of EU environmental regulations into Czech legislation concerning the energy sector.

- Provide conditions for the fulfilment of the national target for renewable energy sources – the share of electricity produced from renewable sources in gross electricity consumption to reach 5-6% (indicative target).

Long-term targets

- Comply with binding EU emissions limits in 2010 (SO_2 265 000 tonnes, NO_x 286 000 tonnes, VOC 220 000 tonnes).
- Fulfilment of international obligations of the Kyoto Protocol (and of other agreements connected with it).
- Create conditions for a wider utilisation of renewable energy sources by achieving the indicative target of 8% of gross electricity generation coming from renewable sources by 2010.
- Create conditions for increasing the renewable share in domestic consumption of primary energy to between 15% and 16% by 2030.
- Create conditions for wider utilisation of secondary energy sources and increase the share of alternative fuels in transport.
- Prepare for and use the GHG emissions trading scheme in connection with the EU directive.

Completing the Liberalisation of the Energy Sector

The Energy Policy (2000) contained and provided for the execution of a series of short-term tasks and requirements aimed at the completion of energy sector economic transformation. These included a privatisation programme and a programme of electricity and natural gas market liberalisation. All of these steps were aimed at the gradual harmonisation of Czech legislation with EU standards and directives. The SEP calls for a continuation and completion of this process.

The partial objectives of this goal are:

- Completing transformation measures towards a liberalised energy sector.
- Minimising the prices of all types of energy.
- Optimising backup of energy sources.

In order to meet these goals, the SEP outlines a list of short-term and long-term targets:

Targets to be achieved by 2005:

- Create a new liberalisation strategy for the electricity and natural gas market in accordance with amended EU directives.

- Evaluate the efficiency of regulation and adapt as necessary the regulation framework.
- Specify social measures in connection with the reduction of employment in the coal and electricity sub-sectors.
- Permanently monitor the impacts of energy prices on the population and influence long-term price/tariff relations using sector regulation.

Long-term target:

- Continuous adaptation of energy sector system to the model used within the EU.

ENERGY POLICY INSTITUTIONS

An organigramme of the energy policy institutions of the Czech government is shown in Figure 6. The major bodies are described briefly below.

MINISTRY OF INDUSTRY AND TRADE

The Ministry of Industry and Trade (MIT) has the principal responsibility for overall energy policy. This responsibility includes related industrial policy, the use of mineral resources, heat production, mining, crude oil, natural gas, solid fuels and nuclear materials. It also covers domestic and foreign trade and the protection of consumer interests. The MIT was the main body to develop and prepare the SEP released in March 2004. Within the MIT, two sections deal with energy issues. The first is the Policy-making Section which includes units for economic analysis, economic policy and raw materials, and energy statistics. The second is the Energy Section which includes units dealing with radioactive waste, electric power and heat production, mining, gas and liquid fuels, and energy efficiency and renewable energy.

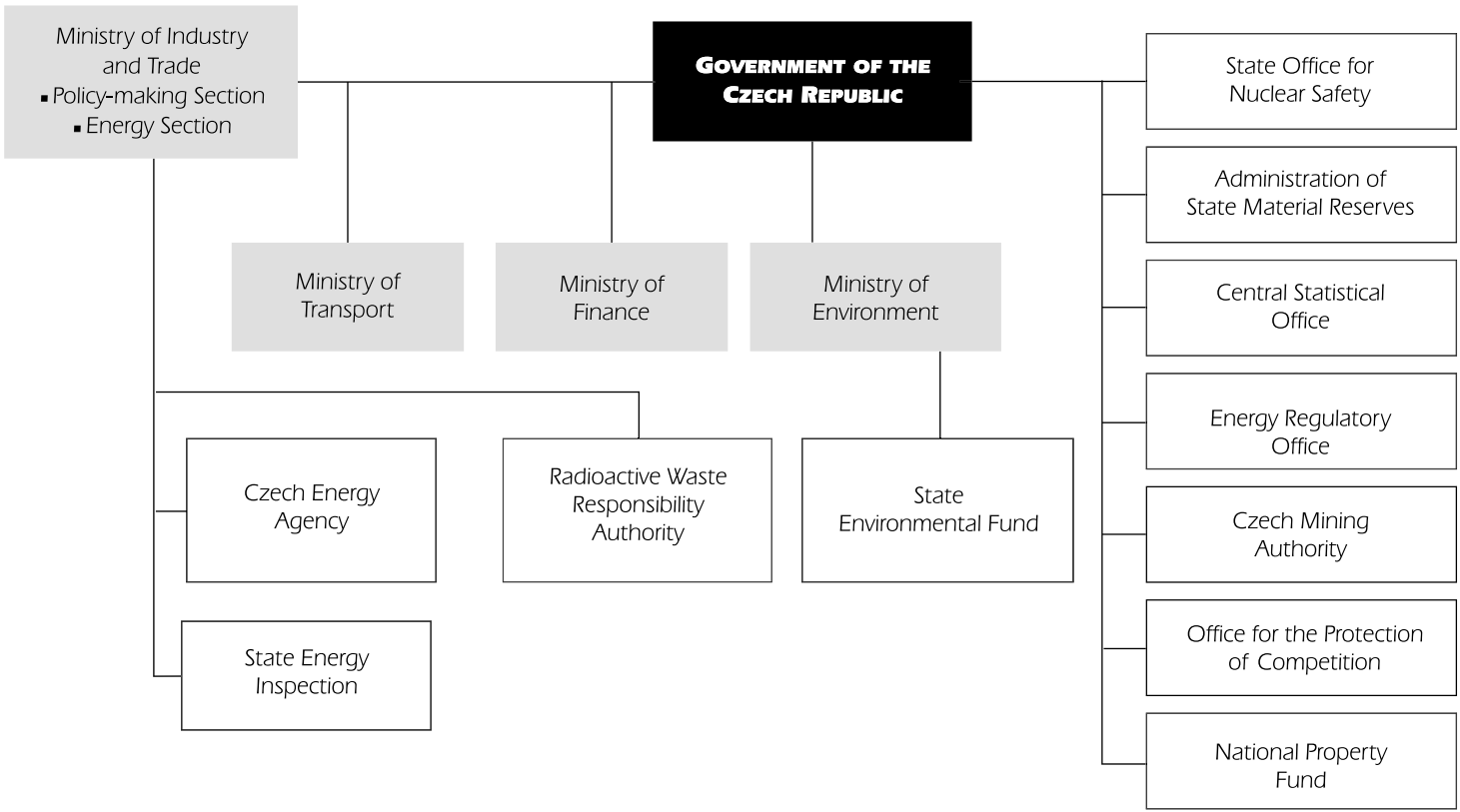
Two other energy-related organisations fall under the auspices of the MIT :

Czech Energy Agency

The Czech Energy Agency (CEA) was established in 1995 as a subsidised organisation under the MIT. Its primary mission is to support the ecological utilisation of energy in the Czech Republic. This goal is pursued in four areas: *i)* energy savings, *ii)* utilisation of renewable resources, *iii)* combined heat and power (CHP) plants, and *iv)* promotion and public education in the field of energy savings. The CEA administers subsidies to projects that support its aims.

Figure 6

Government Institutions Involved in Energy Issues



Sources: Ministry of Industry and Trade and IEA.

State Energy Inspection Board

The State Energy Inspection Board is an administrative office subordinated to the MIT. It is split into the Central Inspectorate and the Regional Inspectorates and has 180 employees, of which 140 are inspectors and 40 are directors or administrative support. The Inspection Board oversees compliance with energy legislation including the Energy Act, the Energy Management Act and the Act on Prices. For breach of laws, the Inspection Board imposes fines.

MINISTRY OF ENVIRONMENT

The Ministry of Environment is responsible for the protection of the environment, including the development of all major environmental legislation. In March 2004, the ministry released a new State Environmental Policy, 2004 to 2010. Regarding the energy sector, the ministry strives to minimise the impact of obtaining energy, promote rational energy consumption and supply of energy, and introduce wherever possible the principles of sustainable development. The Ministry of Environment was involved in the development of the country's National Allocation Plan (NAP) submitted to the European Commission as part of the Emissions Trading System.

ENERGY REGULATORY OFFICE (ERO)

The Energy Regulatory Office (ERO) was established on 1 January 2001 as an administrative authority for regulation in the energy sector. A chairman is appointed by the government for a term of five years. He cannot be dismissed on the basis of ideological differences with the government or other parties but can be dismissed by the government as a result of administrative failings. In August 2004, the chairman of the ERO was dismissed by the government on the grounds that insufficient work was being accomplished towards preparing for the opening of the natural gas market in January 2005.

The ERO is mandated to perform the following tasks:

- Protect consumer interest in energy sector areas.
- Ensure the quality and reliability of energy supplies to consumers.
- Support competition through the development of well-established rules of the electricity and gas markets and the price regulation under the Act No. 526/1990 Coll. on Prices, as amended, inclusive of price regulation on electricity/gas, including services for protected customers.

- Promote the effectiveness of energy utilities' business through analysing the impacts of regulation, motivating energy utilities to reduce costs and making regulated activities more efficient.

- Ensure price stability.

- Grant licences for unbundled activities.

STATE OFFICE FOR NUCLEAR SAFETY (SONS)

The SONS is the competent authority of the Czech Republic responsible for governmental administration and supervision in the fields of nuclear safety, radiation protection, and of the adherence to the international ban on nuclear, chemical and biological weapons. SONS is headed by a chairperson appointed by the government. SONS has an independent position within the Czech central administration and has its own budget approved by the Parliament as a part of the National Budget. Execution of the state supervision of peaceful utilisation of nuclear energy and ionising radiation is governed by the Atomic Act which, together with the Act on State Inspection, provides the SONS with corresponding powers and competence. For 2004, the SONS was allotted a staff of 194 employees, approximately two-thirds of them representing nuclear safety and radiation protection inspectors who are appointed by the SONS chairperson. In the event of a dangerous situation requiring timely action that has an impact on nuclear safety, radiation protection, physical protection and emergency preparedness, SONS is authorised under the Atomic Act to impose a provisional measure to reduce the power output or suspend operation of certain nuclear-related activities. SONS is further authorised to prohibit the handling of nuclear items, ionising radiation sources or radioactive wastes. Violation of a legal obligation established in the Atomic Act may be fined by the SONS with a penalty specified in the act.

ADMINISTRATION OF STATE MATERIAL RESERVES (ASMR)

The Administration of State Material Reserves (ASMR) is a state administrative body responsible for the organisation of the material support of measures in an emergency and for state material reserves. The ASMR is the holder of the emergency oil stocks at or above the 90 days of net oil imports required by IEA membership. It also co-ordinates the country's response (both on the supply and the demand side) to any emergency oil supply shortage.

OFFICE FOR THE PROTECTION OF COMPETITION

The Office for the Protection of Competition was originally established as the Office for Economic Competition in July 1991. It assumed its present name and structure in November 1996. The Office was established to create conditions for the protection and support of competition, to exercise surveillance over public procurement and to monitor state aid. In 2003, 283 new cases were opened by the Office, including 35 cases of agreements to distort competition, 9 cases of abuse of dominant position and 252 cases of market concentration. Decisions were reached in 252 of these cases resulting in fines of CZK 445 850 000. The Office has 115 employees, including 42 lawyers and 43 economists.

The Office was recently involved in two major cases in the energy sector. The first was the majority acquisition of five of the eight local electricity distribution companies by ČEZ. The Office established three preconditions for the acquisition to proceed: *i)* that ČEZ divest itself of its remaining 34% share in ČEPS, the national high-voltage transmission company, *ii)* that ČEZ sell its minority shares in the remaining three local distribution companies, and *iii)* that ČEZ sell one of the five distribution companies it is acquiring. By the end of 2004, only the first two conditions were met.

The second major energy case for the Office was in the natural gas sector. The Office approved the concentration of the gas market with RWE acquiring the supply, high-pressure transport and six of the eight local distribution companies with the following conditions: *i)* RWE must not acquire Moravské naftové doly, a.s., a domestic gas producer and storage company and *ii)* RWE must not acquire or construct electricity distributors or heat-producing companies until the privatisation process is completed. These conditions have so far been met.

SECURITY OF ENERGY SUPPLY

Energy security is an important concern for the Czech Republic as it is for all IEA member countries. In general, the Czech Republic has a secure supply for its major primary energy sources. In 2002, the country produced 75% of its energy needs (considering nuclear power as an indigenous production source). The SEP makes independence from imports, and particularly from higher-risk regions, to be one of its three central components. While the share of imports is expected to rise in the coming years owing to a continuing decrease in coal use, the SEP has set indicative targets to limit the import percentage to 45% in 2010, 50% in 2020 and 60% in 2030.

ELECTRICITY

The Czech Republic has overcapacity in its generation portfolio to meet domestic demand, minimal transmission line constraints or bottlenecks and substantial interconnections with other countries equal to approximately one-

third of its domestic demand. Since the Temelín nuclear power plant came fully on line in 2003, the Czech Republic has been a major electricity exporter. The country has a total gross installed capacity of 17 344 MW while the record domestic peak demand (through 2003) was 11 205 MW on 12 December 2002.

OIL AND OIL PRODUCTS

The Czech Republic relies on imports for approximately 95% of its oil supplies. The IKL pipeline, which links to the Mediterranean terminal of Trieste, reduces Czech dependence on Russian oil imports and provides greater flexibility in responding to possible supply disruptions. The Czech Republic holds emergency reserves in excess of its 90-day IEA obligation, averaging 110 days of net imports in the first half of 2004. Approximately 70-75 days of these net imports are owned directly by the government, while the remainder is made up of non-compulsory industry stocks. Stocks held by the ASMR are owned by the government and financed from the state budget. However, as the ASMR does not directly own storage capacity, industry holds stocks on behalf of the ASMR.

The National Emergency Sharing Organisation (NESO) co-ordinates relevant government offices and representatives of the main oil industry players. The ASMR acts as the political and operational head of the NESO, and is in charge of the stockpiling and monitoring of strategic and company stocks in addition to managing emergency response measures. In the event of an oil supply emergency, the government is empowered to declare an emergency and activate a demand restraint programme. Light-handed measures, such as publicity campaigns, would be followed by compulsory measures ranging from lower speed limits to restrictions on motor vehicle use and rationing as a last resort.

NATURAL GAS

In 2003, natural gas supplied 17.8% of the primary energy and accounted for 23.8% of final consumption. While 1.7% of the gas supply came from domestic sources in 2003, this figure is expected to diminish as domestic fields are depleted or become excessively expensive to operate. Traditionally, all gas imports have come from the USSR and then Russia. In the late 1990s, the Czech Republic began an effort to diversify supply by importing Norwegian gas. From 1997 to 2002, the share of imported gas from Norway increased from 9.7% to 27%. The import share from Norway is not expected to rise further. The Czech Republic has extensive underground storage facilities, primarily in the east of the country. The domestic storage capacity is 2.7 billion cubic metres (bcm) with 6 facilities owned and operated by Transgas a.s. (the high-pressure pipeline system owner and operator) and

2 facilities owned by MND and SPP (domestic oil and gas producers). In addition, 500 million cubic metres of storage in neighbouring countries is contracted for use by the Czech Republic. The storage facilities play a crucial role in moderating supply against seasonal variations in demand. Demand in the winter is about four times that of demand in the summer. The country's storage facilities can hold about 60 days of domestic consumption during the high demand months and considerably more during the low demand months.

Securing the safety of gas supplies is governed by legislation in Act No. 458/2000 Coll. as amended by the Act No. 670/2004 Coll. (Energy Act) based on the Directive 2003/55/EC, which entered into force on 30 December 2004 where the transportation operator is obliged to ensure access to the transmission system and the balancing of the transmission system in compliance with the rules which will be set by the ERO. Organisation of a competitive market, therefore, provides the possibilities of gas supplies from different traders. In the future, in conditions of an open market, safety will be ensured among others by the implementation of the Directive 2004/67/EC. This implementation must be completed by 19 May 2006.

COAL

Coal provides a stable source of domestic energy supply that substantially enhances the country's energy security. Even though coal use has been on the decline, in 2003 it still provided 47.3% of Czech primary energy supply and 14.3% of final consumption. In 2003, the country produced 49.3 million tonnes of brown coal, 14 million tonnes of hard coal and 0.5 million tonnes of lignite. The estimated reserves (and lifetime of production at current extraction rates) are 1.3 billion tonnes (26 years) for brown coal, 350 million tonnes (25 years) for hard coal and 50 million tonnes (100 years) for lignite, although the government does not see lignite mining continuing beyond 2020 for economic and environmental reasons. Additional coal resources beyond the proven reserves and the expected decline in domestic coal usage will likely extend the allowable production from Czech mines well beyond the estimates given above.

ENERGY FORECASTS

METHODOLOGY AND ASSUMPTIONS

As part of the development of the SEP, the government developed a number of future energy scenarios. These projections were all produced with the EFOM/ENV (Energy Flow Optimization Model – ENVironment) model. This is a linear dynamic optimisation model focused on the economy, energy and environment. The model has been accepted by the European Commission for the development of energy development outlook studies.

In preparing the SEP, the government ran about 40 different simulations, using different assumptions on future policies, economic development, technologies and fuel availability and pricing. Specifically the differing assumptions fell into the following categories:

- Extending or not extending the life of the Dukovany nuclear power plant (JEDU).
- The possible construction of new nuclear power stations.
- Reasonable revisions of regional environmental limits for brown coal mining.
- Prices and availability of fuels on the world market.
- Stricter national limits for emissions of GHGs.

As the basis for all work in the SEP, the government selected the "Green Scenario". This scenario had the following characteristics:

- Stagnation of demographic development until 2010, with a slight decrease thereafter.
- An annual GDP growth rate of between 3.22% and 3.99%.
- Continued modernisation of the Czech economy.
- Moderate developments in world and domestic prices of fuel and energy.
- Intensive technological development.
- Increased support for renewable energy sources.
- Increased growth rate in energy utilisation efficiency.
- Promotion and incentives for increased energy efficiency.
- Nuclear energy: today's configuration (Dukovany four units and Temelín two units) plus two new nuclear units possible.
- Increasing levels of energy taxation that falls disproportionately on solid fuels (coal).
- Revision of regional environmental limits for brown coal mining.
- Imports of electricity are possible (when economic), but limited to a maximum of 5 TWh per year.
- Targeted use of state research and development support programmes.

RESULTS

The forecasts of the SEP "Green Scenario" for primary energy supply, electricity generation, final demand and emissions are shown in Tables 2 to 5[5].

5. Comparison with current and historical data from IEA database not directly relevant owing to differences in categorisation.

Table 2

Forecast of Primary Energy Supply in SEP "Green Scenario" (Mtoe)

	2005	*2010*	*2015*	*2020*	*2025*	*2030*
Brown coal	12.11	12.16	11.46	10.37	9.29	8.93
Hard coal + coke	5.47	5.06	5.02	5.42	4.99	4.16
Other solid fuels	0.19	0.21	0.21	0.19	0.17	0.17
Natural gas	8.91	8.57	8.43	8.74	8.74	8.84
Crude oil	5.30	4.99	4.30	3.63	3.32	3.03
Liquid fuels	1.22	1.60	1.82	1.91	1.96	2.05
Electricity	(0.96)	(0.84)	0.02	0.43	0.43	0.02
Nuclear fuel	6.83	6.83	6.83	6.83	7.88	8.96
Renewable sources	2.22	3.80	4.47	5.14	6.42	6.76
Total	**41.32**	**42.40**	**42.56**	**42.68**	**43.23**	**42.92**

Source: State Energy Policy, March 2004.

Table 3

Forecast of Final Consumption in SEP "Green Scenario" (Mtoe)

	2005	*2010*	*2015*	*2020*	*2025*	*2030*
Brown coal	0.96	1.00	0.93	0.60	0.74	0.62
Black coal + coke	2.03	2.01	2.01	1.86	1.91	1.84
Other solid fuels	0.17	0.17	0.17	0.17	0.14	0.14
Natural gas	7.79	7.38	7.14	7.36	7.43	7.55
Liquid fuels	5.42	6.02	5.68	5.25	5.09	4.94
Electricity	4.44	4.82	5.42	6.04	6.23	6.04
Heat	4.39	4.71	5.16	5.52	5.85	5.83
Renewable sources	0.29	0.43	0.50	0.53	0.48	0.45
Savings	0.26	0.57	0.91	1.05	1.05	1.50
Total	**25.77**	**27.09**	**27.92**	**28.35**	**28.92**	**28.90**

Source: State Energy Policy, March 2004.

Table 4

Forecast of Electricity Generation in SEP "Green Scenario"

	2005	*2010*	*2015*	*2020*	*2025*	*2030*
Total (TWh)	78.2	82.37	80.85	84.95	87.49	89.17
Brown coal	48.9%	45.3%	40.5%	37.3%	33.0%	31.9%
Hard coal	6.6%	6.8%	6.5%	9.2%	7.3%	4.9%
Other solid fuels	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Natural gas	4.7%	5.5%	7.7%	8.6%	8.4%	7.2%
Liquid fuels	1.1%	0.8%	0.7%	0.6%	0.5%	0.4%
Nuclear fuel	33.3%	31.6%	32.2%	30.7%	34.6%	38.6%
Renewable sources	5.3%	9.9%	12.2%	13.6%	16.2%	16.9%

Source: State Energy Policy, March 2004.

Table 5

Forecast of Energy-related Emissions in SEP "Green Scenario"

	2005	*2010*	*2015*	*2020*	*2025*	*2030*
CO_2 (mil. tonnes/year)	113	110	105	103	95	89
NO_x (thousand tonnes/year)	296	273	277	275	270	265
SO_2 (thousand tonnes/year)	214	222	210	185	170	159
CO (thousand tonnes/year)	603	595	552	456	458	410

Source: State Energy Policy, March 2004.

OTHER PROJECTIONS

While the forecasts used in developing the SEP were based on the "Green Scenario" whereby policy and other actions were implemented to favour renewable energy, energy efficiency and a more environmental approach in general, the Czech government has also supplied forecasts of a more neutral nature which assume continuation of the existing policy framework. The results of these forecasts are shown below.

Table 6

"Business-as-Usual" Forecast of Primary Supply (Mtoe)

	2002	*2010*	*2020*	*2030*
Coal	20.51	14.10	12.30	10.30
Oil	8.53	9.00	9.40	9.70
Gas	7.76	11.10	13.30	14.30
Biomass	0.82	1.30	1.90	2.20
Nuclear	4.88	6.70	6.70	6.70
Hydro	0.21	0.16	0.17	0.17
Geothermal	-	-	-	-
Solar/wind/other	-	0.00	0.01	0.01
Electricity trade	(0.98)	(0.30)	(0.20)	(0.20)
Total	**41.73**	**42.06**	**43.97**	**43.58**

Source: Czech government.

ENERGY TAXATION

All primary and final energy types are subject to the basic rate of value-added tax (VAT) of 19% with the exception of heating and cooling supply which is taxed at a reduced rate of 5%.

Selected renewable energy technologies are entitled to income tax relief. These are:

- Small water power stations with capacity less than 1 MW.
- Wind power stations.
- Heat pumps.
- Solar facilities.
- Installations for production and energy use of biomass or biogas.
- Installations for production of biodegradable materials the list of which is defined in specific law.
- Installations for the utilisation of geothermal energy.

This full tax relief is valid for the year in which the installation is put into operation and for five successive years thereafter.

Exemption from real estate taxes is provided for buildings that change their heating systems from solid fuels to renewable energy sources (*e.g.* solar, wind, geothermal, biomass). The same tax relief is available for building construction which reduces heat demand. This tax relief is valid for five successive years after the year in which the construction is finished.

Certain goods and services deemed to have high energy efficiency were subject to a reduced VAT of 5% until the end of 2003. Since 1 January 2004, however, the basic VAT rate of 19% has been applied on these products in compliance with the EU directive which provides for VAT in EU member States.

In 2004, taxes for gasoline were CZK 11.84 per litre and taxes for automotive diesel fuel were CZK 9.95 per litre.

Emissions of combustion by-products are taxed at the rate shown in Table 7.

Table 7

Emission Taxes

Pollutant	*Emission tax (CZK/tonne)*
SO_2	1 000
NO_x	800
Particulates/solid substances	3 000
CO	600
Heavy metals	20 000
Volatile organic compounds (VOC)	2 000
Ammonia	1 000
Polycycle aromatic hydrocarbons	20 000
Methane	1 000

Source: Country submission.

A draft of the environmental tax reform has been approved by the Environment Minister and it is now being discussed by the Ministry of Environment and the Ministry of Finance. While the law has yet to be finalised, according to the draft, taxes for solid and liquid fuels would be introduced by 2007 and gradually increased until 2015, although specific rates have so far been proposed. This would decrease demand for these fuels and raise government revenue.

CRITIQUE

The Czech Republic has made remarkable progress in establishing a market-oriented economy after decades of centrally-planned administration. Following a period of economic restructuring, the economy is displaying solid development with growth rates exceeding those of the EU as a whole. The Czech Republic's accession to the EU in May 2004 signifies further economic progress.

Since the last IEA in-depth review four years ago, there have been a number of positive developments in the country's energy sector. The Energy Act stipulating the liberalisation of the electricity market took effect in January 2001 and the Energy Regulatory Office (ERO) was established at the same time. The Transmission System Operator, ČEPS, was legally unbundled from ČEZ and as of the second half of 2004, ČEZ had fully divested itself of all ownership of ČEPS. A draft amendment of the Energy Act was submitted to the Parliament to introduce step-by-step liberalisation of the gas market from January 2005 and to fully incorporate the latest developments in the EU directives. There is a consistent determination to fully comply with these and all EU directives and to fully implement the *acquis communautaires*. It is almost certain that the Czech Republic will meet its Kyoto commitment and it has also made very good progress in reducing local pollution.

The State Energy Policy (SEP) of March 2004 offered a vision for future developments, clearly setting out aims, goals and long-term targets towards 2030. The document sets important goals and considers the different facets of forming effective energy policy. The framework and goals for the Czech energy policy are consistent with the IEA's *Shared Goals*. Its call for energy efficiency as the primary priority in the Czech energy sector is particularly wise. The government should proceed in using this document as a basis for future energy policy directions.

In a few instances, however, the document could benefit from closer scrutiny. The primary concern is the viability of the targets included therein, some of which are highly ambitious. For example, the SEP forecasts that liquid fuel use for final consumption will fall over the long term with usage in 2030 below current levels. While the SEP does not distinguish the sectors in which the fuel will be used, the significant majority will be in the transport sector. Other IEA

countries have had difficulties curtailing energy use in this sector, particularly for road transport, and the last ten years in the Czech Republic have shown tremendous growth in this area with annual average demand growth rates in excess of 6%. As the country's per capita income rises to match the EU average, curbing road transport growth will become even more difficult. For the IEA European countries as a whole, road transport accounts for 30% of TFC compared to less than 20% in the Czech Republic. The targets for renewable energy are also highly ambitious. In the ten years from 1993 to 2002, renewables increased their share of total fuel supply from 1.7% to 2.9% but the SEP calls for renewable use reaching 15% to 16% of TPES by 2030. In 2003, renewables accounted for just 2.3% of electricity generation while the SEP would like to reach 8% of electricity generation by 2010 and 16.8% in 2030. While these and other targets are indicative rather than binding, they represent an ambitious agenda that will be challenging to accomplish. This is not to say that achieving such targets is in any way impossible, but they will require substantial action and could have negative consequences for certain segments of the economy. Cost-benefit analyses of meeting these targets would be helpful in determining which sectors stand to gain and which sectors stand to lose in this process.

The first step in developing such cost-benefit analyses is to specify the policy tools and measures to be used in achieving the desired results. Such specifics are not apparent in the SEP. While it is intended primarily as a blueprint for a desired energy future, the lack of concrete policy measures should nevertheless be redressed soon.

In addition to a more thorough cost-benefit analysis at the outset of the new policy, the government is wise to include provisions for a review of the SEP and its effects after three years of implementation. By that time, some of the consequences of the policies enacted will have been made clear, providing evidence to policy-makers regarding their success and the possibilities for further enhancement.

The SEP includes target ranges for the shares of fuel for primary energy supplies through 2030. There are some benefits to setting such a primary energy portfolio. They could send a signal to the general public and investors as to the overall direction of the Czech Republic's energy strategy. However, it should be noted that the energy mix should be, in principle, achieved by market instruments. While there are certain cases (renewables, for example), where government intervention could be justified, care should be taken that the portfolio target would not result in market distortion through excessive government intervention as this could defer or deter private initiative in the sector. For example, the SEP forecasts that natural gas will account for 8.74 Mtoe of primary supply in 2020 and 8.84 Mtoe in 2030, amounts equivalent to around 21% of total supply in both years. There is a general trend (both domestically and internationally) towards gas use because of its

flexibility and low impact on the environment. The forecasts included in the IEA statistics (and submitted by the government as a business-as-usual projection) show natural gas's share of total supply rising to 30% in 2020 and to 32.8% in 2030. This latter prediction seems more likely given recent trends and the prospects for gas against other fuels. If the government tries to suppress gas use to achieve the target, it would hamper the effective functioning of the market mechanism.

One of the SEP's objectives under the rubric of completing the liberalisation process is minimising prices for all types of energy. While such a goal has its laudable aspects (*e.g.* consumers benefit directly and the overall economy benefits indirectly), overemphasis on price, particularly during times of liberalisation, can cause other important considerations to receive insufficient attention. For example, minimisation of price can lead to the exclusion of negative externalities normally not captured by the market. In the process of pursuing the 3 Es (Energy security, Economic growth, Environmental sustainability), such externalities need to be incorporated through regulatory and fiscal arrangements which could ultimately result in upward pressure on certain energy prices. While low price is one important goal of any country's energy policy, care must be taken that it does not override other issues.

The country's energy policy issues such as market reform, climate change mitigation and energy efficiency affect all sectors of the Czech economy and society. As such, the development and implementation of energy policy should endeavour to be an open, transparent process whereby all factions can contribute and be heard. Greater consultation with all stakeholders in further developing the State Energy Policy could be helpful. In addition, efforts to disseminate information on the energy sector and the plans and objectives for energy policy are essential. It will give society as a whole more of a stake in energy matters and allow to better understand the issues involved.

Two entities established by the government are crucial in assisting the energy sector's transition to a competitive market. The first is the Energy Regulatory Office (ERO). Such an organisation is instrumental for a liberalised competitive market and the ERO has shown itself to be knowledgeable and effective. One of the crucial attributes of such a group, however, is its independence. The regulatory office must be free to exercise its judgement on liberalisation and related energy matters and independent from the influence of the government or industry. While conflicts will undoubtedly rise between the regulator and the government and industry, the ERO must feel secure and independent in its work regardless of its ideological stance on specific issues. In light of the dismissal of the ERO chairman in August 2004, the government is urged to reiterate the regulator's independence.

The Office for the Protection of Competition also plays an important role in the liberalising energy sector. This is especially true in light of the market

concentration currently seen in the electricity and natural gas industries (see Chapters 6 and 7 for more detail). All countries and intranational bodies such as the EU are in the process of defining a workable framework for assessing market concentration and the proper functioning of newly competitive markets. As the Office works in this field, it must be given the resources for continuing its important work as well as the legal and/or regulatory backing for enforcing its decisions in the sector.

Although liberalisation is rightly receiving attention in the Czech Republic, the still-regulated segments of energy supply remain very important. These areas generally fall under the jurisdiction of the ERO and include the electricity and natural gas networks (both at the national and local levels) as well as district heating. Efforts made to improve the quality of these regulated services and to lower their costs would help the country meet its targets. One possible method of doing so would be to benchmark service providers against one another both nationally and internationally. The results of the benchmarking can be used to set tariffs, for example, and to inform the public how these companies behave compared with other similar actors in the market. Companies lagging behind the standard, or median, service levels would be encouraged to improve performance while those above the standard would be rewarded.

As with all IEA countries, energy security rightly receives the attention of policy-makers. In the case of the Czech Republic, overall energy security is sound. Despite a brief period in early 2004 when stocks fell below the 90-day threshold, the record of the Czech Republic with regard to oil stockholdings has been exemplary. There is overcapacity for electricity generation and large interconnections with neighbouring countries. Gas supply is enhanced through diversification of supply, and gas storage and the high-pressure transportation have excess capacity. Coal provides a secure domestic fuel for the foreseeable future. The SEP's indicative targets for import dependence levels (45% in 2010, 50% in 2020 and 60% in 2030) may be too low if gas use rises above expectations and/or coal use falls for environmental reasons. However, higher than forecast import levels need not pose a problem from the point of view of energy security if international trade takes place in a well-structured environment and strong plans for supply diversity and emergency response are maintained.

RECOMMENDATIONS

The government of the Czech Republic should:

- *Examine the feasibility and cost of achieving the national targets such as energy efficiency, renewable and fuel mix goals.*

- *Supplement work in strategy with detailed action plans and with sub-targets to ensure progress across all areas.*
- *Follow through on the intention to conduct a three-year review of strategy by developing an analytical framework to assess progress.*
- *Develop a regulatory, fiscal and market structure that seeks to reflect environmental externalities in energy prices.*
- *Enhance involvement of all stakeholders, including consumers, when developing energy policies and disseminate information widely.*
- *Ensure the independence of the Energy Regulatory Office from political and industry influence.*
- *Enable the anti-monopoly authority to monitor energy markets in depth, promote a competitive environment and prevent possible abuse of market power, and act where appropriate.*
- *Consider means of improving the efficiencies of the still-regulated components of the liberalising energy sector, including domestic and international benchmarking and regulatory incentives.*

ENERGY AND THE ENVIRONMENT

INTRODUCTION

Concern and consideration for the environment is one of the main tenets of Czech energy policy. The State Energy Policy (SEP) of March 2004 includes sustainable development as one of its three basic priorities and has maximising environmental friendliness as one of its four essential goals. The State Environmental Policy 2004–2010 also includes substantial treatment of the effect of energy production, supply and usage on the environment.

There are three facets to energy-related environmental protection in the Czech Republic: *i)* reducing emissions of local pollutants, *ii)* reducing greenhouse gas (GHG) emissions, and *iii)* ensuring the safety of nuclear power operations, plant decommissioning and the mid- to long-term storage of waste. (The environmental aspects of nuclear power production will be addressed in Chapter 8.) Environmental protection within the energy sphere will be pursued mainly with energy efficiency and renewable energy. Energy efficiency has improved considerably in the Czech Republic over the last decade, although energy intensity remains higher than the IEA and EU averages. Renewable energy has not yet captured a large section of overall supply, although both the SEP and the State Environmental Policy have ambitious targets to increase its share.

CLIMATE CHANGE

HISTORICAL TRENDS IN EMISSIONS

Between 85% and 90% of the Czech Republic's GHG emissions come in the form of CO_2 from energy consumption and use. This is a higher percentage than the IEA average due to the relatively high levels of CO_2 from the overall high energy intensity and the low share of sectors such as agriculture or livestock that could represent substantial sources of GHGs other than CO_2.

The Czech Republic's energy-related CO_2 emissions were 114.7 Mt in 2002[6]. This represents a 24% reduction from 1990 levels and a 35% reduction from the

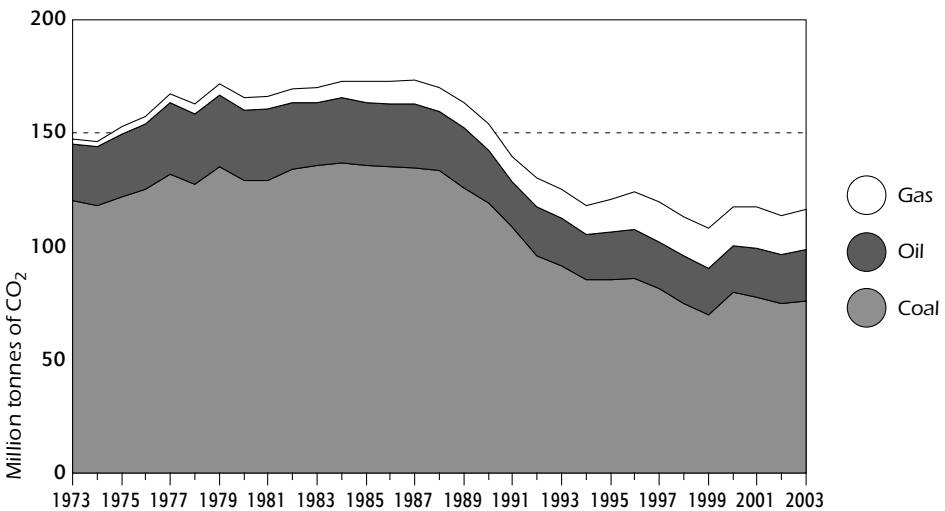
6. Energy-related CO_2 emissions have been estimated using the IPCC Tier I Sectoral Approach. In accordance with IPCC methodology, emissions from international marine and aviation bunkers are not included in national totals. Projected emissions for oil and gas are derived by calculating the ratio of emissions to energy use for 2001 and applying this factor to forecast energy supply. Future coal emissions are based on product-specific supply projections and are calculated using the IPCC/OECD emission factors and methodology. Because of differences in methodology and definitions in estimating energy-related CO_2 emissions, the IEA statistics and the official Czech statistics submitted to the UNFCCC and elsewhere may differ. Unless otherwise stated, statistics in this book are taken from the IEA's statistics in *CO_2 Emissions from Fuel Combustion 1971-2002* (2004).

peak emissions year of 1985. In relative terms, Czech energy-related CO_2 emissions amounted to 11.47 tonnes of CO_2 per capita (the fourth-highest rate among OECD European countries). Its energy-related CO_2 emissions per unit of gross domestic product (GDP) using market exchange rates was 1.98 kg of CO_2 per 1995 US$ in 2002, the highest level in the OECD. Its energy-related CO_2 emissions per unit of GDP using purchasing power parity (PPP) was 0.83 kg CO_2 per 1995 US$ in 2002, also the highest level in the OECD.

In 2003, coal contributed the most (65%) to the Czech Republic's energy-related CO_2 emissions. However, both the long- and short-term trends show that emissions from coal are decreasing in both relative and absolute terms. In 1973, coal emissions were 66% higher than in 2003 and accounted for more than 82% of total emissions. More recently, emissions from coal have declined steadily over the last three years, from 79 935 kt CO_2 in 2000 to 75 908 in 2003. Oil is the second-largest emitting fuel, accounting for 19.3% of the total in 2003. Oil emissions have risen substantially in relative terms but stayed level in absolute terms. From 1991 to 2003, oil emissions have ranged between 20.2 Mt CO_2 and 22.6 Mt CO_2. Natural gas is the third-most important fuel for CO_2 emissions, accounting for 15.3% of the total in 2003. As with oil, the absolute levels of emissions from gas have stayed at the same level over the last ten years but the level relative to other fuels has risen.

Figure 7

CO_2 Emissions by Fuel*, 1973 to 2003



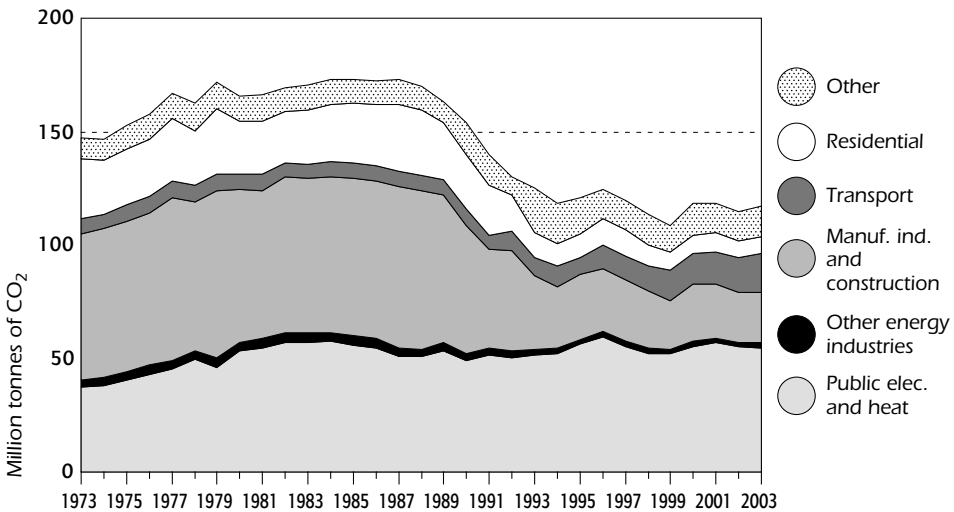
* estimated using the IPCC Sectoral Approach.

Source: *CO_2 Emissions from Fuel Combustion*, IEA/OECD Paris, 2005.

On a sectoral basis, the electricity and heat production accounts for the largest share of CO_2 emissions, equal to 53% of the total in 2003. Since the mid-1990s, the absolute value of emissions from this sector has been relatively level, although its comparative share of total emissions has increased slightly, from 49% in 1993 to 53% in 2003. Industry accounted for 19% of total energy-related CO_2 emissions in 2003, down from 37% in 1990. This decreasing trend may have stabilised, however, as recent figures suggest a flattening-out of industrial emissions on a relative basis. While transport only accounted for 14% of 2003 CO_2 emissions, this sector has experienced remarkable growth in recent years. For much of the 1980s, transport accounted for less than 4% of total emissions and, as recently as 1991, this percentage was under 5%. From 1991 to 2003, CO_2 emissions from transport have grown by more than 150%, at an average annual rate of 8.2%.

Figure 8

CO_2 Emissions by Sector*, 1973 to 2003



* estimated using the IPCC Sectoral Approach.

Source: *CO_2 Emissions from Fuel Combustion*, IEA/OECD Paris, 2005.

TARGETS AND FORECASTS

Under the Kyoto Protocol, the Czech Republic must reduce its total GHGs by 8% from 1990 levels in the period 2008–2012. Based on its baseline emission level from 1990 (190.5 Mt CO_2 eq.), this means the country's annual target under Kyoto is 175.26 Mt CO_2 eq. Given the massive drop in emissions from 1990, this appears easily achievable even in the absence of concerted

emissions reduction efforts. In addition, the government has established a unilateral target of reducing CO_2 emissions by 20% from 1990 levels by 2005. This also appears easily achievable given that CO_2 emissions have fallen by more than 25% from 1990 to 2002. Table 8 shows the progression of all GHGs covered under Kyoto from 1990 to 2001.

Table 8

GHG Emission Inventories from 1990 to 2001

	1990	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*
CO_2 emissions [Mt]	162.5	148.1	134.2	129.2	125.9	123.4	128.8	133.1	124.7	118.2	124.2	124.1
CH_4 [Mt CO_2 eq]	16.8	14.9	14.0	13.3	13.0	12.6	12.6	12.1	11.4	10.7	10.7	10.4
N_2O [Mt CO_2 eq]	11.3	7.3	7.0	6.6	8.3	6.7	9.2	8.8	8.4	8.1	8.2	8.3
HFCs, PFCs, SF_6 [Mt CO_2 eq]	inventory not carried out					0.2	0.3	0.6	0.5	0.5	0.9	1.3
Total CO_2 eq [Mt]	190.5	170.3	155.2	149.1	147.2	142.8	150.9	154.6	145.1	137.6	144.0	144.1
% of 1990 level	100.0	89.4	81.5	78.3	77.3	75.0	79.2	81.2	76.2	72.2	75.6	75.7

Source: Ministry of Environment.

The Czech government has included some forecasts of CO_2 emissions in its State Energy Policy of March 2004. These are shown in Table 9.

Table 9

CO_2 Emission Projections

	2005	*2010*	*2015*	*2020*	*2025*	*2030*
CO_2 (Mt/year)	113	110	105	103	95	89

Source: State Energy Policy (2004).

It must be kept in mind that these projections are a product of the SEP's "Green Scenario" wherein energy efficiency and renewable energy are favoured at the expense of solid and liquid fuel use. As such, they do not represent a business-as-usual forecast[7].

7. The types of measures to promote renewable energy and energy efficiency are discussed in greater length in the following chapter.

POLICY AND MEASURES

The Czech Republic relies primarily on energy efficiency and renewable energy to achieve future emissions reductions. The measures in these areas, both planned and currently in place, are discussed in their respective sections below. While the SEP includes specific targets for reduction of energy intensity and increase in renewable energy production, it does not set concrete targets for GHG reductions for individual policy measures or approaches. In addition to renewable energy and energy efficiency, the SEP sees new 600-MW nuclear units coming on line in 2025 and 2030 which will also act to decrease emissions against a baseline of fossil fuel-fired generation. A new national climate change strategy is, at present, under preparation.

EMISSIONS TRADING, JOINT IMPLEMENTATION AND THE NATIONAL ALLOCATION PLAN

As an EU member State, the Czech Republic is subject to the directive introducing the EU Emissions Trading Scheme (EU-ETS). As required, the Czech Republic has developed and submitted a National Allocation Plan (NAP) to the European Commission (EC) which details emission allowances it proposes to allocate to different installations as well as other details. Along with many other countries, the Czech Republic missed the initial deadline for submissions of NAPs to the Commission. The Czech Republic submitted its NAP in October 2004, being one of the last to do so.

Under the plan, allowances equal to 107.65 million tonnes a year will be allocated annually for the first three-year period (2005–2007). The first draft of the plan, developed largely by the Ministry of Environment, proposed to allocate 91.5 Mt CO_2 annually. Following criticism from industry over the stringency of this allocation level, the annual allocation was raised to 99.6 Mt CO_2. This increase was insufficient to quell the debate and the Ministry of Industry and Trade asked that the cap be raised to 116 Mt CO_2 annually. Finally, a compromise was reached at 107.65 Mt CO_2. Of this amount 98.99 Mt CO_2 will go to existing installations along with a 3.11 Mt CO_2 bonus for early action, a 1.55 Mt CO_2 bonus for CHP plants and a 1 Mt CO_2 correction opportunity for installations that serve as central heating sources. All allowances will be allocated freely[8].

Allowances were initially based on historical emissions in the 1999 to 2001 period with the average of the two years with the highest emissions being used. This basis was then increased according to the projected growth rates for each type of industry and further negotiations. Approximately 450 installations will be covered under the system representing around 65% of total Czech GHG emissions.

8. Each such allowance permits the installation to emit one tonne of CO_2 per year.

A reserve of three million allowances per year has been established for new entrants. These allowances will be distributed free-of-charge and any unused allowances from the new entrant reserves will be sold at auction. New entrants will apply for allowances from this reserve before the installation become operational on a "first come, first serve" basis. Allocation to these new installations will be based on benchmarking with best-available-technology (BAT). The transfer of allowances to the second trading period (*i.e.* "banking") is not permitted.

Final allocations per sector are shown in Table 10.

Table 10

NAP Allocations by Sector,

(million tonnes of CO_2)

	2000 basis	*Annual allocation, 2005-2007*[1]	*Assumed % annual growth, 2000 to 2006*[1]
Public electricity production	61.23	63	0.48
Corporate energy production	3.44	3.93	2.24
Refineries	0.95	1.55	8.50
Chemicals	4.61	5.97	4.40
Coke	0.23	0.31	5.10
Metals	12.15	16.46	5.19
Cement	3.01	3.35	1.80
Lime	1.15	1.6	5.66
Glass	0.72	0.94	4.54
Ceramic	0.65	0.69	1.00
Pulp	0.12	0.16	4.91
Paper and board	0.77	1	4.45
Basic total[1]	**89.03**	**98.99**	**1.78**
Bonus for early action		3.11	
Bonus for CHP		1.55	
Degree day standardisation		1	
New entrants		3	
Total	**89.03**	**107.65**	**3.22%**

[1] Except for total annual percentage growth figure (3.22%), these figures do not include the additional bonus allocations to be made for early action, CHP or degree day standardisation.

Source: Czech Republic National Allocation Plan, October 2004.

The government regards the interaction between the EU-ETS and other Kyoto flexible mechanisms (primarily Joint Implementation, JI) as crucial for the Czech Republic. Since the country will be below its Kyoto target, even under business-as-usual scenarios, both the government and industry stand to

benefit financially through exchanges with other countries struggling to meet their cap. The methodology for treating JI projects has been prepared by the government, including the administrative procedures for the approval of projects. The necessary institutional structures (*e.g.* a JI office) are now being established. There has been active interest from investor countrie including some 60 projects with an estimated total emissions reduction of at least 470 000 tonnes of CO_2 per year. Nevertheless, the government feels there are a number of issues that have not been resolved to decide whether JI or emissions trading will have priority. There is a lack of adequate human and financial resources to prepare for the Kyoto Protocol flexible mechanisms. There are also some technical problems concerning data quality and availability, and legal, financial and organisational issues that will impact on effectiveness.

OTHER ENERGY-RELATED EMISSIONS

The Czech Republic has made remarkable progress in lowering emissions related to fuel combustion. A great deal of this decrease has resulted from the addition of pollution control technologies on coal-fired power plants as well as the general increase in efficiency and the shift away from coal as a primary fuel. Table 11 shows emissions data from 2000 to 2002.

Table 11

Emissions, 2000–2002

(kilotonnes)

Year	*Particulates*	*SO_2*	*NO_x*	*CO*
2000	57	264	326	648
2001	54	251	332	649
2002	59	237	318	550

Sources: ČHMÚ, ČIŽP, CDV, VÚZT, ČSÚ.

Emissions of SO_2 are caused mainly by stationary sources (92%) and particularly by those with capacities above 5 MW (73%). NO_x emissions occur roughly equally from transport (42%) and from stationary sources (41%).

During the accession process within the EU, the Czech Republic negotiated annual national emission limits to be reached by 2010 for the following pollutants: SO_2 at 265 000 tonnes, NO_x at 286 000 tonnes, and VOCs at 220 000 tonnes. The government does not anticipate having any difficulties meeting these limits.

Despite improvements in this area over the last decade, the Czech Republic still has emission levels above the EU average, as shown in Table 12.

Table 12

International Comparison of Sulphur Dioxide and Nitrous Oxide Emissions, 2001

	SO_2 kg/person	NO_x kg/person
Czech Republic	25	33
EU-15	**19**	**27**
Belgium	20	36
Austria	5	23
Denmark	5	39
Finland	15	46
Germany	10	20
France	14	28
UK	20	27
OECD – total	**33**	**40**
USA	63	84
Japan	7	13
G7	**35**	**48**
Poland	39	22
Slovakia	33	24

Source: Yearbook OECD, 2003 from Country submission.

CRITIQUE

The government has made protection of the environment a key axis of its energy policy. In the State Energy Policy, sustainable development (including environmental protection) is one of the three basic priorities and maximising environmental friendliness is one of the four major goals. The State Environmental Policy also deals extensively with how environmental harm from energy production, supply and use can be minimised.

The Czech Republic has already made substantial progress in this area over the past 15 years. CO_2 emissions have fallen by about 25% and emissions of other energy-related by-products are also down substantially. However, relative emission measures of all types (*e.g.* emissions per capita or per GDP) are still well above standards set by other EU countries. The progress to date resulted from both government policy and the effects of economic restructuring that saw a shift away from energy-inefficient production methods and state-supported use of coal.

Regarding climate change and greenhouse gas (GHG) emissions, the country should not have any difficulties meeting its international commitments under the UNFCCC's Kyoto Protocol or its current unilateral targets, even under a

business-as-usual scenario. In fact, GHG emissions reduction represents not a threat but an opportunity for the country. Since the emissions are so far below the Kyoto target and substantial opportunities remain to reduce emissions further with moderate or no net cost, the Czech Republic could reap a financial gain through trading and/or Joint Implementation.

While steps have been taken by the government to reduce emissions through policy tools, the lack of a comprehensive GHG emissions reduction strategy is limiting the degree of opportunities in this area. Because both the Kyoto target and its voluntary target by 2005 are likely to be achieved without further efforts, another voluntary target covering the Kyoto first commitment period could be developed to maximise such opportunities. The government is encouraged to develop such a plan as part of a long-term strategy to address this issue. Nearly all IEA countries have already developed such a comprehensive plan. While it is understandable that different ministries would have different views on this subject, as was seen in the formulation of the NAP, co-operation in this matter is clearly in everyone's best interest since the country is in the enviable position of being able to reduce emissions while profiting industry, government finance and the economy as a whole. Such a climate change strategy should include targets on emissions reduction that reach the sectoral level. This will be particularly important for those sectors not covered by the emissions trading scheme such as transport and housing. Such a strategy should also be supported by analysis showing the cost-effectiveness of the policies to be used as well as provisions for regular review and assessments of these policies once experience is gained.

Since the use of the Kyoto flexible mechanisms will be the primary means by which the Czech Republic can benefit financially from past and future emissions reductions, developing a strategy and administrative apparatus for their use is imperative. The government has certainly been paying attention to this issue in its development of the National Allocation Plan (NAP) as part of the EU Emissions Trading System (EU-ETS). The NAP submitted to Brussels in October 2004 included an annual allocation for 2005 to 2007 of 107.65 Mt CO_2, up nearly 18% from the first draft. If, as the NAP states, the covered emissions are 65% of the total GHG emissions, this would mean that the total GHG emissions during the 2005-2007 period would be 164.6 Mt CO_2 eq., or still 6.1% below the Kyoto target. So while the level of allowances in the NAP would still allow the country to achieve its Kyoto target, it is nevertheless quite high when considering current circumstances. When new entrant reserves and bonus allocations are considered, the NAP assumes an average annual growth in emissions of more than 3.2%. In addition, the base year is equal to the average emissions from the two highest-emitting years from 1999 to 2001 while indications are that emissions have already fallen since then. The SEP projects further significant GHG emissions reductions in the future.

Even given the economic growth opportunities of the Czech Republic and industry's concern on international competitiveness, the NAP allocations seem

to be generous to industry. Such an assessment in no way implies that Czech industry and the country as a whole should not benefit from selling or otherwise transferring allowances elsewhere. On the contrary, the key will be to maximise these benefits and such a generous allocation scheme may not do so. Furthermore, generous allocation to the industrial sector could lead to more reduction burden in the transport and residential/commercial sectors where emissions are growing rapidly. Slightly more stringent emission goals, either through the NAP or other domestic legislation, would provide more incentive for industry to actively look into emissions reductions, including through energy efficiency improvements. This would allow it to further benefit from trading allowances to other companies that need them. In addition, any allowances that are not allocated to industry are held in the hands of the government which can sell them to other governments and thus benefit the country financially.

RECOMMENDATIONS

The government of the Czech Republic should:

- *Consider developing a plan for reducing GHG emissions with targets on overall and sectoral level; regularly update GHG projections and take measures if necessary.*
- *Monitor and evaluate the cost-effectiveness of the policies and measures in the State Environmental Policy and the National Plan to Mitigate Climate Change.*
- *Define clear responsibilities of relevant ministries and strengthen co-ordination among different ministries.*
- *Examine and institute means of profiting from continued emissions reduction through the use of flexible mechanisms such as emissions trading and/or Joint Implementation.*
- *Continue to reduce the level of emissions of local pollution.*

ENERGY EFFICIENCY AND RENEWABLE ENERGY

INTRODUCTION

The public policy frameworks for both energy efficiency and renewable energy are closely linked in the Czech Republic. Objectives in both fields and the policies to support them are often stated in the same policy documents and programmes. Many agencies are mandated with achieving targets in both areas and the budgets allocated for these areas are often pooled. This chapter covers the legislative frameworks supporting energy efficiency and renewable energy, discusses the history and potential of each and looks at the current and expected policies used to meet the government's objectives.

NATIONAL PROGRAMME

The Energy Act called for the establishment of the National Programme for the Support of Energy Savings and the Utilisation of Renewable and Secondary Sources of Energy. The National Programme began in 2001 and is set to run through 2005. The four-year programme allocates state funds for energy-saving measures, promotes co-generation and modernisation of generation and distribution facilities and supports renewable energy resources, as well as education, training, energy management, R&D and the preparation of territorial energy policies. The objectives of the programme to the year 2005 are shown below:

- Reduction in energy demand per unit of gross domestic product by between 14.8% and 19.6% compared to 2001.
- Savings of primary energy consumption of 97 PJ compared to 2001.
- Production of electricity from renewable sources to 3% of total electricity consumption (not including hydropower stations larger than 10 MW) or 5.1% (including hydropower stations above 10 MW).
- Share of renewable energy sources in the total primary energy consumption at the level of 2.9% (without hydropower stations with capacity above 10 MW) or 3.2% (including hydropower stations above 10 MW).
- Reduction in emissions by the year 2005:
  - SO_2 to 1.9 kg/1 000 US$ of GDP or to 26 kg per inhabitant.
  - NO_x to 35 kg per inhabitant.

- Advancement of research, development and the production of advanced technologies to support energy efficiency and renewable energy sources.
- Raising awareness of the possibilities and contribution of measures for energy efficiency improvements and the wider use of renewable energy sources.
- Integrating EU priorities in the energy sector.
- Reducing the dependence of the Czech economy on the import of energy resources.

STATE ENERGY POLICY TARGETS

The SEP of March 2004 includes some new targets for both energy efficiency and renewable energy. For energy efficiency, there are three goals:

- The annual improvement of energy intensity of GDP should reach 2.6% by 2005, and between 3.0% and 3.5% (as an indicative target) over the longer term.
- The absolute value of primary energy supply should remain constant.
- The annual improvement of electricity intensity of GDP should reach 2.0% by 2005, and between 1.4% and 2.4% (as an indicative target) as a long-term goal.

For renewable energy, there are also three targets in the SEP:

- Renewable energy should account for 5–6% (as an indicative target) of gross electricity consumption by 2005.
- Renewable energy should account for 8% (as an indicative target) of gross electricity consumption by 2010.
- Renewable energy should account for 15–16% (as an indicative target) of primary energy supply by 2030.

The SEP also includes two more targets for renewable energy: an increase in supply to 6% of TPES and to 8% of electricity consumption by 2010.

BUDGET FUNDING

The state budget and other funding for renewables energy and energy efficiency over the last eight years are shown in Table 13.

Table 13

Budget for the Promotion of Renewable Energy and Energy Efficiency, 1995 to 2003

(million CZK)

	1995	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*
State budget	211.0	229.9	362.6	341.9	315.0	209.0	102.2	92.5	102.0
Other public resources	185.0	220.0	243.0	213.0	205.0	150.0	120.0	797[(1)]	410[(2)]
Privately financed measures	488.2	492.6	672.0	1 482.0	2 144.0	977.0	534.0	n.a.	n.a.
Total	**884**	**943**	**1 278**	**2 037**	**2 664**	**1 336**	**757**	**890**	**512**

(1) Other public resources for 2002 and 2003 includes state budget for renewable energy support through both subsidies and loans.

(2) Full cost data for this area not yet available for 2003.

Source: Country submission.

ENERGY EFFICIENCY INDICATORS

In 2002[9], Czech aggregate energy intensity, as measured by TPES per person, was 4.1 tonnes of oil equivalent (toe) per capita. This is 20% above the average for the OECD European countries. The Czech Republic's TPES in toe over its national GDP (in thousands of 1995 US dollars PPP), was 0.30 toe per US$ 1 000. This was 71% higher than the average for OECD European countries. When considering TPES over national GDP (in thousands of 1995 dollars calculated with the exchange rate), the Czech Republic's figure was 346% above the average for OECD Europe.

The energy intensity figures are closer when comparing the Czech Republic to other Eastern European countries, as shown in Table 14.

Table 15 shows the evolution of aggregate energy intensity figures as measured by TPES (toe) per GDP (US$ 1 000 PPP) for a variety of countries and Figure 9 shows a lengthier trend.

Table 16 shows the evolution of the electricity intensity of the Czech Republic and selected other countries.

9. Energy intensity figures for 2003 not yet available for all countries, so 2002 data will be used in order to make legitimate international comparisons.

Table 14

Comparison of Aggregate Energy Intensity Figures, 2002

Country/region	*TPES per capita (toe per person)*	*TPES/GDP (toe per 1 000 1995 US$ PPP)*
Czech Republic	4.09	0.301
OECD Europe	3.41	0.176
comparison with Czech Rep. [1]	*20%*	*71%*
Poland	2.33	0.240
comparison with Czech Rep. [1]	*75%*	*26%*
Slovakia	3.45	0.328
comparison with Czech Rep. [1]	*19%*	*(8%)*
Hungary	2.51	0.209
comparison with Czech Rep. [1]	*63%*	*44%*
Austria	3.78	0.144
comparison with Czech Rep. [1]	*8%*	*109%*

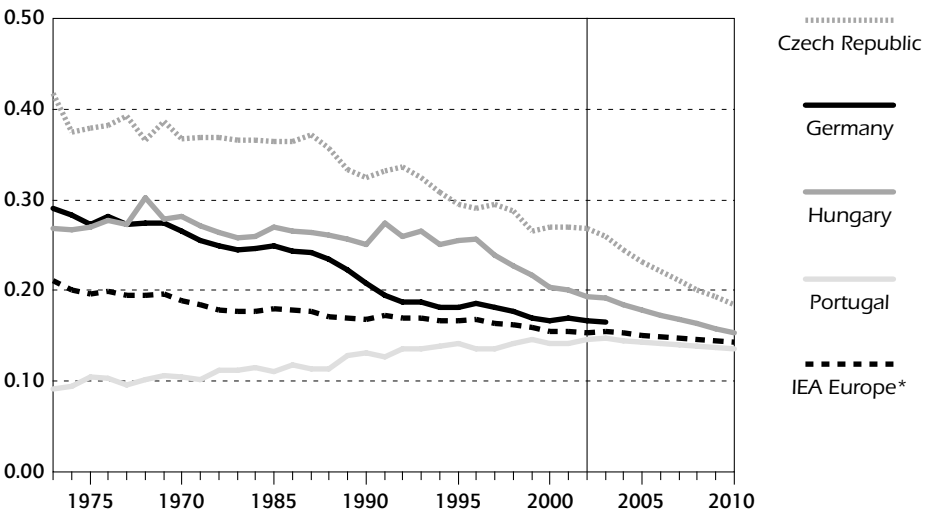
[1] The comparison figures indicate how much higher (lower) the Czech data are compared to the other countries/regions.

Source: Energy balances.

Figure 9

Energy Intensity in the Czech Republic and in Other Selected IEA Countries, 1973 to 2010

(toe per thousand US$ at 2000 prices and purchasing power parities)



* Belgium, Germany, Korea and Norway are excluded, as forecast data are not available for these countries.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2005; *National Accounts of OECD Countries*, OECD Paris, 2005; and country submissions.

Table 15

Change in Aggregate Energy Intensity, 1990 to 2002

Country/region	*TPES/GDP (toe per 1 000 1995 US$ PPP)*		*Total % change in intensity*	*Annual % change in intensity*
	1990	*2002*		
Czech Republic	0.364	0.301	–17.2%	–1.6%
OECD Europe	0.204	0.176	–13.5%	–1.2%
Poland	0.393	0.240	–39.0%	–4.0%
Slovakia	0.450	0.329	–26.9%	–2.6%
Hungary	0.272	0.209	–23.2%	–2.2%
Austria	0.154	0.144	–6.7%	–0.6%

Source: Energy balances.

Table 16

Change in Electricity Intensity, 1990 to 2002

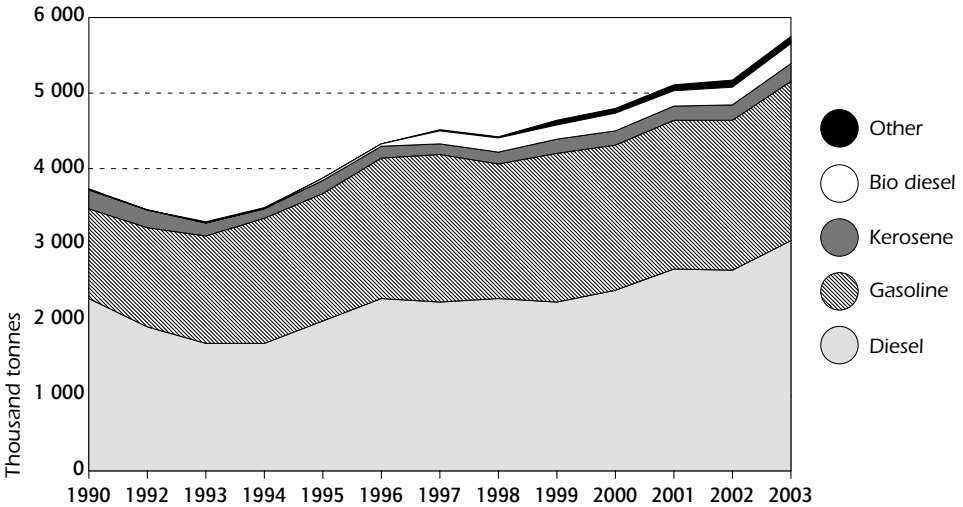
Country/region	*Electricity consumption/GDP (kWh per 1995 US$ PPP)*		*Total % change in intensity*	*Annual % change in intensity*
	1990	*2002*		
Czech Republic	1.05	1.034	–1.5%	–0.1%
OECD Europe	0.284	0.277	–2.5%	–0.2%
Poland	1.05	0.706	–32.8%	–3.3%
Slovakia	1.291	1.078	–16.5%	–1.5%
Hungary	0.706	0.616	–12.7%	–1.1%
Austria	0.221	0.219	–0.9%	–0.1%

Source: Energy balances.

When considering final energy consumption and the intensity of the various sectors of the Czech economy, the transport sector stands out as the only sector whose energy consumption per unit of total GDP is increasing. Total final energy consumption per unit of GDP for the country as a whole has fallen by nearly 30% from the early 1990s to 2002. Final consumption in the residential sector per unit of GDP has fallen by 34% over the same period and for industry the percentage decrease is more than 45%. For road transport, however, final consumption per unit of GDP has risen by more than 67% from the early 1990s to 2002. Figure 10 shows the growth in fuel use in the transport sector.

Figure 10

Energy Use by Fuel in the Transport Sector, 1990 to 2003



Source: Czech Ministry of Transport.

ENERGY EFFICIENCY POLICIES

The primary policy structure supporting government energy efficiency efforts is the National Programme for the Support of Energy Savings and the Utilisation of Renewable and Secondary Sources of Energy. The Czech government analysed the energy efficiency activities of the National Programme for 2003 in order to evaluate their benefits against their costs. These activities under review (and described below) have been administered by the Ministry of Industry and Trade and most of them have been carried out by the Czech Energy Agency (CEA).

The total subsidy in 2003 represented the sum of CZK 102 million; 299 actions were supported, of which 61 were investment (implementation) projects. For the purpose of this evaluation, the actions are divided into three groups:

- Conservation projects – implementation of specific measures resulting in energy savings achieved.
- Energy audits – evaluating the existing condition of buildings and equipment and advising on the implementation of energy-saving measures.
- Others – territorial energy concepts, research and development, consultancies.

CONSERVATION PROJECTS

Conservation projects that increase the effectiveness of energy use in production, distribution or final consumption are entitled to apply for subsidies. The subsidy can cover up to 15% of the total investment cost for installation of new equipment, up to a maximum of CZK 3 million per site. Altogether, 61 implementation actions for energy conservation were supported out of 179 applications submitted. The supported projects constituted an investment of CZK 802 million (of which CZK 70 million were state subsidies) for a total saving of 465 505 GJ per year. To save 1 GJ, it was necessary to invest approximately CZK 1 724 (of which the subsidy amounted to CZK 150, or on average 8.7% of the total investment). The calculations of economic efficiency show that net pay-off period of investment for all the implementation actions is under 8.8 years (using an internal rate of return, IRR, of 11.6%). The amount of energy savings resulting from these projects is approximately 13.6 million cubic metres of natural gas. They will also reduce CO_2 emissions by over 50 000 tonnes annually.

ENERGY AUDITS

A subsidy for the elaboration of an energy audit can be awarded to regions, towns or communes as well as to schools, health care, civic amenities and other public institutions. The subsidy for the energy audit can cover up to 30% of its total costs, up to a maximum of CZK 500 000. The total sum allocated for the elaboration of energy audits of buildings and equipment was CZK 9.8 million. The total cost of the audits was CZK 34 million so the subsidies amounted to 28.6% of the total costs on average. The sites granted subsidies are obliged to start the energy-saving measures recommended by the audit within five years from the elaboration of audit (or within three years for business entities). If all sites were to fully follow through on the recommendations of their audit, the facilities would make efficiency investments of CZK 535 781 million with a predicted energy savings of 194 915 GJ/year.

OTHER PROJECTS

CZK 3.3 million in subsidies was provided to enable the drafting of 12 territorial energy concepts (TEC) of which one was for a region, two for statutory cities and nine for other municipalities and towns. The total cost of drafting the TECs was CZK 14.163 million, with the share of subsidies equal to 23% of this total.

Energy Consulting and Information Centres of the Czech Energy Agency (ECIC CEA) or Municipal Energy Consulting Centres (MECC) operated in a

total of 52 locations across the country. Provision of consulting services was subsidised with CZK 5.9 million, or CZK 114 000 per consulting centre per year on average. These centres provided 9 914 consultations and responded to 475 inquiries over the Internet.

In 2003, the status of a Regional Energy Agency was bestowed on five organisations in the following regions: Ústí, South Bohemia, Zlín, Plzeň and Vysočia. CZK 1.8 million went towards their operation.

CZK 11.6 million was earmarked to help organise 39 educational and promotional events and subsidise 25 products and 9 information and computer systems developed to support consulting and design activities in the area of energy conservation and renewable sources. The total cost of this programme was CZK 26.9 million.

RESIDENTIAL AND COMMERCIAL EFFICIENCY MEASURES

In addition to the general measures described above which often apply to the residential and commercial sectors, a number of other initiatives have been put in place to increase the efficiency of heating and appliances in buildings.

The Decree No. 291/2001 Coll. sets out the details of energy efficiency for heating consumption in buildings. Decree No. 137/1998 Coll. for the Construction Law established the thermo-technical and energy properties of buildings that must be met by both new construction and refurbishment. The decree sets the formula for the calculation of continuous heating and ventilation consumption and sets the calculation for the heat profits and consumption and the capacity of heating energy. The decree further sets out the possibility of using calculations according to the Czech State Norms No. 730450, 060210 and EN 832 and has been in place since 1 January 2002. The specific energy consumption set up by this decree is binding for all constructions and reconstructions financed from public means. As far as construction from private means is concerned, limits for the overall consumption exceeding 700 GJ/year are given.

Decree No. 152/2001 Coll. established rules for the heating and distribution of warm service water (WSW), specific heating consumption indicators for heating and WSW preparation and requirements for equipment of the inner heating facilities of estates with appliances which regulate heating energy supplies to the end-user. There are rules for heating and distribution of the WSW, central heating and centralised WSW systems in households and non-residential premises of rented houses, co-operatives and privately owned dwellings. The specific consumption indicators for heating and WSW supplies are applied for new constructions or reconstructions.

The Decree No. 215/2001 Coll. requires the labelling of appliances with energy labels and technical information. The labels must have a specific design and structure and provide an energy efficiency ranking in comparison to other competing products. The decree also establishes minimal energy efficiency standards for electrical appliances.

TRANSPORT EFFICIENCY MEASURES

The main policies to curb energy use in transport are listed below:

- Use of biodiesel as realised in the framework of the so-called OLEOPROGRAMME, in which the Ministry of Transport is involved.
- Research into the possibilities of using bioethanol in transport as an alternative energy source in the framework of the implementation of Directive 2003/30/EC of the European Parliament and of the Council of 8 May 2003.
- Electrification of public transport – Czech Railways, municipal transport companies.
- Supporting public transport especially in large urban agglomerations.
- Supporting the implementation of environmental management systems by cleaner production in transport companies.

The Ministry of Transport programme for energy saving and use of alternative fuels in transport is divided into the following fields:

- Transport infrastructure:
  - Reduction of energy use during the construction, use and operation of the transport infrastructure.
- Organisation of transport:
  - Implementation of mobility management (car-pooling, car-sharing, etc.).
  - Actions to reduce traffic congestion.
  - Support of "Park and Ride".
  - Actions to increase other modes of non-motorised transport (cyclists, pedestrians, etc.).
- Promotion of economical energy use in transport with emphasis on environmental improvement:
  - Improvement of public awareness of economical energy use in transport.
  - Changing public perception of the urgency of economical energy use in transport.
  - Changing public perception of non-renewable energy use in transport.
- Support of alternative fuels:
  - Support of technology for alternative fuels.
  - Support of technology application for the production and storage of hydrogen for vehicles and the technology of fuel cells for vehicle propulsion.

In addition to these measures, the government is also implementing a National Cycling Strategy in conjunction with a range of interest groups and motivated individuals. The plan defines steps for strengthening municipalities' functions in the improvement of the transport network and its accessibility from the point of view of the quality of life of the inhabitants.

HISTORICAL AND POTENTIAL RENEWABLE ENERGY PRODUCTION

In 2002, the Czech Republic produced 1.05 Mtoe of renewable energy, or 2.5% of TPES. This amount is well below the average for both the EU (7.0%) and for the IEA as a whole (5.8%).

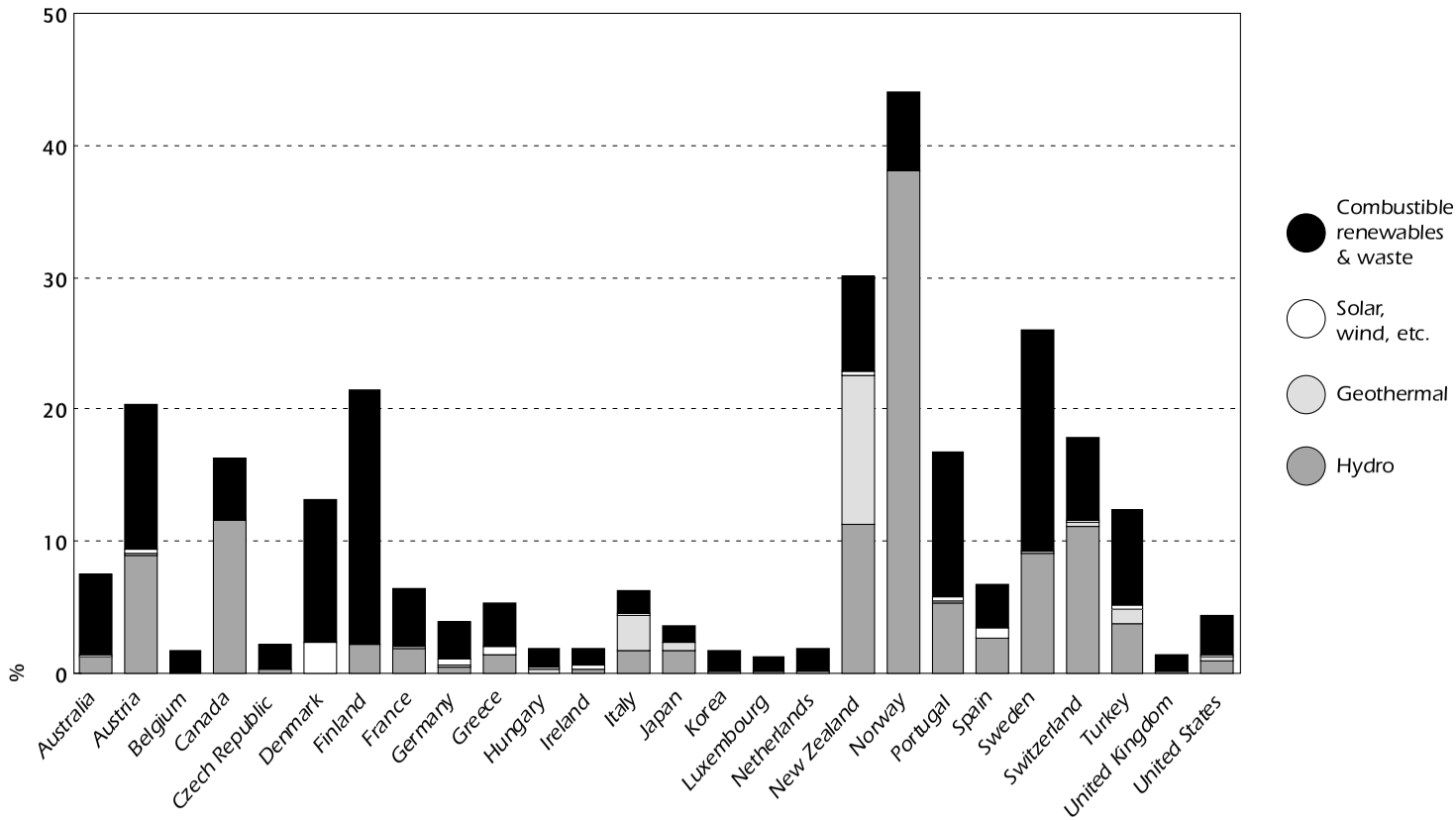
The percentage share of Czech TPES for renewables has risen from 1.5% in 1992[10] to 2.5% in 2002. Much of this increase has been seen in the last five years; from 1997 to 2002 the absolute supply from renewables has risen by more than 50%. Biomass dominates renewable energy production in the Czech Republic, accounting for 80% of the total renewables contribution. Hydropower contributed about 20%, with wind accounting for only 0.02% of the total renewable energy supply in 2002. In the same year, renewables generated 4.2% of total electricity generation with hydropower accounting for 3.3% and biomass 0.9%. While this is the highest percentage share of electricity generation that renewables has ever had, a large part was due to very wet meteorological conditions in 2002 and the resulting increase in hydro capacity. Less favourable conditions in 2003 caused hydroelectric generation to fall by nearly 40% from 2002, although final data on the share of all renewables are not yet available.

The Ministry of Environment commissioned a study to examine the potential of renewable energy production. The final report, produced within the framework of the project entitled "Prognosticating the use of renewable energy sources in the Czech Republic until the year 2050", was co-ordinated by the Association for the Use of Renewable Energy Resources and includes assessments of the technical, available and economic potential of different renewables. While some of the resulting numbers on Czech renewable potential are substantial, anecdotal evidence indicates that renewable resources in the country are modest. The country's northern latitude makes solar power less appealing and, as a landlocked nation, wind speeds are generally low. In addition, the most attractive sites for wind turbines are in mountainous regions which also tend to be national or local parks, thus inhibiting development on environmental grounds.

10. Renewable energy data before 1992 are not reliable.

Figure 11

Renewable Energy as a Percentage of Total Primary Energy Supply in IEA Countries, 2003*



* preliminary data.

Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2005.

RENEWABLE ENERGY SUPPORT MEASURES

The renewable energy policy of the Czech Republic is currently under review with a new strategy expected in 2005. There are currently two ways in which renewables are supported: *i)* investment subsidies and low-interest loans, and *ii)* feed-in tariffs for the purchase of electricity from renewable resources.

INVESTMENT SUBSIDIES AND LOANS

The Czech government provides a range of subsidies and loans to renewable energy projects available to both businesses and governments. Direct subsidies may be provided from 30% to 90% of a project's initial costs. In addition, loans are offered that can cover up to 70% of a project's cost with below-market interest rates and, in certain cases, with no interest payments at all. Eligible projects include hot water heaters for homes, small hydroelectric stations, co-generation projects using biomass and/or biogas, wind turbines, heat pumps, photovoltaic cells and education, promotion and counselling in the field of renewable energy.

In 2003, 1 053 such projects received support. The total investment costs of these projects was CZK 615.3 million, of which CZK 323.6 million (53%) was obtained via direct subsidy and CZK 85.2 million (14%) was obtained via a low-interest loan. The remaining percentage (33%) was obtained by project sponsors. If all these projects proceed as envisaged, they would cumulatively result in a reduction of CO_2 emissions equal to 50 864 tonnes per year.

FEED-IN TARIFFS

Electricity distributors are required to purchase electricity generated from renewable resources at rates determined by the Energy Regulatory Office in its annual pricing decisions. The progression of these rates over the last several years is shown in Table 17.

The new legislation for treatment of renewables to be implemented in 2005 is expected to continue with feed-in tariffs as the primary means of support. While a number of ideas with a more market-oriented approach have been discussed (*e.g.* certificates system with quotas for suppliers), it is likely that the feed-in tariff system will continue in a modified form.

DISTRICT HEATING (DH) AND COMBINED HEAT AND POWER (CHP)

CURRENT SITUATION

District heating (DH) plays an important role in the Czech Republic. More than 60% of heat supplied in the country comes via DH with heat-only plants

Table 17

Mandatory Prices Received for Electricity Generated from Renewable Resources

Type of renewable source	*Minimum purchase price per MWh of power supplied to the grid, in CZK*		
	2002	*2003*	*2004*
Small hydroelectric plants	1 500	1 500	1 550
Wind power stations commissioned after 1 January 2004	–	–	2 700
Wind power stations commissioned before 1 January 2004	3 000	3 000	3 000
Biomass combustion electricity production	2 500	2 500	2 500
Electric energy generation by burning fuel mixtures of biomass and fossil fuels	–	–	2 000
Electric energy generation by burning biogas in plants commissioned after 1 January 2004	–	–	2 400
Electric energy generation by burning biogas in plants commissioned before 1 January 2004	2 500	2 500	2 500
Geothermal energy used for electricity production	3 000	3 000	3 000
Solar radiation used for electricity production	6 000	6 000	6 000

being used in 55% of these facilities and CHP plants used in 45% of the facilities. In 2003, DH supplied 4.2 Mtoe of heat. Households received 44% of this heat, followed by industry (39%) and commercial services (17%). The CHP plants in the Czech Republic have a total installed electricity capacity of 6 000 MW_e and accounted for 18% of national electricity generation. Fuels used for DH are shown in Table 18.

Table 18

Fuels Used in District Heating Facilities, 2003

Type of fuel	*Consumption, PJ*	*Share, %*
Brown coal and lignite	78	42.6
Hard coal and coke	36	19.7
Gaseous fuels	41	22.4
Liquid fuels	11	6.0
Renewables	17	9.3
Total	**183**	**100**

SUPPORT SYSTEM FOR CHP

In order to support the energy efficiency advantages of CHP plants, the government has created legislation that favours its continued and expanded use. The Energy Act stipulates that electricity from CHP plants should have a right of connection to the network and that local electricity distribution companies are obliged to purchase electricity from CHP plants at rates determined by the Energy Regulatory Office (ERO). For CHP plants with an installed capacity up to 5 MW_e, local distribution companies are obliged to pay CZK 1 130/MWh. For CHP plants with an installed capacity greater than 5 MW_e, a generator receives the market price for electricity plus a bonus of CZK 38/MWh. These payment amounts are decided upon annually by the ERO.

CRITIQUE

ENERGY EFFICIENCY

The Czech Republic has seen substantial decreases in its energy intensity in the last ten or so years. Since 1990, Czech energy intensity (as measured by TPES over units of national GDP) fell by 1.6% annually with a total decrease of 17.2%. The energy intensity decrease for OECD Europe as a whole over the same period was 1.2% annually. However, the Czech figures are still well above those of other European countries. Energy intensity is still 71% greater than the European average and even higher than in comparable countries such as Poland (26% higher) and Hungary (44% higher). In addition, the rate of decrease of Czech energy intensity lags behind that of its neighbours. Whereas the Czech Republic has decreased energy intensity by 1.6% annually since 1990, Poland has seen a decrease of 4.0% annually, Slovakia 2.6% and Hungary 2.2%. While the electricity intensity of the Czech economy has stayed roughly constant since 1990, this has decreased by more than 30% in Poland, around 16% in Slovakia and by more than 12% in Hungary.

These figures suggest that great potential for more energy efficiency improvement exists in the Czech Republic. As such, the SEP is completely appropriate in establishing improved energy efficiency as its primary goal. The goals it has established are highly ambitious: *i)* an annual decrease of energy intensity of 2.6% by 2005 and between 3% and 3.5% as a long-term goal, *ii)* an annual decrease of the electricity intensity of around 2%, and *iii)* stabilisation of the country's TPES. These goals are laudable but the targets are inconsistent with historical trends and, therefore, substantial government efforts need to be made. Unfortunately, the SEP lacks concrete plans for the tools and measures that would be necessary to dramatically alter past trends. As a result, an analysis of the feasibility of the targets and what their cost and benefits would be is difficult to perform. More concrete plans, coupled with detailed sector-specific energy intensity targets, will be necessary to meet the SEP's ambitious and important targets.

There is no sectoral breakdown of the overall energy intensity target. Given that energy efficiency relates to a wide range of sectors, without such sectoral targets (even indicative ones), it would be extremely difficult to monitor progress made and to take additional measures when necessary. At the same time, the lack of sectoral targets could lead to weaker recognition of responsibilities by relevant ministries and make it difficult to incorporate energy efficiency viewpoints in the sectoral policies. Stronger co-ordination among different ministries with clear leadership is essential.

The Energy Act is the legal framework to promote energy efficiency involving such measures as energy labelling of household appliances, obligatory energy auditing, binding limits of minimal level energy efficiency of certain products and technologies. These policies should be supported by concrete measures (*e.g.* premiums, tax incentives, energy taxation, subsidies) accompanied by information dissemination by the Czech Energy Agency. The National Allocation Plan based on the EU-Emissions Trading System has been recently agreed at government level, which can also encourage further energy efficiency efforts in large-scale emitters in the energy and industrial sectors. While mandatory auditing is applied only to large-scale consumers, the government should consider how to maximise energy efficiency for small and medium-size industrial consumers which are not covered by the EU-ETS system. One option could be to oblige them to appoint energy managers, or to conduct simpler energy audits compared with the ones for large-scale industry. This could expand the opportunities of such enterprises to recognise their energy saving potentials and make access to various support schemes such as the PHARE Energy Saving Fund.

Transport represents the biggest challenge in improving Czech energy efficiency. Energy use in that sector is growing faster than in any other area with no signs of decline. The government's projection (or target) to stabilise energy demand in the transport sector seems to be overly ambitious. In addition, measures to curb transport energy use are not easy to implement. Neither the Emissions Trading System nor any type of non-biofuels renewable energy can help in this area. In addition, the measures put in place through the National Programme for the Support of Energy Savings and the Utilisation of Renewable and Secondary Sources of Energy do not directly address the issues. While the Ministry of Transport is taking various measures to promote public support for alternative fuels and to curb oil consumption in the sector, the programme has only a few quantitative targets, such as the share of biofuels, and has not succeeded in reversing the trend of growing consumption and growing share of road transport. Greater concentration on the ramifications of transport energy growth that continues at such a rapid pace will be needed. Economic and regulatory measures to accelerate the penetration of more fuel-efficient vehicles and the retirement of older inefficient vehicles (*e.g.* fuel taxation, vehicle taxation, car inspection, etc.) should be explored. The government has taken

certain measures to address the energy demand in road transport through park and ride schemes and such policies should be further expanded in other cities.

As with all sectors, but especially in the transport field, co-ordination between the ministries is important. The Ministry of Transport leads in efficiency efforts in this sector, but its activities are complementary with activities in other sectors and any such synergies between entities implementing energy efficiency tools and measures should be explored.

It is also a challenge to lower energy demand growth in the residential/commercial sector which is not covered by the EU-ETS system. Renovating old and inefficient panel buildings has significant energy efficiency potential.

RENEWABLE ENERGY

Renewable energy helps to address many of the issues that Czech energy policy-makers have identified as important for the country. In addition to being environment-friendly, renewable energy is a domestic resource that will help the country maintain its stated goal of minimising energy dependence. Renewable energy use in the Czech Republic is very modest compared to the standards of other EU or IEA countries, both on an absolute and percentage basis. Renewable energy has not been a major factor historically (as it has in some other countries with hydropower or biomass), there is little industrial push for new technologies (as was seen in Denmark with wind power) and government support for renewables is not as developed as in other EU and/or IEA countries.

The government is to be commended for its plan to overhaul the existing support mechanism. The two-tiered approach of feed-in tariffs with subsidies is unnecessarily complicated and could result in overlap of support. In addition, the use of such investment subsidies is not widespread in IEA countries since it can be costly and with limited impact. In general, IEA countries have moved on to support schemes consisting of either feed-in tariffs or a renewable portfolio requirement with tradable certificates (*i.e.* "green certificates"). The Czech Republic would be well served to do likewise.

In the event that a continuation of the feed-in tariffs is decided upon, a number of factors should be kept in mind. The major reason that feed-in tariffs have induced substantial investments is the assured revenue they represent to project developers. Well-designed feed-in tariff legislation can give sufficient security to debt and equity players to invest in a project. On the other hand, under the feed-in tariff, depending on the design, the incentives for cost reduction may not be strong and it may be the producers, not the consumers, who enjoy the benefit of any cost reductions, unless benefits are passed through as a result of competitive pressure. Therefore, the level of feed-in tariffs must be regularly reduced to encourage and reflect continued advancements

for the technologies in question. However, if these tariffs are reviewed and re-visited each year without predictability, as is currently done in the Czech Republic, the assurances are no longer so secure and, as a result, an investment risk is created which will lead to fewer new renewable plants. As such, the most effective means of attracting investment, while at the same time encouraging improved efficiency, is by establishing a feed-in tariff that is guaranteed over the pre-determined period with built-in rate reductions over the lives of the projects. Noting that renewable energy will benefit from the EU-ETS scheme, this factor should be taken into account in setting the level of feed-in tariffs. Furthermore, the necessity of differentiated feed-in tariffs for different technologies should be reviewed because supporting all technologies equally without regard to the cost or future prospects may not be cost-effective.

A green certificates system tends to be more complicated than the feed-in tariffs. It requires the active participation of more players and greater oversight by government and regulatory bodies. There is less experience with this support system and the results to date have yet to demonstrate that it can induce the same level of investments as with feed-in tariffs. At the same time, green certificates schemes can more effectively use the market to minimise the prices paid by consumers and stimulate advances and innovations in the technologies and their operations. If the Czech Republic chooses a green certificates programme, it may wish to consider the benefits of an international, or regional, market for the certificates. This could expand opportunities for siting plants in the most suitable geographic areas and lower prices to consumers. Regardless of the renewable support scheme ultimately chosen, care should be taken to avoid overlap with any other support schemes, whether they be domestic or international (*e.g.* the EU-ETS).

Biomass use for both heating and transport warrants special attention. Biomass is the renewable resource best suited to the Czech Republic. While there have been some efforts to promote its use, they have been scattered. A true push for biomass would combine the efforts of the Ministries of Industry, Environment and Agriculture. Biomass end-use is well suited for heating given the extensive district heating networks in urban areas and the greater difficulty of providing fossil fuels for heating in rural areas. Biomass also has potential as a transport fuel. Support for biomass in either or both of these two end-uses will require co-ordination and ingenuity since its use will not fall automatically under the standard renewable energy support systems or the emissions trading scheme.

DISTRICT HEATING AND COMBINED HEAT AND POWER

District heating and combined heat and power are important in supplying reliable energy products to the Czech population and its economy. The regulatory support of CHP obligatory purchases and above-market rates is

motivated by the technology's high efficiency in producing two products with one fuel. This is prudent given the government's goals of improving efficiency. At the same time, indiscriminate support for CHP will not provide targeted motivation for the more efficient CHP plants or for those plants using biomass as part of their fuel mix. The government is encouraged to define the role of CHP, particularly the more efficient and/or biomass-burning facilities, in meeting the country's energy goals.

OVERVIEW

Both energy efficiency and renewable energy offer the means to help the Czech Republic meet its goals of greater environmental friendliness and reduced dependence on imported energy resources. These goals are often pursued in tandem with much of the legislation and organisational structure supporting them overlapping. Even the budgets for both energy efficiency and renewable energy overlap and it is difficult to discern exactly where the money is being spent. However, it appears that government funding for energy efficiency has fallen in recent years while funding for renewable energy has risen. For example, since 1997, Czech Energy Agency resources have been substantially reduced. It is not consistent with the ambitious targets for energy efficiency improvement. This is largely attributed to a significant reduction in the support programme for renovating existing buildings and diversion of budget priority to promoting renewable energy sources.

If energy demand can be reduced at a lower cost than production of useful energy through renewable means, more emphasis and attention should be directed towards energy efficiency and vice versa. As a result of the country's history and geographical position, indications are that the potential for energy efficiency in the Czech Republic is greater than that for renewable energy. The finite budget priorities of the government should be allocated accordingly. A periodic comparison of the costs of both energy efficiency and renewable energy can help minimise payments that taxpayers and society in general will incur to achieve the nation's energy goals.

RECOMMENDATIONS

The government of the Czech Republic should:

- *Develop sectoral targets supported by concrete measures to achieve the national target of improving energy efficiency, and closely monitor progress.*
- *Define clear responsibilities of relevant ministries and strengthen co-ordination among different ministries to improve energy efficiency in each sector.*

- *Consider expanding efforts to capture the energy-saving potential of medium- and small-size energy users.*
- *Address energy demand growth in the transport sector by:*
  - *Further fostering more energy-efficient modes such as public transport.*
  - *Providing economic and regulatory incentives (*e.g. *fuel taxation, vehicle taxation, car inspection system) for the choice of more fuel-efficient vehicles and for the accelerated retirement of old and inefficient vehicles (vehicle taxation, car inspection system, etc.).*
  - *Enhancing measures to control the volume of road traffic such as park and ride and road pricing.*
- *Enhance policies to encourage renovation of existing energy-inefficient buildings.*
- *Define the role of combined heat and power (CHP) in achieving national energy policy objectives and target the support scheme for CHP plants with higher efficiency.*
- *Pursue renewable energy policy that is cost-effective with elements of incentives for cost reduction. Consider a market-oriented approach such as green certificates.*
- *Enhance measures to promote renewable energy use in the heat and transport sectors.*
- *Review prioritisation of state budget allocation between energy efficiency improvement and renewable energy promotion based on its cost-effectiveness.*

NATURAL GAS

SUPPLY AND DEMAND

In 2003, natural gas accounted for 7.8 Mtoe of primary energy supply, or 17.8% of the national total for all fuels. The gas supply share is down slightly from 18.6% in 2002 but up substantially from 11.1% in 1990. The large majority of gas is imported (98.2% in 2003). Historically all imported gas came from Russia (and previously the USSR). However, in the late 1990s, in an effort to diversify supply and increase energy security, the Czech Republic began importing gas from Norway. In 1997, Norwegian gas constituted 9.2% of total imports and this amount has steadily grown to 27% in 2002. This import share is not expected to grow further. Norwegian gas contracts are with producers Statoil, Norsk Hydro and Saga Petroleum and have run from 1997 while the contract with Russian Gazprom has run from 1998. These import contracts will not terminate until some time after 2010. While gas use and gas imports are growing in the Czech Republic, they are still a fraction of the gas that transits the country. In 2003, transited gas was approximately four times more than domestically consumed gas. The transit gas system is discussed more in the section on the transportation network below.

Domestic gas production is limited. The only gas production company in the Czech Republic is Moravské naftové doly, a.s. (MND) in Hodonín, owned 51.8% by SPP Bohemia (described below) and 48.2% by EUROPGAS a.s. (a 50/50 joint venture between Ruhrgas and Czech interests). The annual production from the Southern Moravia fields is approximately 100 million cubic metres, but may decline in the coming years owing to resource depletion.

In 2003, the final consumption of gas in the Czech Republic was 6.3 Mtoe, or 23.8% of the total for all fuels. While this figure is below the 24.9% share in 2002, it represents a substantial increase from gas's 11.9% share of TFC in 1990. In 2003, industry accounted for 40% of gas final consumption, followed by residential with 38% and commercial and public services with 22%.

The government has put forward various projections for gas use in coming decades. In the forecasts sent by the government to the IEA, gas supply is expected to grow substantially. According to these data, by 2010 absolute gas supply will have increased by more than 40% to capture 26.4% of national TPES. By 2020, gas's share of TPES is forecast to grow to 30.2%. However, forecast scenarios used in the government's March 2004 State Energy Policy show a considerably more modest role for gas. In 2010, gas's share of TPES will only be 20.2% and stay relatively stable in 2020 (20.5%) and 2030

(20.6%). The same divergence between the forecasts can be seen in the final consumption figure. Data provided to the IEA show gas reaching 30.4% of TFC in 2010 and 31.9% in 2020 while the SEP forecast predicts the share of gas will be just 27% in 2010 and fall to 26% in 2020.

INDUSTRY STRUCTURE

The Czech gas industry is dominated by the RWE Group of Germany. As part of the privatisation process of the gas sector, RWE Gas AG paid 4.1 billion euros to the Czech government's National Property Fund to obtain shares in all the Czech gas transport and distribution companies:

- Transgas a.s., Prague: 100%.
- Pražská plynárenská a.s., Prague: 49.18%.
- Středočeská plynárenská, Central Bohemia: 51.18%.
- Severočeská plynárenská, Northern Bohemia: 51.8%.
- Západočeská plynárenská, Western Bohemia: 50.11%.
- Východočeská plynárenská, Eastern Bohemia: 50.1%.
- Jihočeská plynárenská, Southern Bohemia: 46.66%.
- Severomoravská plynárenská, Northern Moravia: 58.2%.
- Jihomoravská plynárenská, Southern Moravia: 50.11%.

Transgas is the country's only substantial gas importer and owns and operates the high-pressure transportation lines serving both the transit and the domestic market.

The other eight companies are all local gas distributors. The six distribution companies in which RWE owns a majority share have an 83% market share of final sales. Of the two other distributors, one is majority owned by E.On-Ruhrgas of Germany and the other is majority owned by the municipality of Prague. The size and operations of all the distributors are shown in Table 19.

The Office for the Protection of Competition approved the sale of gas assets to RWE with the following two conditions:

- RWE must not acquire Moravské naftové doly, a.s., a domestic gas producer and storage company.
- RWE must not acquire or construct electricity distributors or heat-producing companies until the privatisation process has been completed. These conditions have so far been met.

Table 19

Czech Regional Gas Distribution Companies

Company	*Gas sales (bcm)*	*Number of customers*	*Length of gas pipelines*
Pražská plynárenská a.s.	1.163	436 294	4 001
Středočeská plynárenská	1.007	208 706	6 472
Jihočeská plynárenská	0.436	104 096	3 763
Západočeská plynárenská	0.767	234 521	5 901
Severočeská plynárenská	1.155	305 708	6 165
Východočeská plynárenská	0.998	270 113	10 241
Jihomoravská plynárenská	2.266	617 752	17 204
Severomoravská plynárenská	1.743	555 663	13 176
Českomoravská plynárenská	0.019	4 871	556
Transgas a.s.	0.031	6	–
Total net sales in the CR	**9.585**	**2 737 730**	**67 479**

Source: The Central Gas Dispatching Centre.

TRANSPORTATION NETWORK

The main international transit gas pipeline began in 1974. It is 2 455 km long and had six compressor stations, five pipeline systems and an overall transportation capacity of between 50 and 60 billion cubic metres (bcm) per year[11]. Transit gas arrives at the incoming transfer stations of Lanžhot and Olbernau and departs from the outgoing transfer stations in Waidhaus and Hora Svaté Kateřeny. In 2003, the pipeline transited 30 bcm of gas, or about 25% below capacity. Transit gas volume has fallen from its peak of around 40 bcm in 1999 owing to the commissioning of a transit pipeline connecting Russia and Germany through Poland. Despite the decrease in flow, gas transit through the Czech Republic still accounts for 25% of Gazprom's exports to the EU, 16% of Gazprom's total exports and around 11% of all gas imports into the EU.

The transit system is connected to the Transgas internal system which consists of 1 183 km of large-diameter, high-pressure transmission pipelines (maximum 64 bars) and 22 transmitting stations. Natural gas is supplied to end-users through a 48 200 km distribution network (with operating pressures less than 4 MPa) that includes 4 312 regulation stations.

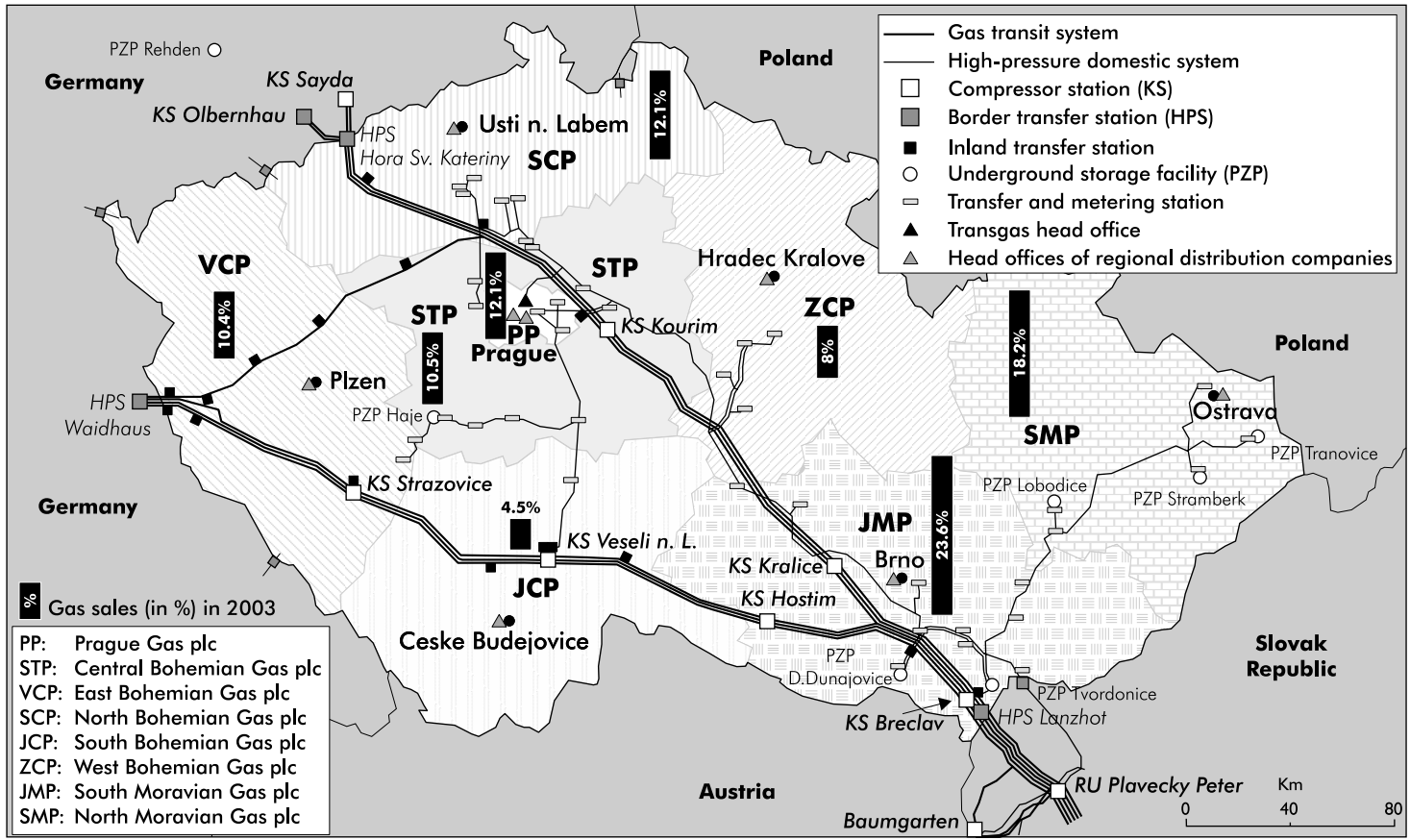
Thanks to network expansion efforts in the late 1990s, the Czech Republic has achieved a high level of gasification. Up to 90% of municipalities with populations greater than 2 000 inhabitants and 50% of smaller municipalities with populations greater than 500 inhabitants are supplied with natural gas. Overall, 66% of households have access to gas, up from 54% in 1994.

A map of the gas transport pipelines and facilities is shown in Figure 12.

11. Exact transit capacity is not considered public information by the pipeline owners.

Figure 12

Gas Transport Pipelines and Facilities



Source: Transgas, RWE.

STORAGE AND SECURITY OF SUPPLY

Securing the safety of gas supplies is governed by legislation in Act No. 458/2000 Coll. where the transportation operator is obliged to ensure gas supplies from different sources. In future, in conditions of an open market, safety will be ensured, among others, by the implementation of the Directive 2004/67/EC in agreement with Act No. 458/2000 Coll. This implementation must be completed by 19 May 2006 and will include the required 8 weeks' period for securing supplies in case of serious supply interruption as well as the protection of household supplies in the event of a 1-in-20 winter. Secondary legislation also dealing with the safety of gas sources is the MIT Decree No. 167/2001 Coll. on emergency state in crisis situations in the gas industry.

Underground storage facilities play a major role in meeting seasonal demand variations. Demand in winter is approximately four times the demand in summer. Six underground storage tanks, owned by Transgas, are connected to the network with a total capacity of approximately 2 bcm with a peak daily output of 40 million cubic metres (mcm). In addition, in 1999 SPP Bohemia[12] constructed an underground storage facility in Dolní Bojanovice which has a direct connection to the Slovak gas system. In 2001, Moravské naftové doly, a.s. (MND)[13] started operation of an underground storage tank in Uhřice. This has a storage capacity of approximately 130 mcm and a daily peak output of 6 mcm. Its capacity should grow to 180 mcm by 2006. In addition to these domestic facilities, 500 mcm of storage in neighbouring countries is contracted for use by the Czech Republic.

Most of the storage is located in depleted gas reservoirs. The total storage capacity represents 25% to 30% of the domestic annual gas consumption. Storage details are shown in Table 20.

Table 20

Czech Gas Storage

Underground storage tank	*In operation since*	*Volume of operation (mcm)*
Lobodice	1965	150
Tvrdonice	1975	460
Štramberk	1983	450
Dolní Dunajovice	1989	700
Háje	1998	55
Dolní Bojanovice (SPP)	1999	576
Třanovice	2001	240
Uhřice (MND)	2001	130

Source: The Central Gas Dispatching Centre.

12. SPP Bohemia is a Czech gas trading company owned 50% by SPP (the Slovak gas transporter, distributor and supplier), 25% by Ruhrgas and 25% by other Czech interests.
13. MND is owned 51.8% by SPP Bohemia and 48.2% by EUROPGAS a.s. (a 50/50 joint venture between Ruhrgas and Czech interests).

In the event of supply disruptions, the Energy Act authorises the TSO (Transgas) and the local distributors to promulgate a state of emergency. In 2001, the MIT issued the Decree No. 167/2001 dealing with emergency situations in the gas sector. In such cases, all customers and licence holders in the gas sector are obliged to accept a reduction in gas supply. The law allows for a reduction of gas to final customers to a level of minimum safety or a complete interruption of supplies if necessary.

GAS PRICES

Retail gas prices for both Czech industrial and household customers are among the lowest in the IEA. Among a selection of ten IEA countries[14], the Czech Republic has the second-lowest industrial gas prices after Finland. In the household sector, the Czech Republic has the fourth-lowest retail prices among a selection of 13 countries[15]. Consumers are shown in Figures 13 and 14.

Regulated end-user gas prices were increased significantly in 2001 to remove subsidies and cross-subsidies existing in the rate structures of both Transgas and the local distribution companies. Later price changes primarily reflect the strong influence of the import purchase prices of natural gas to the final price for end-users, which are derived from world prices of light and heavy fuel oils in the import contracts as well as from the rate of the CZK towards US$ and the euro. Table 21 shows the year-on-year changes in the regulated prices for different customer classes. The table does not include the influence of the VAT decrease from 22% to 19% since 1 May 2004.

Table 21

Year-on-year % Change in Regulated Gas Prices for Selected Customer Classes

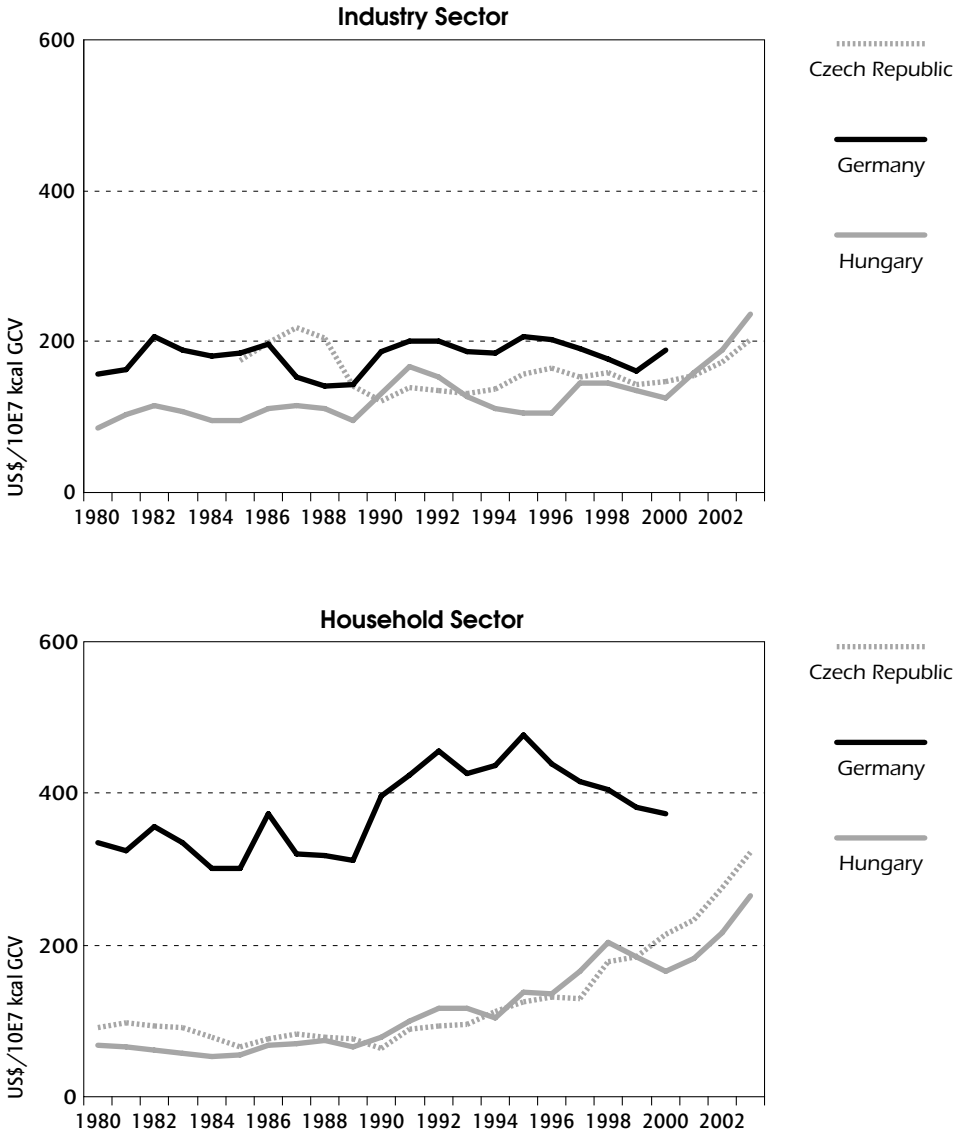
Customer class	*2001*	*2002*	*2003*	*2004*
Large industrial consumption	+17,9	–17,0	+12,1	–3,5
Medium-scale consumption	+22,8	–17,8	+11,0	–4,4
Commercial consumption	+19,0	–12,9	+10,1	–5,7
Household consumption	+38,5	–11,2	+9,2	–0,6

Source: Country submission.

14. Only ten countries are selected owing to the difficulty in securing quality data from the others. These ten countries are: Switzerland, Portugal, Hungary, France, Turkey, the Netherlands, the United States, Spain, the Czech Republic and Finland.
15. As with the industrial sector, the difficulty in securing quality price data limits the comparison pool. The 13 countries are: Denmark, Portugal, the Netherlands, Spain, Switzerland, France, Austria, the United States, the United Kingdom, the Czech Republic, Hungary, Turkey and Finland.

Figure 13

Gas Prices in the Czech Republic and in Other Selected IEA Countries, 1980 to 2003



Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2005.

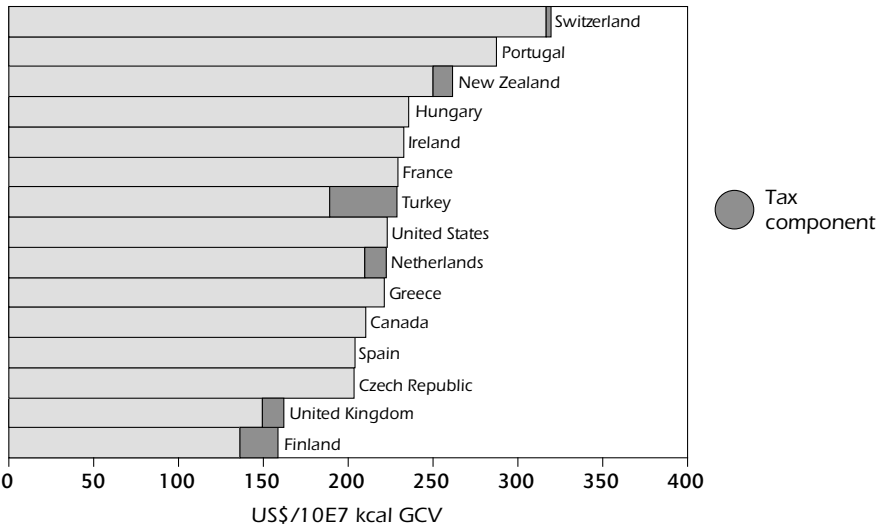
The principles of price regulation for the period 2005-2009 will be based on the following basic common principles:

- Stability of the regulated part of the price.

Figure 14

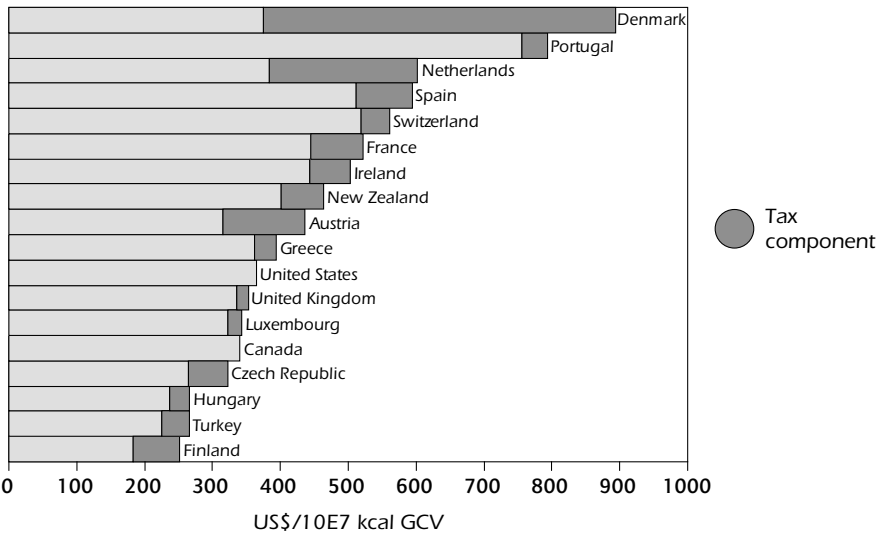
Gas Prices in IEA Countries, 2003

Industry Sector



Note: Tax information not available for Canada and the United States. Data not available for Australia, Austria, Belgium, Denmark, Germany, Italy, Japan, Korea, Luxembourg, Norway and Sweden.

Household Sector



Note: Tax information not available for Canada and the United States. Data not available for Australia, Belgium, Germany, Italy, Japan, Korea, Norway and Sweden.

Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2005.

- Increased economic efficiency of regulated activities.
- Maximal transparency and concrete regulatory methodology.

MARKET REFORM

The Czech natural gas sector is undergoing a process of reform and liberalisation. During the team's visit to Prague in October 2004, the details of this process were still being debated and the information given herein is according to the major legislation pertaining to this issue, Energy Act No. 458/2000 Coll. as amended by the new Energy Act No. 670/2004 Coll. The natural gas market will open to consumer choice in three stages. On 1 January 2005, all consumers who burn gas in thermal power plants or combine the production of electric energy and heat as well as all consumers with gas use greater than 15 mcm yearly were given the right to choose their supplier. On 1 January 2006, all non-residential customers will be given supplier choice and on 1 January 2007, all customers regardless of size will be given supplier choice. Customer classes not declared contestable will continue to be served by the incumbent at regulated rates determined by the ERO. However, once able to choose their supplier, customers will no longer be able to continue receiving service at fully regulated rates and terms. While the network component of their service will continue to be regulated, competing gas providers can offer the supply component of the service at the rates and terms of their choosing.

Unbundling of supply and network activities is currently developing. At present, the accounts of the supply and the network activities of both the high-pressure transport company (*i.e.* Transgas) and the eight local distribution companies are fully unbundled. The more substantial act of legal unbundling will take place by 1 January 2006 for Transgas and by 1 January 2007 for the distribution companies. All customers who have been given supplier choice (or, alternatively, all suppliers serving such customers) are granted non-discriminatory third-party access to the high-pressure and the low-pressure local distribution lines at rates and terms determined by the ERO.

COAL

SUPPLY AND DEMAND

In 2003, coal accounted for 20.9 Mtoe of primary energy supply, or 47.3% of national TPES. This percentage share has been declining steadily over both the long term and the short term. In 1973, coal's share of TPES was 78.4% and as recently as 1991, coal's share was 63.8%. The large majority of coal consumed in the Czech Republic is produced domestically. In 2003, the country produced 24.3 Mtoe of coal. Coal production has declined along with

coal primary supply, having fallen by 43% since its peak in 1979 and by 30% since 1990. In 2003, 49.3 million tonnes of brown coal were mined, 39.3 Mt of which came from North Bohemia. The other coal fields are near the city of Sokolov in Western Bohemia. Most of the mines are opencast and only two underground coal mines are still in operation.

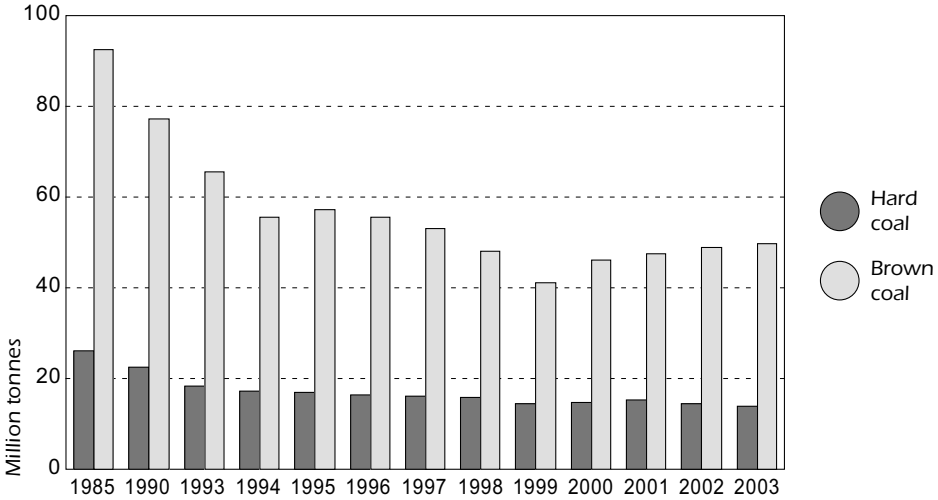
The Czech Republic is a net exporter of coal. In 2003, the Czech Republic exported 4.9 Mtoe of coal and imported 1.3 Mtoe for a net export of 3.6 Mtoe, or 17% of domestic use. Two-thirds of exports are coking coal (3.7 Mt in 2003) mostly to the iron and steel industries in Slovakia (44% of total), Austria (33%), Hungary (12%) and Poland (11%). In 2003, 2.0 Mt of steam coal were exported mainly to Germany (36%), Austria (29%) and Slovakia (28%). Total hard coal exports have approximately doubled since 1990 thanks to the increase of sales to Austria and Germany and represent 42% of total production (50% of coking coal). Also, 1.2 Mt of brown coal was exported in 2003 mostly to Slovakian (63%), Hungarian (22%) and German (13%) power plants. Czech coke producers import hard coal from Poland (1.2 Mt in 2003). From 1999 through 2003, the Ministry of Industry and Trade (MIT) set import quotas for hard coal coming from Poland. In 2003, the authorised import volume of 1.2 Mt was completely used. Over the same time, Poland restricted Czech exports of hard coal to Poland to 0.5 Mt per year. The Czech quotas were put in place to protect domestic hard coal producers but have been eliminated as of 2004 and there are no plans to revive them. Coke exports declined from 1.4 Mt in 1990 to 0.95 Mt in 2003 although imports started in 1993 and reached 0.7 Mt in 2003.

Coal production in the Czech Republic has fallen substantially since the time of the centrally-planned economy, decreasing by 30% from 1990 to 2002. Coal production as a goal, regardless of demand, was no longer pursued. In addition, the requirements for full employment were no longer in place and there was greater awareness of coal's environmental consequences. Lastly, there was a major decrease in the Czech production of steel (also due to the shift from a centrally-planned to a market economy) and, as a result, the demand for coking coal has decreased substantially. Figure 15 shows the production of hard and brown coal in the Czech Republic since 1985.

Continuing exploitation of native coal resources is at times competing with environmental issues and the concerns of local populations. Approximately 1.3 billion tonnes of brown coal reserves are not accessible because of the binding territorial limits imposed by the government. These limits have been put in place out of regard for the environment and the local population and at this point most significantly affect the Czech mining company Mostecká uhelná, a.s. In addition, approximately 360 000 tonnes of hard coal are being blocked in the Beskydy Mountains of Northern Moravia where the new Frenštát mine shaft is being prepared. The local population is opposed to certain facets of this new shaft and opposed its development.

Figure 15

Hard and Brown Coal Production, 1985 to 2003



Source: Country submission.

In 2003, 73% of coal final use went to industry followed by 14% to residences and 13% to other sectors (mainly the commercial sector). While industry's share of coal final consumption has risen at the expense of residences, the absolute amount of coal use in all sectors has fallen precipitously. From 1990 to 2003, absolute coal final use in industry has fallen by 74% and by nearly 80% in the residential sector. These figures underline the larger shift away from coal as an end-use fuel. In the late 1980s coal final consumption as a percentage of coal primary supply was in the 60% range. By 2002, coal final consumption over coal primary supply had fallen to 17%.

INDUSTRY STRUCTURE

There are seven mining companies operating in the Czech Republic. The coal sector has nearly 50 000 employees, representing over 50% of total employment in the energy sector. Two hard coal companies, OKD, a.s. and ČMD, a.s., operate in the Ostrava-Karviná coal mining area situated in the Czech part of the Upper Silesian Basin. In 2002, the second-largest hard coal producer ČMD ceased operations in the Central Bohemian Basin. Brown coal is extracted by huge open pit mining operations by three mining companies: Severočeské doly, a.s., Mostecká uhelná and Sokolovská uhelná, a.s. The only mining company extracting brown coal in an underground mine is Důl Koh-i-noor, a.s. Lignite is extracted in a limited amount in South Moravia near the city of Hodonín. Ownership of the Czech mining companies is open to any group and is largely free of government influence.

In the second half of 2004, the State divested itself of its interests in OKD by selling its holdings to the company's major shareholder, Karbon Invest. Karbon

Invest also owns 80.2% of the country's other hard coal operator CMD; 97.7% of Metalimex, the largest Czech commodity trader; and 36.3% of the brown coal mining company, Sokolovská uhelná. In November 2004, the Cyprus-based company, RPG Industries, acquired a majority stake in Karbon Invest and as a result of the acquisition, Karbon Invest is making buy-out offers to the minority shareholders of the firms it controls. For the brown coal companies, the Appian Group, majority owner of Mostecká uhelná, has indicated it would like to gain majority ownership of the Severočeské doly. The two companies operate on essentially the same coal deposits although local media and other sources have warned against the market concentration consequences of such a development. The Appian Group is also competing to supply large electricity customers that have been given the right of supplier choice under the country's reform process.

Table 22 provides information on the Czech coal companies.

Table 22

Coal Mining Companies in the Czech Republic, 2003

	Hard coal		*Brown coal*				
	OKD	*ČMD*	*Mostecká uhelná*	*Severočeské doly*	*Sokolovská uhelná*	*Lignit*	*Koh-i-noor*
Location of operations	*Karvina*	*Kladno, Stonava*	*Northern Bohemia*	*Northern Bohemia*	*Western Bohemia*	*Hodonin*	*Northern Bohemia*
Production (Mt)							
2002	12.1	2.4	16.2	21.4	10.4	0.5	0.4
2003	11.4	2.3	16.0	22.8	10.1	0.5	0.5
Economic resources (Mt)	191	n.a.	551	582	232	n.a.	n.a.
Calorific value (MJ/kg)	19-36	21	10-18	11-13	12-13	8	15
Number of mines U: Underground O: Opencast	U (4)	U (1)	O (3)	O (2)	O (2)	U (1)	U (1)
Employees							
2002	18 708	4 118	5 469	4 154	2 870	412	786
2003	17 528	3 543	4 641	3 934	2 747	405	513
Productivity, 2003 (t/man-year)	650	650	3 450	5 780	3 670	1 160	900
Ownership							
Capital (bn CZK)	24.3	2.4	8.8	8.9	6.8	n.a.	0.4
State				55.4%	50.0%		
ČEZ				37.2%			
Municipalities				5.3%	1.5%		
Private companies	95.9% Karbon Invest	80.2% Karbon Invest	96.4% Investenergy		36.3% Metalimex	100% Lignit	100% MUS
Others	4.1 %	19.8%	3.6%	2.1%	12.2%		

Source: Country submission.

COAL PRICES

Coal prices for electricity and industry have been stable or declining since the transition to a market economy in the early 1990s. Coal has been and continues to be several times cheaper than natural gas and fuel oil[16] as shown in Table 23.

Table 23

Prices to End-users for Coal and Competing Fuels, 1990 to 2002

(US$/tonne of coal equivalent)

	1990	*1995*	*2000*	*2001*	*2002*
For electricity generation					
Steam coal	25.74	26.99	22.30	22.52	23.85
Heavy fuel oil	109.27	67.98	80.44	90.31	100.60
Natural gas	94.07	122.50	113.73	117.98	131.20
For industry					
Steam coal	32.80	31.70	27.31	28.80	34.32
High sulphur fuel oil	109.32	69.18	80.86	91.90	102.38
Natural gas	94.07	122.50	114.81	121.27	135.00

Source: *Coal Information 2004*, IEA.

COAL SUBSIDIES

The significant decrease in domestic coal production seen in the last decade has resulted in the closing of a number of coal mines. These closed facilities have tended to be the more inefficient operations as well as a high proportion of mines for coking coal which were no longer needed when steel production fell. These closed mines required environmental restitution of the sites as well as payments for the health and social needs of the former workers. The Czech government established a payment scheme to address these needs.

The three state enterprises which own the closed mines receive this support. They are: DIAMO, s. p., Palivový kombinát Ústí, s. p. and Východočeské uhelné doly, s. p. The payments are granted in compatibility with the Act No. 59/2000 Coll. on public support and Act No. 154/2002 Coll. on temporary financing of some social and health payments and on the basis of the government Decree No. 395/2003. The Office for the Protection of Competition has concluded that these payments are not state aid since they go to operations which no longer produce coal. The payments only go towards the rehabilitation of environmental damages, technical liquidation of the mines and the ongoing health and social needs of former workers. The EU has

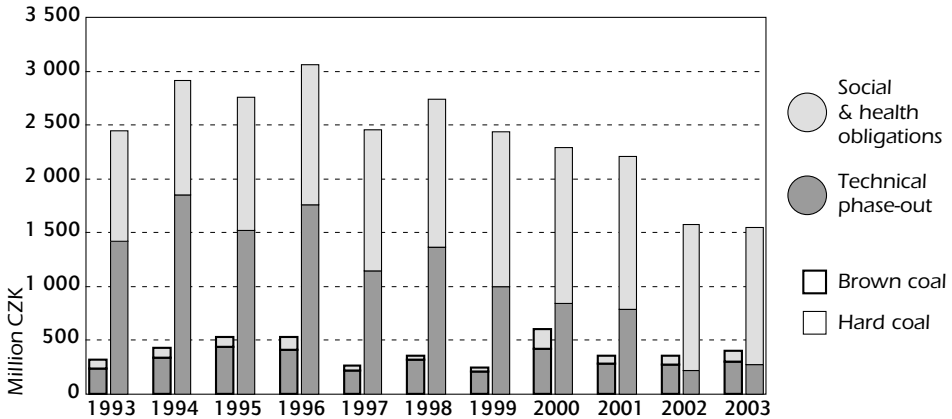
16. While true, the efficiencies of the plants for the other fuels can be higher than coal plants, especially natural gas-fired combined cycle power plants.

determined that these payments are compatible with the EC Council Regulation No. 1407/2002 – Chapter 2, Article 7 – Aid to cover exceptional costs. All these and other such payments will continue to be subject to examination by the Czech Office for the Protection of Competition. None of the still operating coal mines receives subsidies of any kind.

The history of subsidies from 1993 to 2003 is shown in Figure 16 and Table 24.

Figure 16

State Subsidies to Coal Mining Companies, 1993 to 2003



Source: Country submission.

Table 24

State Subsidies to Coal Mining Companies, 1993 to 2003

(million CZK)

	All subsidies			*Technical phase-out*			*Social and health obligation*		
Year	*Total*	*Brown coal*	*Hard coal*	*Total*	*Brown coal*	*Hard coal*	*Total*	*Brown coal*	*Hard coal*
1993	2 765.8	318.2	2 447.6	1 657.3	238.4	1 418.9	1 108.5	79.8	1 028.7
1994	3 345.1	431.6	2 913.5	2 186.9	336.1	1 850.8	1 158.2	95.5	1 062.7
1995	3 286.7	530.6	2 756.1	1 956.8	436.4	1 520.4	1 329.9	94.2	1 235.7
1996	3 591.0	527.2	3 063.8	2 168.3	408.5	1 759.8	1 422.7	118.7	1 304.0
1997	2 727.4	267.5	2 459.9	1 364.5	219.3	1 145.2	1 362.9	48.2	1 314.7
1998	3 093.9	358.2	2 735.7	1 690.2	322.3	1 367.9	1 403.7	35.9	1 367.8
1999	2 682.0	244.4	2 437.6	1 206.1	211.3	994.8	1 475.9	33.1	1 442.8
2000	2 892.6	603.5	2 289.1	1 255.9	417.4	838.5	1 636.7	186.1	1 450.6
2001	2 569.4	360.5	2 208.9	1 068.3	281.9	786.4	1 501.1	78.6	1 422.5
2002	1 936.2	356.1	1 580.1	494.2	277.7	216.5	1 442.0	78.4	1 363.6
2003	1 948.5	403.8	1 544.7	584.5	305.8	278.7	1 364.0	98.0	1 266.0

Source: Country submission.

OIL

SUPPLY AND DEMAND

Oil continues to play an important role in the energy mix of the Czech Republic. In 2003, total oil supply was 8.8 Mtoe representing 19.9% of the nation's total primary energy. In absolute terms, oil supply increased by 2.9% from 2002 to 2003, but has actually decreased by 1.9% since 1990. Despite this decrease, the share of oil in Czech primary supply has increased from 18.9% in 1990 to 19.9% in 2003 as supply from other sources has fallen further. Government forecasts to 2030 predict that oil will continue to gain market share.

Domestic crude oil production is performed by the Moravské naftové doly, a.s. and has almost doubled since the last in-depth review in 2001. The domestic crude oil tank farm has been connected to the Druzhba pipeline in 2003. Despite these improvements, production is still marginal at 317 000 tonnes. As a result, the country remains heavily dependent on oil imports which account for 96% of its oil requirements. Crude oil is imported primarily from the former Soviet Union and the Middle East. Until 1996, Russia was virtually the Czech Republic's sole crude supplier although import sources have been diversified considerably since then.

Table 25

Crude Oil Import Sources, 1996 to 2002

(thousand tonnes of oil)

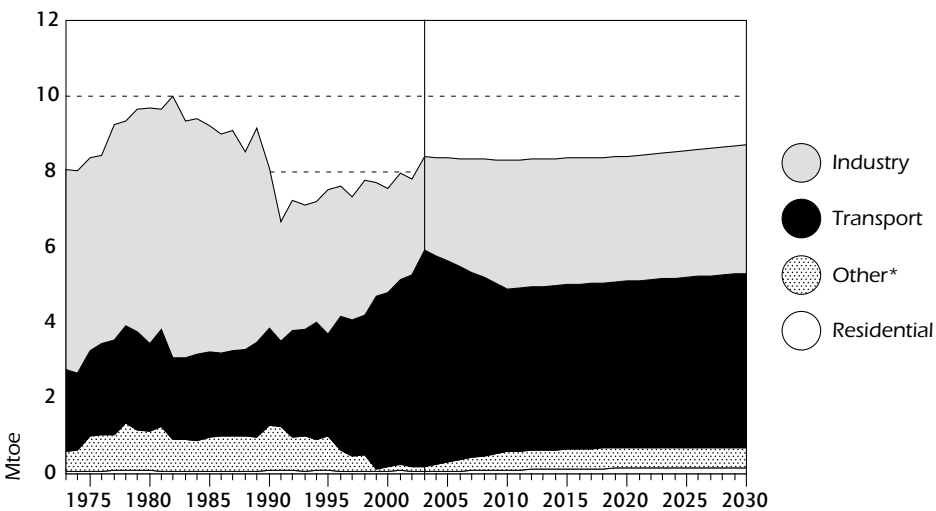
	1996	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*
Russia	7 017	6 249	6 024	5 002	4 721	4 121	3 938
Azerbaijan	0	0	0	40	0	641	934
Syria	258	160	191	0	0	55	629
Libya	40	39	157	217	0	617	276
Norway	0	0	201	131	0	0	199
Algeria	0	257	241	392	445	209	89
Other former USSR	0	0	0	0	0	0	71
Kazakhstan	0	129	0	259	492	329	12
Iraq	190	86	19	0	41	0	0
Saudi Arabia	0	0	41	0	0	0	0
Egypt	57	0	0	0	0	0	0
Nigeria	0	5	72	0	0	0	0
Tunisia	0	66	0	0	0	0	0
Georgia	0	50	0	0	0	0	0
Total imports (trade)	**7 562**	**7 041**	**6 952**	**6 041**	**5 699**	**5 972**	**6 148**
Russia's share of imports	*92.8%*	*88.8%*	*86.7%*	*82.8%*	*82.8%*	*69.0%*	*64.1%*

Czech refinery output does not match up directly with domestic consumption of oil products. This discrepancy is handled through imports and exports of selected products. For this reason, the Czech Republic imports approximately 42% of all automotive fuels consumed in the country. The country exported 1.42 Mtoe of oil products in 2002 (primarily diesel and petrol), up from 0.04 in 1973. The main destination for exports in the Czech Republic is its neighbouring countries of Germany, Austria, Poland and Hungary. There are also substantial product imports. In 2002, total product imports were 3.2 Mtoe, of which 0.99 Mtoe gasoline and 1.3 Mtoe diesel fuel. Slovakia had the most exports to the Czech Republic, accounting for 46% of all imports in 2002, followed by Germany (18.6%), Poland (15.9%), Austria (11.7%) and others (7.8%).

The transport sector became the largest oil consumer in the mid-1990s and has grown ever since. In 2003, transport accounted for 68% of oil TFC, followed by industry at 17%. Like other transition economies, the demand for cars is increasing quickly in the Czech Republic. In 2004, there were around 3.4 million vehicles in the country. In addition, rail freight is being replaced by road transport and a growing number of tourist vehicles are passing through the country. Oil consumption has fallen in the industry and other sectors, including power generation as industry restructures and other sectors switch from oil to gas.

Figure 17

Final Consumption of Oil by Sector, 1973 to 2030



* includes commercial, public service and agricultural sectors.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2005; and country submission.

Crude oil is imported via two pipelines. The Ingolstadt-Kralupy-Litvínov pipeline (IKL) has been in operation since 1996, supplying a maximum of 10 000 kt/year of oil via Germany. This line is connected to the international Trans-Alpine Line (TAL) pipeline ending in Trieste and, while offering the potential for diversification of imports, is only used at 23% of its capacity. Pipeline maintenance and modernisation (remote control systems and reconstruction) were completed in 2003, and the total supply at this time was 6 413 kt. The main crude oil supply channel is the Druzhba (Friendship) pipeline transiting the Ukraine and Slovakia. The Czech section has a nameplate capacity of 10 000 kt per year. This pipeline delivers Russian and CIS (Commonwealth of Independent States) crude oil to three refineries, which has a financial advantage over higher priced, lighter, sweeter oil on international markets.

Both pipelines, including the Central Crude Oil Refuel, have been operated by MERO, a.s., which is owned by the state National Property Fund.

The Czech Republic has two main refineries, Litvínov and Kralupy, with a total combined atmospheric distillation capacity of 8.8 Mt/year. Both these refineries are majority owned by Česká Rafinérská, part of the Unipetrol group, but other shareholders include the multinationals AgipPetroli, Conoco and Shell, which together own 49% of the company.

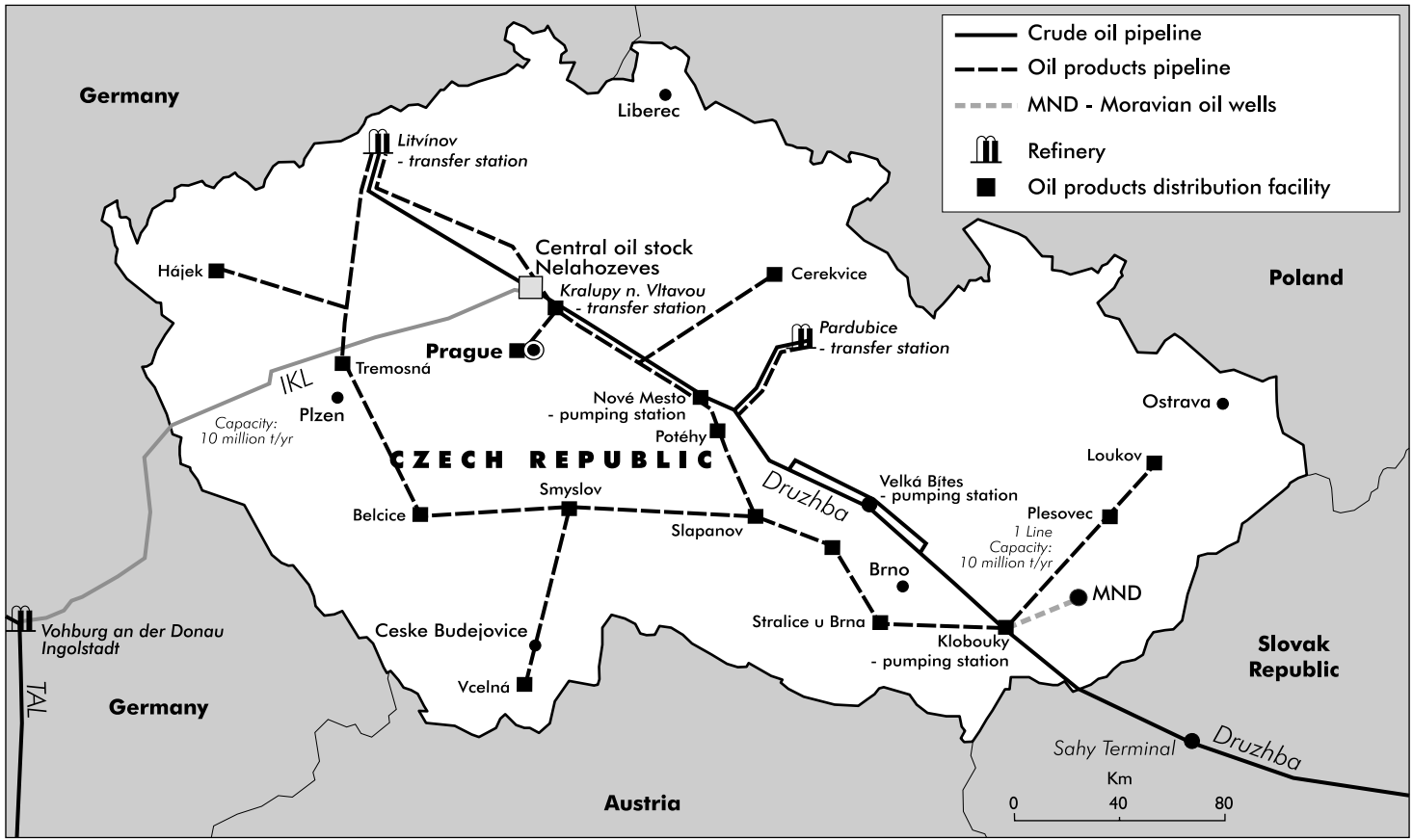
Litvínov is the larger of these two refineries with a total atmospheric distillation capacity of 5.5 Mt/year and is supplied by the Družhba pipeline. This refinery has recently been upgraded to include a visbreaking unit of 0.92 Mt/year capacity.

The Kralupy refinery has a total atmospheric distillation capacity of 3.3 Mt/year. This refinery can be supplied by both the Druzhba and the IKL pipelines. This refinery has recently been upgraded to include a 1.3 Mt/year fluid catalytic cracking unit to allow the flexibility to process lighter products from heavier crude oils, enabling the refinery to produce automotive fuels meeting tighter European Union directives.

The Pardubice oil refinery is a smaller unit focused on crude oil processing and production of diesel, fuel oil, lubricating oil and bitumen. It refines crude oil from the CIS and has a total atmospheric distillation capacity of 0.8 Mt/year. After the sale of the majority state share in the Pardubice facility to Unipetrol, it has been incorporated into this domestic refinery-petrochemical complex. In November 2003, it merged with the oil refinery Koramo in Kolin which has no atmospheric capacity but does have a lube producing capacity of 2 500 barrels per day.

Figure 18

Map of Oil Infrastructure, 2004



Source: IEA.

Domestic refineries have a significant share of the domestic market accounting for 57.5% for gasolines and 60.2% for diesel. The Czech refineries have recently been modernised so that the technologies used reach the highest standards of European technologies. They produce refinery products with quality meeting the requirements of the European directives.

Oil products from the Czech refineries are transported either by road tankers, rail tankers or by an oil product pipeline system operated by the state-owned company ČEPRO. The pipeline system is connected to the Slovak Republic and the Slovnaft refinery, which enables the import and export of oil products by pipeline. Pipelines and oil storage facilities are at the disposal of all fuel-trading enterprises in the Czech Republic. Much of the refining industry has been privatised. The State still holds a 63% share in Unipetrol Holding but this is in the first stages of being privatised.

RETAIL MARKETS AND PRICES

Crude oil has been imported to the Czech Republic at world prices since 1994. The crude oil and oil products market in the Czech Republic is fully liberalised. Imported crude oil and products were, until 1 May 2004, subject to licensing by the Ministry of Industry and Trade. However, this requirement was removed with the accession of the Czech Republic to the European Union.

At present, the oil companies and traders individually negotiate crude oil supplies without restriction. The crude oil supplies sourced from Russia and the CIS are fulfilled on the basis of long-term contracts under an intergovernmental protocol signed on December 1994. The supplies are specified quarterly and fulfilled in compliance with the signed agreement. Before 1 August 2003, the Ministry of Industry and Trade managed these purchase agreements. However, since that date, the shareholders of the Česká Rafinérská company have purchased crude oil individually for their two refineries from Russia, rather than buying the totality of their supplies together. This has created occasional problems and disruptions in supplies.

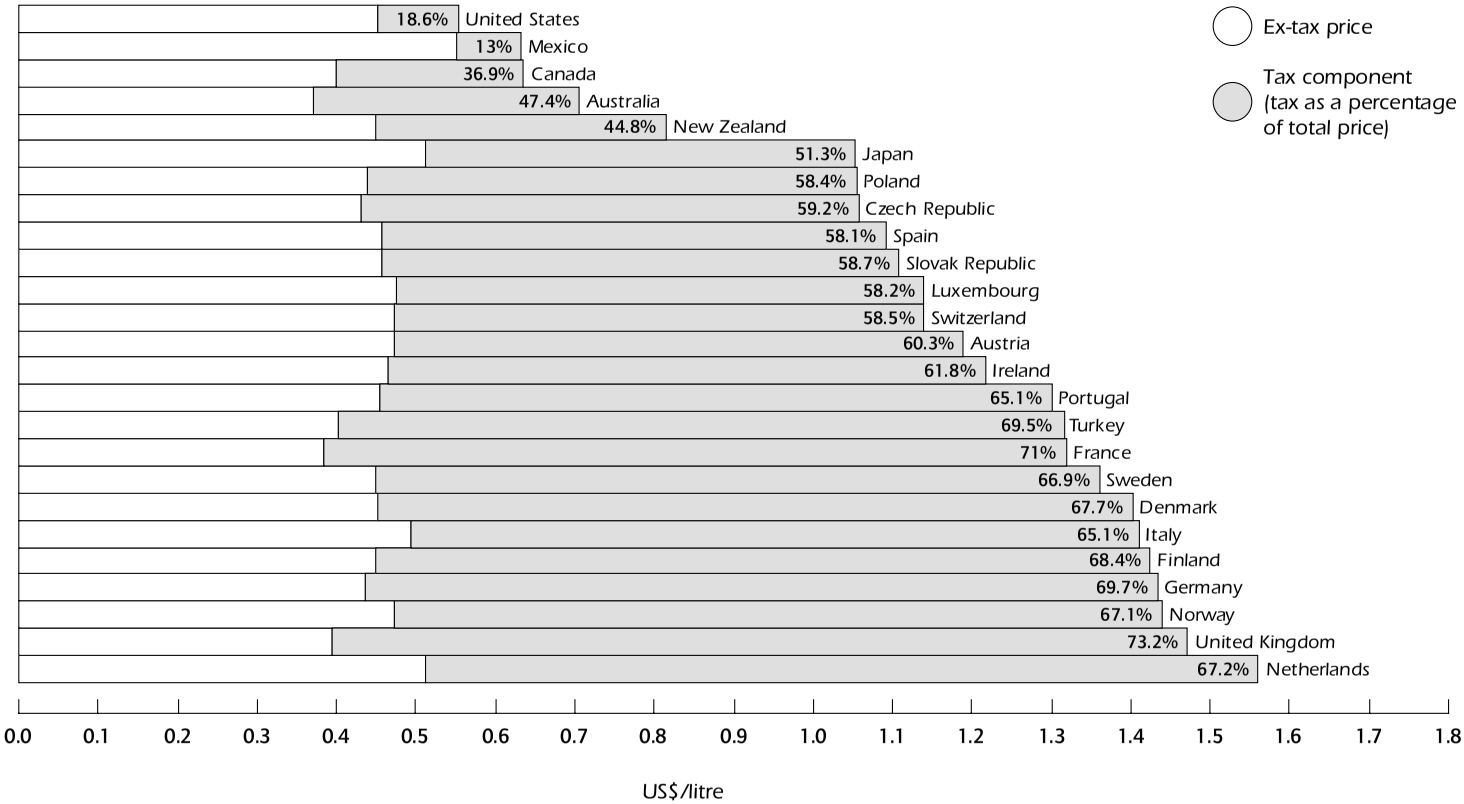
World crude oil prices, Rotterdam product prices, local refining and distribution costs, production margins, taxation levels and market demand are influential in determining production quantities and retail prices of oil products. The Czech Statistical Office monitors the monthly oil consumption. Crude oil is exempt from customs fees, consumption tax and VAT.

Since 1 May 2004 customs and fees for oil traded among EU member States have been removed and the VAT for oil products was reduced from 22% to 19%. The rate of consumption tax for fuels and other crude oil products is being harmonised with the level of taxes within the EU. Despite these efforts there are still some differences in prices between EU member States.

Figures 19 and 20 above show the prices of unleaded gasoline and automotive diesel in the Czech Republic in relation to most other IEA

Figure 19

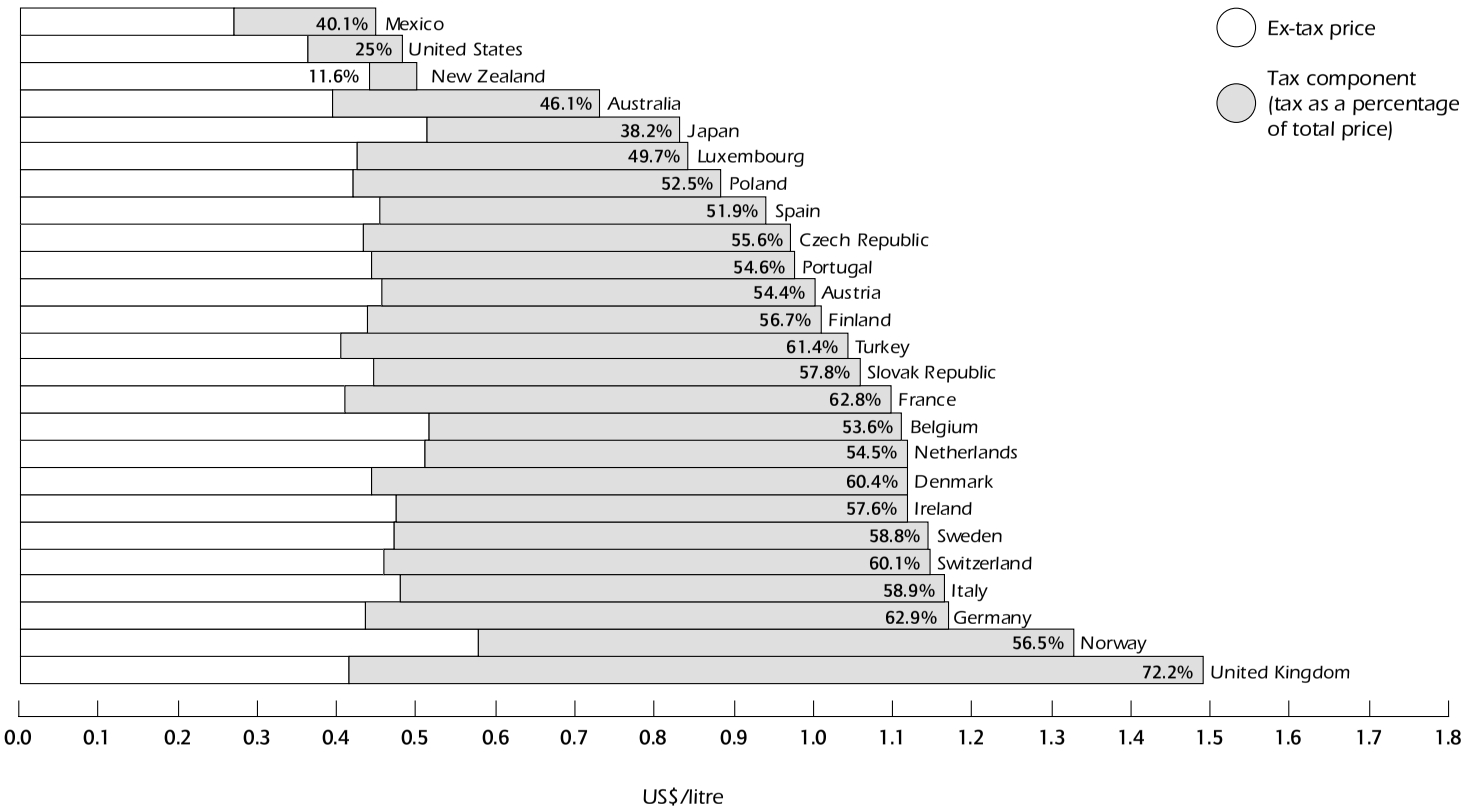
OECD Unleaded Gasoline Prices and Taxes, Third Quarter 2004



Note: data not available for Belgium, Greece, Hungary and Korea.
Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2005.

Figure 20

OECD Automotive Diesel Prices and Taxes, Third Quarter 2004



Note: data not available for Canada, Greece, Hungary and Korea.
Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2005.

countries. The Czech prices are about average in the IEA for both diesel and gasoline. More important, though, are the differences between Czech prices and those of its neighbours, which can lead to cross-border refuelling. Czechs living close to the Polish border are drawn by the cheaper road fuels in Poland; but German and Austrian drivers have a financial incentive to buy automotive fuels in the Czech Republic.

The network of filling stations selling automotive fuels to the public expanded to approximately 2 200 stations at the end of 2003. Most of the filling stations in the Czech Republic now meet EU standards. The Czech Association of Petroleum Industry and Trade (ČAPPO) member companies' share of the total number of public service stations is 50.2% and their share of total product turnover in the Czech Republic is more than 75%.

Benzina, a.s., subsidiary of Unipetrol, operates the largest network of 319 filling stations, followed by Čepro, a.s. operating 189 and Paramo Trysk, a.s. operating 19. Their share of the total sale of all oil products amounts to 17% of the market. Eleven major foreign petroleum companies[17] own or lease filling stations in the Czech Republic and have a 45% share of the retail market (545 filling stations – 29% of all statistically registered filling stations).

In 2003 the big foreign supermarket chains successfully entered the retail market (Globus ČR, Carrefour ČR, Makro and Ahold ČR). At the end of 2003 they operated 22 efficient filling stations and had won 4% market share of domestic fuel sales.

Table 26

Total Supply of Oil Products (kt)

Product	*2001*	*2002*	*2003*
Leaded gasoline	0	0	0
Unleaded gasoline	1 974.4	1 976.0	2 156.7
Diesel fuel	2 678.2	2 853.4	3 211.1
Biodiesel (31% of rape oil methyl ester)	207.5	225.0	215.7
Rape oil methyl ester 100%	73.9	104.4	99.9
LPG	72.4	81.0	97.8
Aviation petrol	3.2	2.5	3.1
Kerosene jet fuel	181.7	202.4	240.4
Fuel oil, S < 1%	383.7	351.0	317.9
Fuel oil, S > 1%	188.9	106.3	196.2

Source: Country submission.

17. Companies in alphabetical order: Agip, Aral, Avanti, Eigl/Avia, Esso, Jet (Conoco), Lukoil, OMV, Shell, Slovnaft, Total.

Consumption of fuel oil has been decreasing since the early 1990s. This is due to structural changes in the heavy industry and substitution to natural gas in industrial production and heating. In compliance with a tighter environmental legislation, the share of fuel oils with a sulphur content lower than 1% is increasing.

INDUSTRY STRUCTURE AND OWNERSHIP

The State has controlled the majority of assets of the major oil companies for a long time, but since the early 1990s has been transferring its ownership to the private sector.

Unipetrol, a.s., the 63% state-owned holding company, is the major oil operator in the Czech Republic. On 4 October 2002, the Czech government cancelled the decision to privatise Unipetrol as the Agrofert Holding, a.s., the company chosen from the public tender, withdrew the purchase of the company shares. In the Resolution No. 1173 of 25 November 2002, the government approved the renewal of the privatisation process of Unipetrol and at the same time approved the selection of advisory institutions by means of public tender. In a consequent Resolution No. 65 of 13 January 2003 the government approved the privatisation completion of Unipetrol, as a whole entity, by the method of direct sale based on the results of the public tender. On 28 April 2004, the Czech government approved by its Resolution No. 415 the direct sale of the 63% share of the State in Unipetrol to PKN Orlen (Polski Koncern Naftowy Orlen Spolka Akcyjna). In June 2004, PKN Orlen paid the first instalment of its purchase amounting to CZK 1.3 billion representing one-tenth of the purchase price.

Significant affiliated companies of the Unipetrol Holding, a.s. are as follows:

- Česká Rafinérská, a.s. Litvínov.
- Paramo, a.s.
- Chemopetrol, a.s. (leading petrochemical production in the CR).
- Kaučuk, a.s. (leading producer of plastic in the CR).
- Spolana, a.s. (production of alpha olefins and other chemical assortment).
- Benzina, a.s. (319 petrol stations).
- Unipetrol Trade, a.s.
- Unipetrol Rafinérie, a.s. – Established in 2003 as a processing unit leading the activities of the Česká Rafinérská, a.s. in a way as to fully utilise the production capacities owned by Unipetrol, a.s. (51% stake).

Since August 2003, Česká Rafinérská, a.s. has been deemed by the government as a "toll processing company". Under this system, the shareholders buy the crude oil, the refinery then produces oil products for a given fee which the shareholders then have the right to resell.

EU MEMBERSHIP AND LEGISLATIVE REQUIREMENTS

The EU legislation concerning environmental protection is valid for the refinery industry and the quality of products as follows:

- Directive 98/70/EC of the European Parliament and of the Council of 13 October 1998 relating to the quality of petrol and diesel fuels and amending Council Directive 93/12/EEC.
- Commission Directive 2000/71/ES of 7 November 2000 to adapt the measuring methods as laid down in Annexes I, II, III and IV to Directive 98/70/EC of the European Parliament and of the Council to technical progress as foreseen in Article 10 of the directive.
- Commission Decision of 18 February 2002 on a common format for the submission of summaries of national fuel quality data.
- Directive 2003/17/EC of the European Parliament and of the Council of 3 March 2003 amending the Directive 98/70/EC relating to the quality of petrol and diesel fuels.
- Directive 2003/30/EC of the European Parliament and of the Council of 8 May 2003 on the promotion of the use of biofuels or other renewable fuels for transport.

Domestic refineries conform to the EU legislation and related valid Czech legislation (transposition of EU directives) as follows:

- Act 56/2001 Coll. on conditions of the vehicular traffic on roads, as amended later.
- MIT Decree No. 227/2001 Coll. determining the requirements of road transport fuels and the way of monitoring their quality.
- MIT Decree No. 229/2004 Coll. determining the requirements for fuels for vehicular traffic on roads and the methods of monitoring their quality (valid as of 1 May 2004).

Since 1 July 2001, the Czech Trade Inspection has monitored oil product quality in retail sales for petrol, diesel, biodiesels and LPG based on Act No. 56/2001 Coll. and the MIT Decree No. 227/2001 Coll. The decree transposed the requirements of the Directives 98/70/ES and 2000/71/ES. As of 1 May 2004, the MIT Decree No. 229/2004 Coll. was validated. This

decree transposed the Directive 2003/17/ES (the amendment of the 98/70/ES Directive) and Decision No. 159/2002 and also partially the Directive 2003/30/ES. In this Czech legislation there are references to relevant European standards (EN/EN ISO) and Czech technical standards (ČSN), which determine the quality requirements and methods of testing monitored fuels.

MIT as a state body is responsible for monitoring the quality of oil products, processes the records of the Czech Trade Inspection for the yearly surveys and from 2005 will pass them on to the EC. The Czech Standards Institute (ČNI), a member of the European Committee for Standardisation (CEN) since 1997, ensures that the European standards of the technical commission CEN/TC 19 "Petroleum products, lubricants and related products" will become part of the Czech technical standards framework. In compliance with the Directive 98/70/ES, the import and sale of leaded petrol was stopped since 1 January 2001.

EMERGENCY PREPAREDNESS FOR OIL

EMERGENCY RESPONSE AND LEGAL AUTHORITY

Ensuring oil supply security is a high priority for the Czech Republic, as the country depends on imports for 98% of its oil requirements. The IKL pipeline, which links to the Mediterranean terminal of Trieste reduces Czech dependence on Russian oil imports and provides greater flexibility in responding to possible supply disruptions. The Administration has established and subsequently strengthened the legal framework for crisis management. The National Emergency Sharing Organisation (NESO) is a co-ordinating committee of relevant government offices and representatives of the main oil industry players. The Administration of State Material Reserves (ASMR) provides the political and operational head of the NESO, and is in charge of the stockpiling and monitoring of strategic and company stocks in addition to managing emergency response measures.

The role of the ASMR was strengthened by the Act on Emergency Oil Stocks (No. 189/99 of November 1999) as amended in 2004 reflecting EU requirements in detail. This provides the legal basis for the implementation of the International Energy Program (IEP) and Co-ordinated Emergency Response Measures (CERM), including oil allocation and demand restraint. The government would declare a state of emergency on the recommendation of the chairman of ASMR, acting as head of the NESO. The ASMR would then manage the crisis situation and release the state-owned stocks up to explicit limits approved in advance by the government. Stocks held by oil companies could also be drawn down according to NESO instructions and under the supervision of the ASMR. In case of a more serious emergency, these company stocks – following the agreement reached in NESO – would be drawn down before the government stocks.

EMERGENCY RESERVES

The Czech Republic holds emergency reserves in excess of its 90-day IEA obligation, averaging 110 days of net imports in the first half of 2004. Approximately 70-75 days of these net imports are owned directly by the government, while the remainder is made up of non-compulsory industry stocks. The non-compulsory industry stocks which are owned and financed by oil companies, could be controlled by the ASMR on behalf of the government in times of emergency, and more importantly if an emergency status is declared following the legislation.

The Act on Emergency Oil Stocks ensures compliance with the IEA stockholding obligation by requiring that stocks cover at least 90 days of net imports. The act also reflects other IEA requirements, such as the exclusion of certain categories of stocks defined in the annex to the IEP Agreement and deductions for operating stocks, as well as EU requirements for minimum levels of products in total stocks and arrangements for bilateral stocks in EU countries. The act specifies that crude oil makes up no more than 60% of emergency reserves, and there is a government decision which states that a maximum of 17% of total stocks (up to 15 days) could be held in other countries under bilateral government agreements.

Stocks held by the ASMR are owned by the government and financed from the state budget. However, as the ASMR does not directly own storage capacity, industry holds stocks on behalf of the ASMR. These state-owned stocks are not directly commingled with company stocks, but being stored in the same infrastructure, there are, in practice, no special difficulties in the rotation of these stocks in order to maintain fuel standards. Any increase in net imports would result in an automatic increase in the stockholding obligations for the ASMR. Possibilities to increase storage capacity are being explored by the ASMR, and include the commissioning and construction of new storage tanks in Nelahozeves and the Sedlnice regions. Additionally, a bilateral agreement with Germany was concluded in early 2004 which opens the way for the ASMR to hold state-owned stocks abroad.

EMERGENCY DEMAND RESTRAINT

The Act on Emergency Oil Stocks empowers the government during a declared emergency to activate a demand restraint programme designed to comply with Article 5 of the IEP. Specific measures would depend on the severity of the crisis. Light-handed measures, such as publicity campaigns, would be followed by compulsory measures ranging from lower speed limits to restrictions on motor vehicle use and rationing as a last resort. Each demand restraint measure may be implemented at short notice, typically the day after issuing a public notice. The implementation of rationing could take longer, as

coupons and/or payment cards would have to be printed and distributed. The ASMR informed the review team that any individual measure was discussed with the respective ministries and also directly with bodies responsible for any field where demand restraint measures are targeted.

CRITIQUE

NATURAL GAS

Czech gas use has risen substantially since the transformation towards a market economy, with absolute gas supply increasing by nearly 50% from 1990 to 2003 and gas's share of TPES growing from 11.1% to 17.8%. Different government scenarios now show different futures for gas use. Projections submitted to the IEA show a large increase in gas supply to 26.4% of TPES in 2010 and 30.2% in 2020, while the SEP projects gas staying at its current share of TPES of about 20% through 2030.

However, the review team felt that the projection of SEP is overly conservative concerning the future gas use. Gas competes with coal as a primary fuel and with electricity as an end-use fuel. Coal tends to be cheaper on a heat content basis with generally more stable prices, but it has a serious environmental disadvantage to gas. While electricity is relatively inexpensive and widely available, its prices could increase through incorporation of environmental externalities. The country benefits from its proximity to Russia's gas production and, therefore, has fewer transport costs than other EU countries. Gas use will also benefit from the expansion of the domestic pipeline network undertaken in the late 1990s. Construction of gas-fired CCGT plants is less costly and quicker compared with other plants. Taking all these factors into account, the team thought that gas use would continue its expansion and thus be consistent with the general trend in most OECD European countries.

Overly conservative gas use projections could have negative policy implications. First, this could discourage the potential new investment in the gas sector and new entrants in gas markets. Competitors could either accept this target as the most likely or believe that the government would take steps to ensure that its projected fuel share is achieved. In either case, anticipation of static demand will discourage new entrants since the incumbent has the existing market well in hand with its current relationships and its long-term take-or-pay import contracts. Only a belief in greater gas demand will induce new entrants into the market and, therefore, foster competition. The second policy implication of an overly conservative gas demand projection concerns any policies the government might take to ensure such fuel market shares are achieved. Such policies tend to be interventionist and can harm economic efficiency and deter private-sector initiative because of the uncertain presence of government actions to reach its fuel target shares. Therefore, the

government is encouraged to make a reality check in terms of its projections for future natural gas use. At the same time, it should make it clear that the fuel choice, including gas demand, is to be left to the market and individual market players, not subject to undue government influence to contain the gas penetration in line with the government projection.

Despite modest domestic gas production, the security of supply is sound and the Czech Republic is to be commended for its efforts in diversifying its gas supplies. The diversification of supply regions, with Norway now accounting for more than 25% of supply, substantially enhances security of supply. Such diversification is greater than most neighbouring countries such as Slovakia which gets 100% of its imports from Russia, and Hungary, which receives 88% from Russia. Gas storage is also sufficient given supply levels and patterns, and an emergency plan is in place to address supply disruptions and any consequent need to interrupt supply to customers.

The price increases of recent years for retail customers are a welcome trend to the extent that previous tariffs to different customer classes have not always been cost-reflective. In effect, revenues earned from gas transit were being used to subsidise Czech gas consumers. Cost-reflective pricing will ensure greater economic efficiency and is likely to encourage efficiency in gas use. It is also essential to ensure appropriate future investment. In addition, the cost-reflective higher prices are essential for the development of competition. If new entrants must compete against subsidised prices in one or more customer classes, it will be difficult for them to gain clients or capture market share.

The reform process being undertaken by the government contains all the essential components for a successful liberalised market and is similar to reforms undertaken by other IEA and EU countries. There is gradual market opening completed in steps, non-discriminatory third-party access at regulated terms, account unbundling leading to legal unbundling and a regulator in place to oversee many aspects of the process. The Czech government is to be commended for its work in this area, especially in light of the transition it has made from a centrally-planned economy as recently as the late 1980s. At the same time, delays in determining the regulatory and logistical details of reform implementation, even such basic parameters as the schedule for market opening and the stages of unbundling, make the entire process more uncertain. The Czech Republic is encouraged to finalise all the necessary debate and rule-making in order to adhere to the original schedule.

The idea of gas competition in the Czech Republic, as it is in much of Central and Eastern Europe, is not straightforward. Even with the proper regulatory framework in place, as the country appears to have, there is no plurality of suppliers to foster true competition. The fact that there is no upstream competition for Russian gas supplies and that Russian gas is significantly cheaper than gas from other sources, this should be kept in mind when

envisioning a competitive Czech gas sector. In addition, the existence of long-term take-or-pay contracts with Russian (and Norwegian) suppliers also makes downstream competition difficult, at least in relation to static gas demand.

While these barriers to entry are largely intractable, certain others particular to the Czech Republic can be addressed. Primary among these is RWE's dominance of the domestic market. With control of imports, high-pressure transport and majority ownership of six out of eight distribution companies (with 83% of market share), one company (RWE) dominates every level of the gas market. This potential barrier could manifest itself in a number of ways. For example, the RWE-controlled distributors could fail to provide truly non-discriminatory access to alternative suppliers shipping gas to newly released customers. In addition, these distributors could continue to buy gas from Transgas to serve their load even if more attractive alternatives were to emerge. Even the suggestion or possibility that these distribution companies would favour Transgas over other wholesale suppliers could be sufficient to deter new entrants.

This vertical and horizontal dominance of the incumbent must be monitored and addressed wherever possible. The conditions established by the Office for the Protection of Competition that RWE does not acquire domestic gas producers or electricity distributors or heat-producing companies appear sound given the existing scope of the company within the sector. This decision should be upheld unless further debate can prove that expanded RWE market concentration would not cause problems. In addition, the legal unbundling of the transportation and distribution system should proceed as planned. The government and/or the regulator should be active in monitoring the gas market for any possible abuses of market power. This would occur if the still-regulated activities of network service in any way favour the competitive activities of supply within the same company. The government can act most effectively in this regard by ensuring that non-discriminatory open access is provided to all eligible customers and the new entrant suppliers serving them. The government may also want to consider a gas release programme whereby Transgas would sell some of the gas from its take-or-pay contracts to new entrants who could then use that gas to compete with Transgas for final customers. This would encourage participation of new competitors in the Czech market who might otherwise be discouraged by the dominance of the incumbent. Any such release programme would have to be consistent with the terms of the privatisation contract of the Czech gas assets.

Despite any steps taken now or at a later date, Transgas is likely to remain dominant in the transitional period towards a competitive market. Such market concentration, coupled with the elimination of regulated service for customers granted supplier choice, could expose some consumers to excessive non-competitive prices. Since the provision of service at terms decided by the regulator will no longer be a mandate for Transgas, the company will be able

to set the prices and terms of its choosing. This may not be a problem for larger industrial customers who know the market well and have the resources and motivation (owing to their large volumes) to pursue alternative suppliers if the incumbent raises prices too much. The smaller customers, however, will generally not be so motivated to search out better deals and thus accept the terms that Transgas offers. Ideally, competing gas suppliers would enter the market if Transgas did indeed charge above-market rates, but this may take some time if it occurs at all. In the interim, the government should take steps to ensure that newly-freed customers are given the choice to remain with a service that they are guaranteed is fair and free from above-market prices, at least until a true market with viable competitors develops.

The volume and capacity of Czech gas storage is sufficient to provide a degree of security to the sector as a whole. Currently, the large majority of this storage is owned and controlled by Transgas. Unlike transport, gas storage is not strictly a natural monopoly in that any company can develop its own storage facility. However, Transgas currently has an advantage because its storage sites are already built and operational, makes use of the most attractive geological sites in the country and is well integrated with the high-pressure transport system. Since gas storage is essential for gas providers in matching up (normally constant) supply with (normally variable) demand, this gives Transgas an advantage over potential competitors. While new gas storage capacity may indeed be built, it could be some time before alternative gas storage of equivalent utility is fully developed and operational. In the interim, the government should introduce best practice principles that govern the negotiated third-party access for new entrants to use the existing gas storage infrastructure.

COAL

Despite its decreasing use in the Czech Republic over the last 15 years, coal remains an essential component of the country's energy mix. The supply is very secure and provides substantial employment. Its cost is competitive with other fuels and is likely to be more stable than oil or natural gas in the future. Coal is beneficial for the country not only as a direct export but also as an indirect export through use in coal-fired electricity plants. While the problem of high carbon emissions remains intractable, investments by ČEZ and other plant owners throughout the 1990s have significantly reduced other coal-related emissions.

The continued importance of the Czech coal mining industry will rest on the ability of the government to reconcile differences between the mining interests with those of the environment and local communities. Coal mining can be a disruptive activity and the potential harm to the environment is well known. However, through consultation with all parties involved and thoroughly researched environmental impact assessments (EIA), compromises

beneficial to all parties can likely be reached allowing the industry to largely access the reserves it desires. The government is encouraged to make efforts to facilitate such compromises.

The Czech domestic mining industry does not at present appear to be overly concentrated although further consolidation between competing interests could hamper competition. Imports from the regional coal market should act as a check on any potential for market power pricing. In this light, the government acted wisely in lifting its quotas on the import of hard coal from Poland. Such import quotas contradict the IEA *Shared Goal*, stipulating the benefits of free and open trade

The Czech coal market must not only be seen from the supply side but also the demand side where one buyer (ČEZ) acts as a virtual monopsonist given the volume of its transactions. While this could act to counterbalance supply-side market power, it does not readily lend itself to a vibrant competitive market place. The government is encouraged to monitor the coal market to ensure sufficient ownership diversity is in place to foster competition.

Government payments in the coal production sector go only to those companies that have closed their mining facilities. The costs for environmental restitution and worker welfare for these closed mines are a legacy of the inefficiency of the previous economic system. As such, these payments are necessary and should not be seen in the same light as subsidies going to operating coal mines. However, care must be taken that these payments to closed mines do not become a *de facto* subsidy for operating mines. If the industry knows that subsidies are available once a mine is shut, it will allow companies to make insufficient financial provisions for closure, thus giving them excess profits or the means to lower their coal price below full production costs (when closure expenses are considered). The Czech mining industry is fully capable of competing on costs without assistance. Subsidies to these now defunct operations have been reduced by more than 40% since their peak in the mid-1990s, mostly owing to completion of the technical closure and remediation of direct environmental consequences. Nevertheless, the government is encouraged to continue making every effort to decrease these payments in the future while honouring its commitment to the environment and the companies' former workers. In particular, the government should set transparent criteria for future payments, payments to mines currently under operation and a fixed date by which all such payments are terminated.

OIL

The Czech oil sector has experienced dramatic changes since 1990, undergoing a process of restructuring and privatisation culminating with the entry of international oil companies into the Czech market. Further progress

has been achieved since the last in-depth review in 2001. Oil continues to play an important role in the energy mix of the Czech Republic. In 2002, total oil supply was 8.5 Mtoe representing 20.4% of the nation's total primary energy supply. Domestic crude oil production has almost doubled since 2001 and the domestic crude oil tank farm was connected to the Druzhba pipeline in 2003. Despite these improvements, production is still marginal and the Czech Republic remains heavily dependent (96%) on oil imports given the limited availability of indigenous oil reserves.

Two pipelines supply oil to the Czech Republic, the Druzhba supplying oil from Russia and the IKL pipeline which crosses the border from Germany. The State finished modernising the IKL pipeline in 2003 and imports have increased via this route increasing utilisation and maintaining diversification of imports from Norway and North African producers. Despite some progress in diversification of oil sources, the Czech Republic is still heavily dependent on Russian oil and the situation becomes more severe when the heavy dependence on Russian gas is also considered. Utilisation of the IKL pipeline capacity is currently around 22%. Increased use of this pipeline would give the Czech Republic greater diversity and, therefore, more oil supply security.

To some extent this import diversification has been driven by the need for the Kralupy refinery to process lighter sweet crudes to meet its EU oil transport product specifications to which all domestic refineries now conform. The refining industry is now almost fully privatised. Despite earlier failed attempts to privatise Unipetrol, in April 2004, the government approved its privatisation by the direct sale of its 63% share to PKN Orlen. Both crude oil pipelines, their related oil storage facilities and pipeline operators are fully state-owned but open to access by all oil trading companies.

The oil products market is fully liberalised and prices are set by the world oil market, the business environment and taxes. Competition is fierce between a good mix of both domestic and foreign retailers. The oil products market has undergone a process of liberalisation during which large international oil companies have made a vigorous push into the market place. In 2003, foreign supermarkets successfully entered the oil products retailing sector winning 4% of market share. The transport sector remains the largest consumer of oil. Both diesel and gasoline consumption have grown rapidly over the past 10 years and show no immediate signs of slowing despite extremely high world oil prices. The oil industry forecasts oil product consumption growth between 2% to 3% per annum over the next few years. Oil refineries are typically under-utilised so they have room to increase their production but much of the increase in consumption, particularly for diesel, will be satisfied by imports.

The refinery products market has excellent prospects in the Czech Republic. Growth will depend on the economic situation and the purchasing power of the population. The oil industry and accompanying trade in the Czech Republic is and will continue to be subject to strong competitive pressures

from foreign refineries, Slovnaft Bratislava, Austria's OMV Schwechat and the German refineries in Leuna and Ingolstadt. The industry's position in this competitive environment should be strengthened by recent completion of the modernisation of the Kralupy refinery with its additional fluidised catalytic cracking unit, utilising the synergies between domestic producers, distribution companies and by rationalisation of the service station network.

In a drive to fulfil its ambitious environmental and renewable energy strategy, MIT has set ambitious targets to slow oil consumption growth in transport by setting high targets for biofuels. It would appear that while there is sufficient supply of biocrops such as wheat and rape seed, there is limited bioethanol production capacity for the blending component and biodiesel is not cost-competitive even with the current tax incentives. If the government is to achieve its goals, it must introduce a policy to remove these barriers to biofuel production.

The Czech Republic has a very strong centrally-planned stockholding system with both government and industry stockholding. The ASMR's efforts to comply with EU stockholding obligations should ensure that the Czech Republic remains comfortably compliant with IEA requirements. To meet its EU obligations the government is in the process of building more oil storage.

RECOMMENDATIONS

The government of the Czech Republic should:

Natural Gas

- *Continue to monitor overall supply source decisions made by private gas importers to ensure a continued sufficiency of supply diversity and continued adequacy of plans to deal with emergency situations.*
- *Review the static demand projection of gas use presented in the SEP.*
- *Refrain from any policy intervention to discourage gas growth to meet the static demand projections used as the basis for the SEP.*
- *Remove barriers to entry for new competitors in the supply, distribution and retail aspects of the liberalised gas market.*
- *Closely monitor the gas market and prevent possible abuses of dominant position.*
- *Ensure that consumers given supplier choice are provided protection from excessive prices in the transitional phase towards a competitive market.*

- *Develop best practice principles for negotiated third-party access to gas storage so as not to disadvantage new entrants or consumers seeking competitively provided gas supplies.*

Coal

- *Search for a sustainable solution for using coal resources, including consultative processes (*e.g. *facilitating community consultations and environmental impact statements).*
- *Monitor concentration of mining interests to maintain diversity in the market.*
- *Continue to reduce government payments to defunct coal companies while maintaining responsibility for environmental rehabilitation and former workers.*

Oil

- *Sustain efforts to increase the utilisation of the IKL pipeline with further diversification of import sources.*
- *Promote sufficient demand for biofuels to stimulate increased investment in bioethanol production facilities.*
- *Continue to maintain a consistent record of meeting the IEA stockholding obligation.*

ELECTRICITY SUPPLY AND DEMAND

SUPPLY

Coal-fired power plants are the dominant technology for Czech electricity generation. In 2003, coal-fired plants accounted for 61.4% of capacity and coal for 63.7% of generation. Nuclear power is the only other major generating technology accounting for 21.7% of capacity and 31.1% of generation. In 2003, coal and nuclear combined generated 94.8% of all Czech electricity. The figures for all technology types are shown in Table 27 and the historical progression of generation by fuel is shown in Figure 21.

Table 27

Installed Electricity Capacity and Generation, 2003

Type	*Capacity (MW)*	*Capacity share (%)*	*Gross power production (TWh)*	*Production share (%)*
Thermal (coal)	10 650	61.4	53.0	63.7
Thermal (CCGT & SCGT)	774	4.5	2.5	3.0
Nuclear	3 760	21.7	25.9	31.1
Hydro	1 004	5.8	1.4	1.7
Pumped storage hydro	1 145	6.6	0.4	0.5
Wind	11	0.1	*0.0	*0.0
Total	**17 344**	**100**	**83.2**	**100**

* = 3.9 GWh = 0.005%.

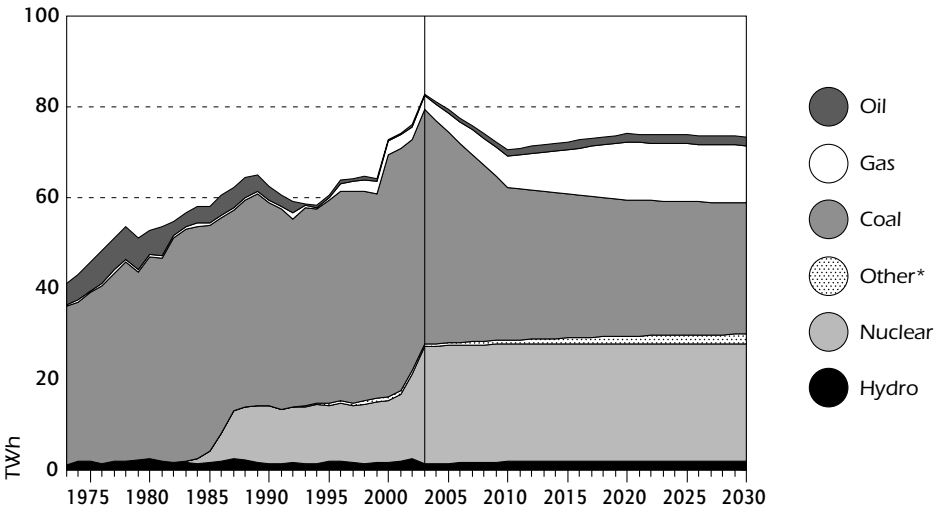
Source: Country submission.

DEMAND

Electricity's share of Czech total final consumption (TFC) has grown substantially in recent years. In 1990, its share was 11.7% and by 2003, it had grown to 17.0%. This growth in percentage share does not reflect such a large growth in absolute demand for electricity, but rather a decrease in final demand for other products, primarily coal. Electricity demand grew by 8% in absolute terms from 1990 to 2003. On a sectoral basis, industry continues to be the largest electricity consumer, although its demand is declining in both absolute and percentage terms. In 1990, industry consumed 2.32 Mtoe of electricity but by 2003, this had fallen by 24% to 1.77 Mtoe. Conversely, the residential and commercial sectors have grown considerably. From 1990 to 2003, their share of the overall electricity demand has risen from 1.56 Mtoe to 2.55 Mtoe while increasing their share of the total from 38% to 57%. Figure 22 shows electricity demand progression by sector from 1973 to 2030.

Figure 21

Electricity Generation by Source, 1973 to 2030

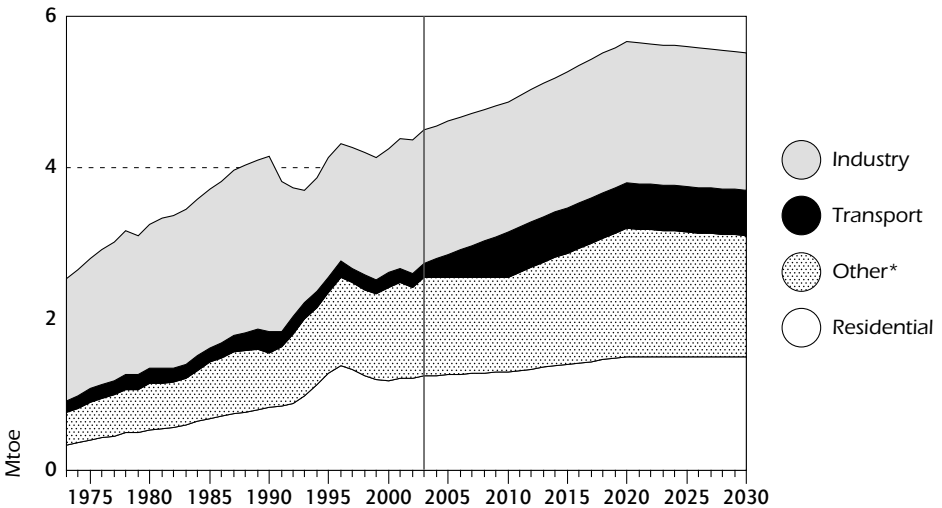


* includes solar, wind, combustible renewables and waste.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2005; and country submission.

Figure 22

Final Consumption of Electricity by Sector, 1973 to 2030



* includes commercial, public service and agricultural sectors.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2005; and country submission.

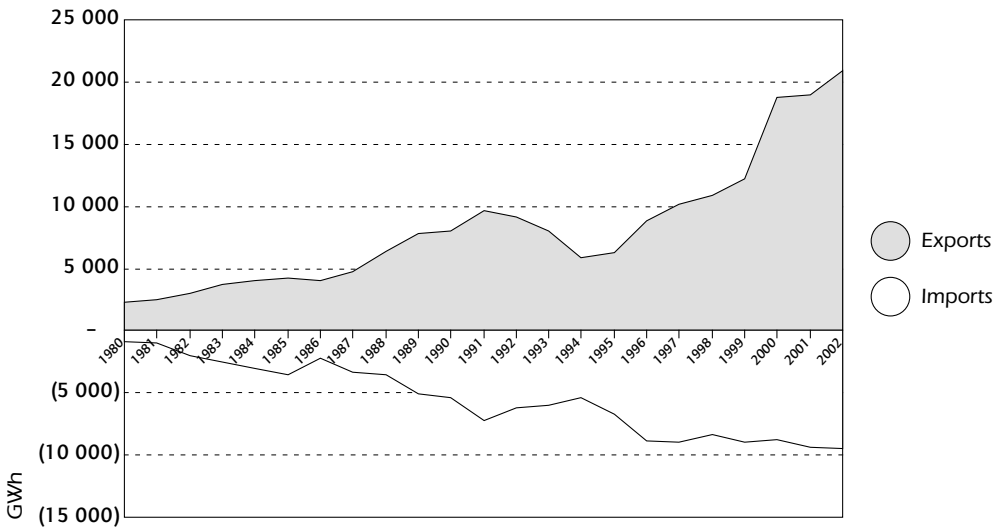
The highest domestic demand ever recorded (through 2003) was 11 205 MW on 12 December 2002. Throughout 2003, the highest demand was slightly below 11 000 MW. While peak demand has grown slightly above the growth in total annual demand, this still gives the country a substantial reserve margin when considering the installed capacity of 17 344 MW. The minimal demand level in 2003 was approximately 7 000 MW reached at the beginning of August. The Czech Republic is a winter-peaking country with demand for electric heating far greater than for air-conditioning. Many businesses and industry also shut down for a few weeks during the summer.

EXPORTS AND IMPORTS

The Czech Republic is a major international trader of electricity. While it has historically been a net exporter, there was a period in the mid-1990s when exports decreased substantially, in large part owing to refurbishment of coal-fired power plants to improve their environmental performance. Since then, the country has resumed its position as net exporter. In 2002, the country had net exports equal to 15% of its domestic generation, and gross exports equal to 27.5% of domestic generation. While the Czech Republic is a net exporter to Austria, Germany and Slovakia, it is a net importer from Poland. Figure 23 shows the historical electricity trade and Table 28 shows imports and exports by country for 2002.

Figure 23

Electricity Trade, 1980 to 2002



Source: *Electricity Information 2004*, IEA/OECD Paris, 2004.

Table 28

Electricity Trade and Trading Partners, 2002 (GWh)

	Exports	*Imports*	*Net exports*
Austria	5 938	-	5 938
Slovakia	3 457	(1 097)	2 360
Germany	11 183	-	11 183
Poland	311	(8 405)	(8 094)
Total	**20 889**	**(9 502)**	**11 387**

Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2004.

INDUSTRY STRUCTURE

GENERATION

The ČEZ Group is the dominant electricity player in the Czech Republic. In addition to majority ownership stakes in distribution companies (described below), it is also the major power generation company through its ČEZ, a.s. subsidiary. ČEZ, a.s. owns 12 153 MW_e of generating capacity or about 70% of the national total. In 2003, the company produced about 73% (60 934 GWh gross) of all electricity generated in the Czech Republic. 67.61% of ČEZ is owned by the State (through the National Property Fund), 23% by institutional investors, 5.34% by individuals and 4.05% by custodians. ČEZ has 6 603 MW of coal-fired plants, 3 760 MW of nuclear power plants and 1 934 MW of hydropower plants.

The ČEZ Group is the tenth-largest electricity utility in Europe, both in terms of installed capacity and number of customers. It is the second-largest electricity exporter (after France's Electricité de France (EDF)). The ČEZ Group has a stated ambition of becoming a leader in the Central European region by expanding into neighbouring markets. ČEZ owns three recently tendered distribution companies in Bulgaria, including their nearly 2 300 MW of generating capacity. ČEZ bid for Slovakia's dominant utility Slovenske Elektrame but was outbid by the Italian company Enel. ČEZ became winner of tender on sale of a major distribution company in Romania. It is currently pursuing the acquisition of thermal power plants in Bulgaria. ČEZ is also considering the addition of two 1-GW nuclear reactors that could be sited on the location of the company's two existing nuclear power plants. In 2005, ČEZ will decide on the extent and procedure of renewal of their production capacities in classical power stations after the year 2010. ČEZ also holds majority ownership of five out of eight Czech distribution companies (discussed below).

In addition to ČEZ, there are a number of other generators in the Czech Republic who are collectively termed independent power producers (IPPs). Together, they own and operate 5 191 GW of capacity (30% of national total) and generated nearly 23 TWh (28% of national total) in 2003. IPP development has benefited from distribution utilities' diversifying their supply sources away from ČEZ, a.s. and, as a result, IPP capacity and generation have grown by nearly 50% since 1993, while ČEZ's share of generation diminished from 79% in 1993 to 70% in 2003. IPPs also increased their power supply to the distribution companies since 1 January 2001, when the regulated third-party access to transmission and distribution grids was established by the Energy Act (Law No. 458/2000 Coll.). In 2003, the local distribution companies purchased 60% of their electricity on average from ČEZ and 40% from other sources, mainly IPPs[18].

Individual IPP companies are relatively small compared to ČEZ, a.s., and most supply heat as well as electricity. There has been foreign acquisition of this capacity. Cinergy, a U.S. utility, owns over 1 000 MW of CHP power generation facilities. International Power of the UK owns three plants and over 700 MW of CHP capacity. United Energy, a subsidiary of the U.S. Company National Fuel Gas, has three CHP plants totalling 236 MW. Dalkia (France), a subsidiary of Vivendi and EDF, owns a total generating capacity of 360 MW through its interests in district heating companies based in Northern Moravia.

TRANSMISSION

In January 1999, the Czech Electricity Transmission System Company (ČEPS) was established as a 100% subsidiary of ČEZ. Through a series of divestitures, ČEZ has slowly transferred ownership to the State. ČEZ attempted to sell its remaining 34% stake in ČEPS to private investors in 2004, but found no suitable buyers. It therefore sold its ownership share in September 2004 to the Ministry of Finance which has made the State sole owner of ČEPS. Since 2003, ČEPS has been legally and operationally unbundled from ČEZ.

ČEPS operates the transmission network and acts as the transmission system operator (TSO). ČEPS's responsibilities include:

- Ensuring electricity transmission.
- Ensuring a balance between electricity generation and consumption.
- Maintenance, modernisation and development of the transmission equipment.
- Co-ordinating with foreign networks.
- Assuring that current facilities dispatch electricity efficiently and in a safe manner.

18. The disparity between ČEZ's 70% wholesale market share and the distribution companies getting just 60% of their electricity from ČEZ is due to the substantial exports by ČEZ.

ČEPS is strictly prohibited from doing any business besides the transmission of electricity. Included in its responsibility of maintaining the integrity of the transmission system, ČEPS purchases electricity to cover transmission losses and purchases ancillary services on the market. ČEPS also co-operates with the electricity market operator in organising the intraday electricity market and the balancing energy market.

As of 1 January 2003, the ČEPS transmission system comprised 37 substations of 420 kV and 245 kV located at 30 transformer stations, 2 900 km of 400 kV lines and 1 440 km of 220 kV lines. Two 123-kV substations and 105 route kilometres of 110 kV lines are also part of the system. ČEPS has ten 420 kV cross-border tie-lines and six 220-kV cross-border tie-lines. The Czech Republic has the following interconnection capacities with bordering countries: Germany (2 100 MW), Austria (750 MW) Slovakia (1 500 MW) and Poland (1 200 MW). The combined amount of these interconnections (5 550 MW) is almost 32% of the country's domestic installed capacity. Thanks to the Czech Republic's substantial reserve margin, this interconnection capacity is equal to 49% of the all-time historic peak and to 79% of the minimum demand for 2003. A map of the transmission system is shown in Figure 24.

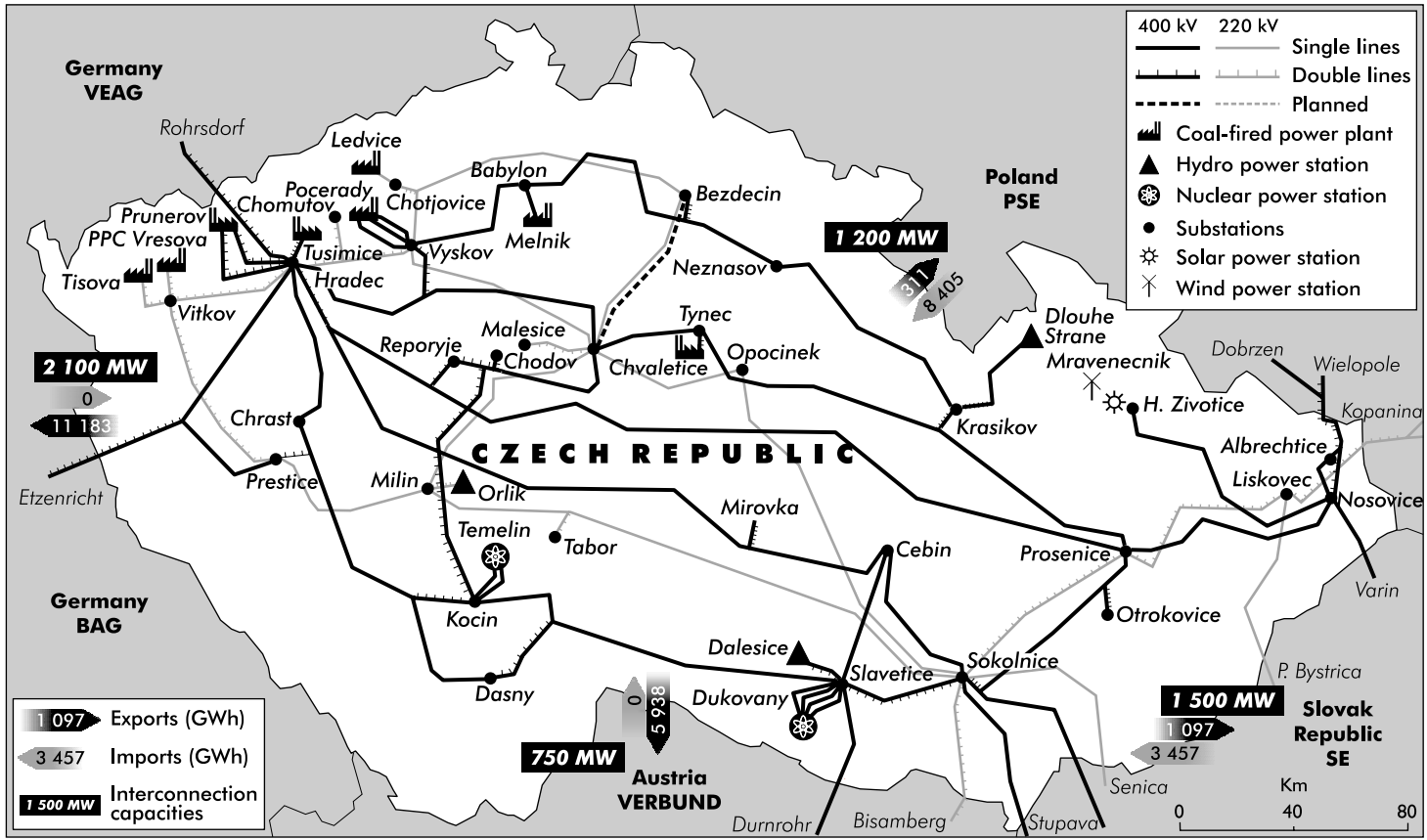
DISTRIBUTION

The eight distribution companies were created in 1990 as part of a disaggregation of the network. They supply all final consumers with the exception of approximately 6 TWh used by industrial autoproducers and 0.1 TWh sold by ČEZ directly to consumers. Ownership of the distribution companies was originally in the hands of the State Property Fund. For each company, about 34% of the ownership was transferred to municipalities, and another 15% was sold to the private sector. Many municipalities have sold their shares to foreign companies. In 1998, the government decided to regain majority control over the companies through share purchases by ČEZ before carrying out full privatisation. At present, ČEZ owns majorities in five out of the eight distribution companies. It held minority positions in the other three distributions companies but sold those shares in 2004. The German utilities E.ON Energie and RWE have significant holdings in several of the companies. Table 29 ranks the eight companies by number of customers and shows their major significant shareholders.

The ČEZ acquisition of the majorities of the five distribution companies was agreed upon by the Office for the Protection of Competition with the stipulation that one of these companies, Severoceská Energetika (SCE), be subsequently divested. ČEZ took possession of all five companies in early 2003 but has still not taken any serious steps towards this divestiture. In its long-range strategy, Vision 2008, ČEZ includes SCE as an important part of its overall strategy.

Figure 24

Map of Electricity Transmission Network



Source: ČEPS.

Table 29

Electricity Distribution Companies

	Region of operation	*Customers (thousands)*	*Ownership, 31 Dec 2003*[1]
Jihomoravská Energetika (JME)	Southern Moravia	1 009	E.ON Czech Holding AG (100%)
Severomoravská Energetika (SME)	Northern Moravia	931	EBO Czech Invest. Lim. (21.8%) E.ON Czech Holding AG (8.5%) ČEZ, a. s. (59.1%)
Severoceská Energetika (SCE)	Northern Bohemia	658	MES AG (29.2%) E.ON Czech Holding AG (5.9%), ČEZ, a.s. (51.0%)
Východoceská Energetika (VCE)	Eastern Bohemia	649	E.ON Czech Holding AG (41.7%) ČEZ, a.s. (50.1%) DEOP v.o.s. (6.7%)
Prazska Energetika (PRE)	Prague	683	PRE Holding (50.8%), Honor Invest (34.0%), MPSV (14.2%)
Stredoceská Energetika (STE)	Central Bohemia	661	ČEZ, a.s. (58.3%), RWE plus AG (35.0%)
Západoceská Energetika (ZCE)	Western Bohemia	489	E.ON Czech Holding AG (34.4%) Energie AG-Austria (11.2%) ČEZ, a.s. (50.3%)
Jihoceská Energetika (JCE)	Southern Bohemia	403	E.ON Czech Holding AG (100%)
Total		**5 482**	

[1] Shows only significant shareholders.

Source: Country submission.

ELECTRICITY MARKET OPERATOR

The Czech electricity market operator is a company called Operátor trhu s elektřinou, a.s. (OTE). OTE's main responsibility is to co-ordinate supply and demand in the electricity market. In this way, OTE acts as the balance responsible entity for the liberalised components of the Czech electricity sector. To a large degree, this involves resolving imbalances between contracted and consumed electricity and settling the billing consequences of such imbalances for the involved (buying and selling) parties. OTE has also been operating a short-term wholesale electricity market since 2002. OTE collects the bids and offers for the day-ahead market and matches them up until a price is established. In 2002, traded volume for the day-ahead market was 445 GWh and in 2003 it was 480 GWh. This represents approximately 0.8% of total domestic consumption for both years. On 1 January 2004, OTE

established an intraday market although the volumes are considerably below that of the day-ahead market. OTE is a joint stock company founded in 2001 by the State and still solely owned by the Czech government through the Ministry of Industry and Trade. OTE has 34 employees.

ELECTRICITY PRICES

Regulated electricity prices in the Czech Republic tend to be below those of other IEA countries. In 2003, the ex-tax price for industry in the Czech Republic was 10% below the average price in 15 IEA countries[19] and the final price with all taxes included was 14% below. For households, the ex-tax price for the Czech Republic was 29% below the average price of 18 IEA countries[20] and the final price, with all taxes included, was 32% below. Figure 25 shows a selection of comparative prices.

Regulated Czech electricity prices have risen substantially in recent years, particularly for households. From a low tax-inclusive price of 1.6 US cents/kWh in 1991, prices have risen by more than 400% to 8.46 US cents/KWh in 2003. More recently, tax-inclusive household prices have risen by 42% from 2001 to 2003. Tax-inclusive industrial prices have stayed relatively flat since the early 1990s (therefore falling in real terms) although by more recently, these prices have also risen substantially, increasing by more than 30% from 2001 to 2003. These price increases (especially in the household sector) are a consequence of the regulator trying to eliminate subsidies and cross-subsidies for different customer classes. The longer-range historical pricing for both industry and households is shown in Figure 26.

Table 30 shows the relative weighting of the retail electricity prices for households in 2003.

Table 30

Breakdown of Household Retail Electricity Price, 2003

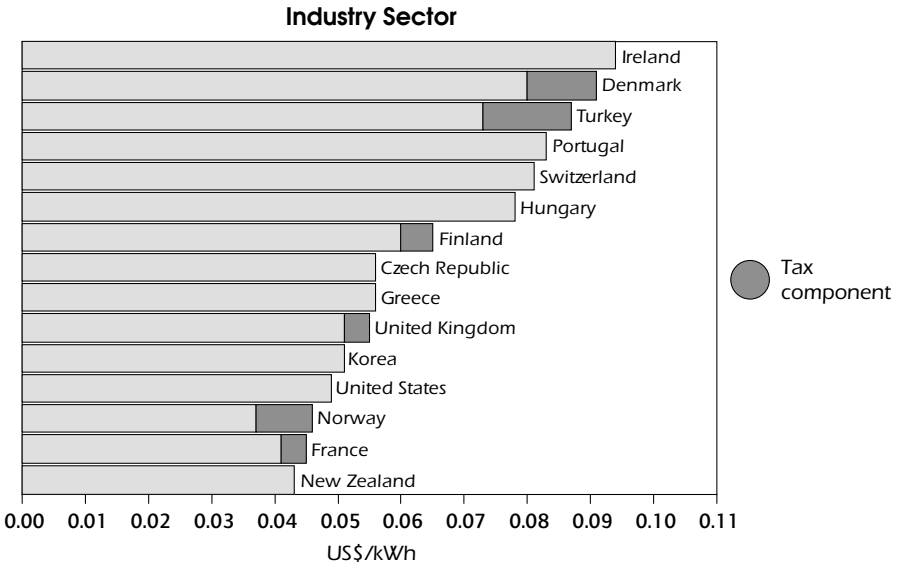
Component	*% of total bill*
Distribution	36.14
Electricity supply	33.91
VAT	18.03
ČEPS services	5.93
Transmission	4.73
Renewables and co-generation support	0.71
Decentralised producers	0.38
Market operator	0.18

Source: Country submission.

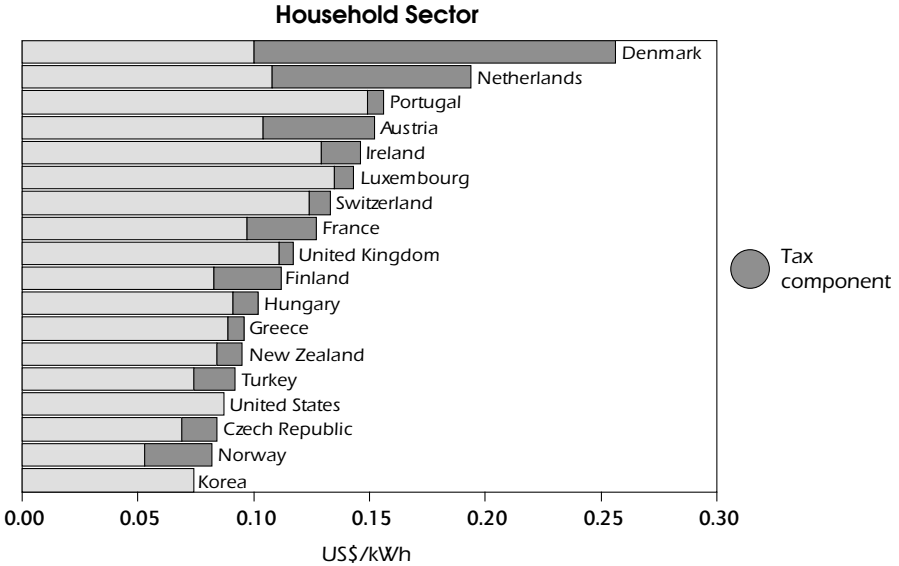
19. New Zealand, France, Norway, United States, Korea, United Kingdom, Greece, Czech Republic, Finland, Hungary, Switzerland, Portugal, Turkey, Denmark and Ireland.
20. Korea, Norway, Czech Republic, United States, Turkey, New Zealand, Greece, Hungary, Finland, United Kingdom, France, Switzerland, Luxembourg, Ireland, Austria, Portugal, Netherlands and Denmark.

Figure 25

Electricity Prices in IEA Countries, 2003



Note: Price excluding tax for the United States. Tax information not available for Korea. Data not available for Australia, Austria, Belgium, Canada, Germany, Italy, Japan, Luxembourg, the Netherlands, Spain and Sweden.

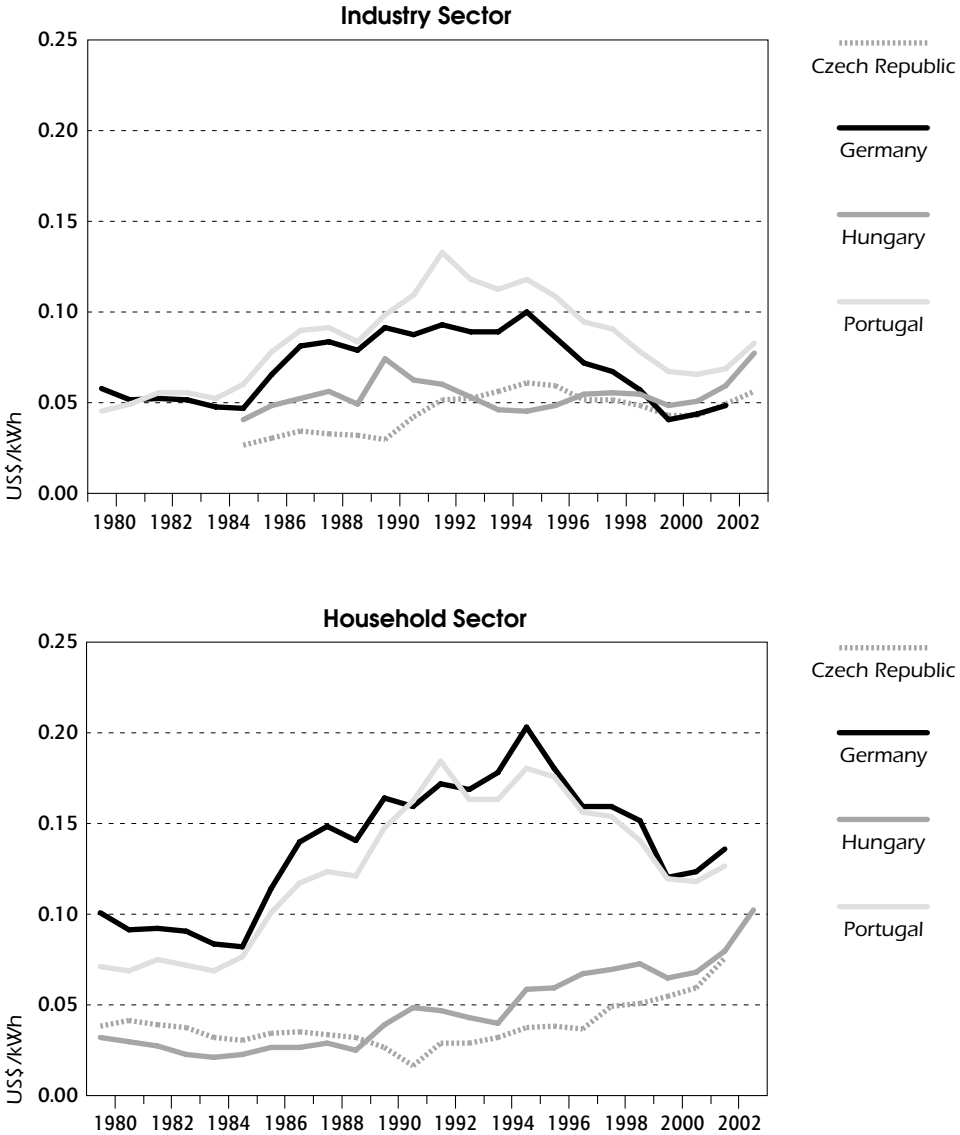


Note: Price excluding tax for the United States. Tax information not available for Korea. Data not available for Australia, Belgium, Canada, Germany, Italy, Japan, Spain and Sweden.

Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2005.

Figure 26

Electricity Prices in the Czech Republic and in Other Selected IEA Countries, 1980 to 2003



Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2005.

More information on prices in the unregulated electricity market for those customer classes granted the right to choose their supplier is included in the following section.

MARKET LIBERALISATION

The Czech electricity sector is undergoing a process of market reform. The government intends this reform process to comply with the EU Directive No. 2003/54/EC on common rules for the internal electricity market and Directive No. 2004/08/EC on promotion of CHP. The Act 458/2000 Coll. on Business Conditions and Public Administration in the Energy Sector and on Amendment of Other Laws (Energy Act) has been amended by the Act 670/2004 Coll. This entered into force on 30 December 2004, and is now fully in compliance with the EU Directive No. 2003/54/EC on common rules for the internal electricity market, Regulation (EC) No. 1228/2003 of the European Parliament and of the Council of 26 June 2003 on conditions for access to the network for cross-border exchanges of electricity, and Directive No. 2004/08/EC on promotion of CHP. The market is opening to supplier choice according to the following schedule:

- January 2002 – Customers with annual consumption greater than 40 GWh (17.9% of the market by volume).
- January 2003 – Customers with annual consumption greater than 9 GWh (29.8% of the market by volume).
- 1 January 2004 – All customers with continuous metering except households (47.4% of the market by volume).
- 1 January 2005 – All customers except households (78.2% of the market by volume).
- 1 January 2006 – All customers.

Once a customer class is opened, all customers will be able to choose the supplier of their choice. While regulated prices and terms will remain in place for network services, all regulations for pricing and terms for the supply of the actual electricity will cease. Customers in classes eligible for supplier choice will not be able to remain with the same supplier being served at fully regulated tariffs.

All eligible customers as defined by the schedule above (or, alternatively, all suppliers serving these customers) have non-discriminatory access to the transmission and distribution lines at rates and terms determined by the regulator.

The supply and network operations of the distribution companies have been unbundled on the accounting level. This has been necessary to inhibit any possible cross-subsidy between the competitive and non-competitive aspects of their operations. It was also necessary to create a set of accounts exclusively devoted to non-competitive network functions which the regulator can use in determining the "lines" component of the tariff for both eligible and captive

customers. Czech law, acting in compliance with EU Directive 2003/54/EC, mandates that all distribution companies legally separate their competitive and non-competitive operations by 1 January 2007. However, many of these companies are proceeding with this legal unbundling in advance of the deadline, according to the following schedule:

- 2 distributors (JME, JCE) controlled by E.ON to unbundle on 1 January 2005.
- 5 distributors (ZCE, SME, SCE, VCE, STE) controlled by ČEZ to unbundle on 1 January 2006.
- PRE (Prague distributor of electricity) to unbundle on 1 January 2006.

The high-voltage transmission operations already have ownership separation from any generation, supply and lower-voltage distribution activities.

Because of the confidentiality of contracts, there is no detailed public information on the numbers of eligible customers who have switched suppliers or renegotiated their contracts with the incumbent at a lower tariff. However, industry participants have identified only two (relatively large) customers that have switched from their incumbent suppliers. The demand of these two customers makes up between 2% and 3% of the total domestic market. These customers lowered their electricity prices by around 5%. No information exists on customers that have renegotiated electricity at a lower price with their incumbent supplier. Other smaller customers have also likely switched although the percentage share of switched companies on a volume or customer basis remains small. One of the customers that switched suppliers was the Prague public transport company which signed a supply contract with the local distribution company Prazska Energetika (PRE). ČEZ is now competing with E.ON, PRE and the Appian Group to supply the major electricity users in the country, among them the Czech national railway, petrochemical group Unipetrol and hard coal company OKD.

ČEZ's wholesale price fell in the first year of the liberalised market, declining by 6.1% from 2002 to 2003. The price then increased by 5.6% from 2003 to 2004. In September 2004, ČEZ announced that it would increase its average wholesale power price by 11% next year. This rate increase was less than the 15.6% rise the company initially announced. The local press has reported that ČEZ was pressured by high-level Czech politicians to limit its price increase and the final 11% increase was reached as a compromise. With the 11% increase, prices in 2005 will be 5.1% above the prices in the last year of the regulated market (2001).

CRITIQUE

Electricity supply in the Czech Republic is stable, reliable and inexpensive. With generating overcapacity, sufficient internal transmission and interconnections

equal to around one-third of domestic installed capacity, the Czech power supply is secure. Since nearly 95% of the generation comes from coal and nuclear plants, fuel supply and the price of supply is also relatively stable. The price paid by final consumers is still significantly below the average for other EU and IEA countries, even though prices have risen as cross-subsidies and subsidies have been eliminated. Electricity generation also provides the country with substantial export revenue.

These favourable conditions for the electricity market are likely to continue in the future. Wholesale price levels, currently in the three euro cent/kWh range are generally insufficient to support new build but will not need to increase to induce added capacity given the currently high reserve margin. While electricity consumption is growing faster than the demand for other end-use fuels, there is still potential for energy efficiency and thus reserve margins are unlikely to be threatened in the near to mid-term and high export levels can be expected to continue. The relative price stability offered by coal and nuclear generation will also act as a stabilising force, although greater international integration could raise prices since surrounding countries tend to have higher prices and thus will draw further Czech exports. One potential threat to the electricity sector is the high carbon content of coal emissions and possible restrictions imposed by the Kyoto Protocol. However, with the country's favourable position vis-à-vis Kyoto and the rather generous NAP allocations, this should not pose a serious threat in the near or medium term.

The increase in regulated tariffs in recent years is a welcome development to the extent that previous tariffs to different customer classes were not cost-reflective. Cost-reflective pricing ensures greater economic efficiency and is likely to encourage efficiency in electricity use. In addition, the cost-reflective higher prices are essential for the development of competition. If new entrants must compete against subsidised prices in one or more customer classes, it will be difficult for them to gain clients or capture market share.

The basic legislative, legal and regulatory framework for market reform and the introduction of competition is sound. A gradual market opening with a fixed date for complete opening is a prudent approach to increasing customer choice since it allows all players to gain experience before facing a fully competitive market. The non-discriminatory open access for high- and low-voltage lines is also essential as is the account unbundling of the distribution companies. The establishment of the regulator is also an important development although, as noted in Chapter 3 on the General Energy Policy, there have been some reservations regarding the regulator's independence from government influence. Lastly, the complete ownership divestiture of ČEZ from the TSO (ČEPS) ensures the framework for neutral and transparent transmission system operation. The Czech government is to be commended for this move towards market reform and in its successful efforts to comply with the demands of the EU directives to which they are

now subject. Act No. 670/2004 Coll., which amended Act No. 458/2000 Coll. (Energy Act), and puts the Czech legislation in full compliance with relevant EU rules has been in force since 30 December 2004.

The harder work will be to translate these sound policies into competition that benefits consumers and the country as a whole. So far, the results are mixed. It is a good sign that ČEZ is competing with a number of viable new entrants to serve the larger electricity consumers in the country. At the same time, it does not appear that many customers are actually switching and that only the largest consumers are in play. A number of factors may have played a role in ČEZ's decision to raise its wholesale prices by 11% from 2004 to 2005. Certainly wholesale power prices in Europe have been going up and international coal prices have increased although this should only indirectly influence the Czech domestic market. In addition, ČEZ would like to procure sufficient funds for the reconstruction of existing thermal power plants and/or the construction of new nuclear power plants and they claim that existing prices are not sufficient to make such future investments. This increase may also be a further correction from a previously subsidised pricing scheme. Nevertheless, a double-digit price increase suggests that ČEZ maintains a strong position in the market. In any event, the government's possible influence in getting ČEZ to keep the price increase to 11% is not an effective means of providing consumers fair prices. If competitive pressures are not sufficient to do so, the structure of the system must be revisited and altered.

One aspect of the Czech market that could impede the benefits of competition is the current horizontal and vertical integration of ČEZ. With roughly 70% of generation market share and control of five out of eight local distribution companies serving 66% of final customers, ČEZ is in a position to influence the overall market in a non-competitive way. On the generation side, its size could allow the company to raise the wholesale price of power to gain greater revenue or, alternatively, to lower the price to punish smaller competitors. While the company is not so dominant that it could exercise this influence throughout the year, it is more likely able to do so on a regular basis in certain supply and demand situations. On the retail side, ČEZ's control of 66% of final customer delivery could pose a number of problems. First, those distribution companies could buy power from ČEZ even if more attractive prices were available on the market. (While competitive pressures would ideally prohibit this practice, the price responsiveness and market sophistication of all customers has not yet been established.) Second, they could potentially deny non-discriminatory access to their low-voltage networks. Even the suggestion or possibility that these distribution companies would favour ČEZ over other wholesale suppliers could be sufficient to deter new entrants.

Regarding the horizontal market share, the country's substantial interconnections will help mitigate the company's dominance. At roughly 32% of the installed domestic capacity, the threat of imported power will keep a check on any above-

market pricing. At the same time, three of the four neighbouring countries (Austria, Germany and Slovakia) are unlikely to target Czech customers given the low levels of competition in those countries and/or higher prices which make the home markets more attractive. The fourth country, Poland, currently exports substantial amounts of power to the Czech Republic and is likely to continue doing so even as both countries introduce market reform. In 2002, Poland exported 8 405 TWh into the Czech Republic, equal to 11.9% of the net domestic generation and, owing to the net exports, 14.4% of domestic consumption. Not only does international trade provide a counterbalance to domestic market concentration, it also enhances energy security and drives higher economic efficiency. All efforts should be made to strengthen international trading possibilities by working to remove any remaining constraints on such trade. As a longer-range project, the government may want to consider the advantages of a regional power pool.

OTE's wholesale short-term electricity market is a welcome development. The current volumes (less than 1% of the whole market) mean the resulting price does not fully reflect all market conditions since not all players are involved and the price can be manipulated. Any actions to increase the volume are encouraged. Some countries have made their pools compulsory although this brings its own set of problems and is probably not appropriate for the Czech electricity sector at this time. It will be essential in any event that international participants have unimpeded access to this market. Such players have an important role in developing competition and the existence of a viable market will give them further comfort and security in entering the country. As market volumes increase, a true market reference price will develop which all industry participants can refer to in making buying and selling decisions. A viable market with a representative price will also provide a measure with which government authorities can assess any possible excessive prices resulting from market concentration. It will also substantially increase market transparency.

The question of vertical market integration has already been addressed by the Office for the Protection of Competition. As a condition for allowing ČEZ to gain control of those five distribution companies, the Office stated that ČEZ must divest control of one of these holdings. This type of merger assessment and conditional divestiture is essential for an effective market. However, ČEZ has not yet sold off the company in question and has even given signs that it does not plan to do so. Not only is resolution of this issue important in its own right, it can also establish an important precedent for the State's assessment and control of market dominance. The decision of the Office for the Protection of Competition should be followed stringently within the context of relevant legislation.

Despite the many commendable developments towards competition in the Czech electricity sector, the lingering uncertainties, as with any newly competitive market, warrant government monitoring. Sector participants that are most vulnerable to any flaws in the new system are those customers that are

given the right of supplier choice but have neither the means nor the motivation to seek the most attractive supplier. These could be commercial establishments or households. Since these customers will no longer have recourse to a regulated tariff, they would be fully susceptible to a price increase from the incumbent and any other suppliers. While the elimination of regulated tariffs would represent the ideal situation to foster competition in a mature market, the government should be vigilant in protecting smaller customers during this ongoing transitionary phase. In many countries, the opportunities to access regulated tariffs in opened customer classes (sometimes termed as "supplier of last resort") continue in markets that have been opened. For example, this is the case in France, Spain and Denmark.

The government must ensure that its majority ownership of ČEZ does not act as a deterrent to a market-oriented electricity sector. The government could potentially favour ČEZ as a means of increasing its dividends or creating a national champion. At the same time, the government cannot constrain ČEZ in its pricing decisions for political reasons. This should be the job of the regulator or, ideally, the markets themselves. State ownership need not imply special government treatment and there are many countries where state-owned companies such as ČEZ operate in highly competitive markets with no apparent government favouritism or influence. The government is encouraged to clarify the role it plays with regard to ČEZ in light of its majority ownership of the company, its influence on liberalised wholesale pricing, its influence on the regulator, its role in establishing market rules, its role in promoting Czech industry abroad and its role in protecting the interests of domestic consumers.

RECOMMENDATIONS

The government of the Czech Republic should:

- *Closely monitor the electricity market and prevent possible abuses of dominant position.*
- *Consider possible impediments to competition resulting from ČEZ's horizontal and vertical integration in the electricity sector, and maintain a robust approach to eliminating any anti-competitive behaviour.*
- *Ensure non-discriminatory access to the grid.*
- *Work with industry and international partners to remove any remaining constraints on international electricity trade to help enhance energy security and reduce the dominant position of the incumbent; consider the advantages of a regional power pool as a longer-range project.*

- *Seek to expand the OTE wholesale market in order to create a viable reference price and increase market transparency.*
- *Ensure that consumers given supplier choice are provided protection from excessive prices in the transitionary phase towards a competitive market.*
- *Maintain a transparently arm's length relationship with ČEZ and clarify the various roles it plays with regard to ČEZ.*

INTRODUCTION

Nuclear energy for electricity production was first introduced in the Czech Republic in 1985. The major change in the Czech nuclear power sector since the last IEA in-depth review four years ago was the commissioning of the Temelín nuclear power plant.

The country today has two operating nuclear sites, Dukovany and Temelín. There are four units operating at the Dukovany nuclear power plant in Southern Moravia. The units are Russian VVER 440/213 type pressurised light-water reactors with a total installed capacity of 1 760 MW_e. There are two units operating in South Bohemia at the Temelín nuclear power plant since April 2003 when the trial operation on the second unit started. The units are Russian VVER 1000/V320 type pressurised light-water reactors with a total installed capacity of 2 000 MW_e.

In 2003, the share of nuclear capacity in electricity generation was 21.7% while the share of nuclear electricity production was 31.1%. The total nuclear capacity is 3 760 MW_e out of a total 17 325 MW_e installed capacity of the Czech power producers. Altogether, the two nuclear power plants generated 24 364 GWh of electricity while the country as a whole produced 76 658 GWh in total.

The six operating nuclear units play an important role in the Czech energy sector. Electricity generation by nuclear power can balance the high emissions from coal-fired power plants and thus place the Czech Republic in a better position vis-à-vis its Kyoto commitments. Until 2001, domestic electricity production was only capable of covering the domestic consumption. After Temelín start-up, an excess capacity is available to export, and the Czech Republic is today the second-largest electricity exporter in Europe.

TWO NUCLEAR POWER PLANTS

All the six units of the Dukovany and Temelín nuclear power plants are owned and operated by ČEZ a.s., the major Czech electricity utility. ČEZ is majority-owned by the State (see Chapter 7). A large programme to modernise and upgrade the Dukovany plant was started in 1995 and should be completed by 2010. This programme, which will create conditions for the extension of the lifetime of the plant, will cost an estimated CZK 20 billion for the period up to 2005.

The Temelín site in Southern Bohemia was originally planned to host four Soviet-designed VVER-1000 units. Construction of the first two units started in

1986, in a regulated electricity market and at a time when electricity demand grew by between 2% and 3% per year. In 1990 the government decided to complete only two units, a decision that was reaffirmed in 1999. The government also decided in 1993 to upgrade the design in order to meet international safety standards. The major design modifications, involving the core and instrumentation and control (I&C), were carried out by Westinghouse. The upgrade delayed completion of the plant and greatly increased its cost.

In response to a request by Austria, which opposed the commissioning of the plant, a special expert mission with trilateral participation (EU, Austria and the Czech Republic) has been established in order to identify issues of Austrian concern and to find solutions to the problems identified. Missions from the International Atomic Energy Agency (IAEA) visited the Temelín nuclear power plant and in the time period between 1990 and 2003 it has been examined by 22 different inspection teams of the IAEA. This work resulted in recommendations for improvement of the reliability and safety of the plant, which were integrated into construction and launch.

In late 2003, the IAEA made follow-up inspections to both Dukovany and Temelín nuclear power plants. These Operational Safety Review Team (OSART) missions concentrated on assessing how the plants succeeded in implementing the recommendations and suggestions of previous OSART missions in 2001 concerning operational safety improvements.

Of a total of 33 recommendations made by the OSART mission in 2001 to Dukovany plant, 22 were found to have been implemented, and 11 were found as satisfactorily progressing towards implementation. None of the recommendations was found to be in an unsatisfactory state of implementation. For the Temelín nuclear power plant, the OSART mission in 2001 made a total of 46 recommendations and suggestions. The IAEA expert team found 29 were fully implemented and the remaining recommendations were found in a satisfactory state of progress of implementation.

The technical and safety performance of the nuclear units in operation at Dukovany is satisfactory according to IAEA. The average availability factor of the Dukovany plant exceeds 85%. The unplanned capability loss factor is below the world average. The plant has improved its operational and safety indicators such as safety system unavailability, number of starting failures, number of unplanned scrams per unit or fuel reliability. The plant has made visible improvements for confinement leak-tightness in three out of four of its units. Temelín has an insufficient operating history to provide a similar assessment.

ČEZ is currently upgrading safety and creating conditions for the potential extension of the lifetime of the Dukovany plant. A contract was signed in 2003 for the upgrade of the low-pressure flow-through turbine components and upgrades for the instrumentation and control system have started.

Additional work to be performed include: installation of new diagnostic systems for the reactor, the main circulating pump and turbine; refurbishment of the radiation control information system, generating unit electrical protection system and main generator automatic activation system. In addition, ČEZ plans to modify the spring-based pipe mountings in both the primary and secondary circuits.

An optimisation programme implemented in the past several years has increased the productivity of ČEZ a.s.-operated power plants, including the two nuclear sites. Labour productivity in 2000 amounted to 467 MWh/month/employee, while in 2003 it was 729 MWh/month/employee. This means that the productivity increased by more than 56% over the three-year period. As a result of the restructuring of the ČEZ a.s., the number of employees decreased from 13 723 to 6 780 in ten years. For both the Dukovany and Temelín nuclear power plants, the process has been reported to and controlled by SONS, the nuclear regulator.

Both nuclear power plants have information centres. Each year, nearly 50 000 visitors pass through the information centres, which contributes substantially to the overall acceptability of nuclear energy in the Czech Republic. Public acceptance of the nuclear power generation is good both in the region of the nuclear units and in the Czech Republic in general.

INTERNATIONAL CO-OPERATION

Since 1 May 2004, the Czech Republic is a member of the EU. It has a long-standing tradition of being involved in the work of international organisations such as the IAEA. Since 1995, the Czech Republic is a member of the OECD and of its Nuclear Energy Agency. ČEZ is also a member of the World Association of Nuclear Operators (WANO). In 2003, it became a member of the World Nuclear Association (WNA) and was also a co-funder of the World Nuclear University (WNU).

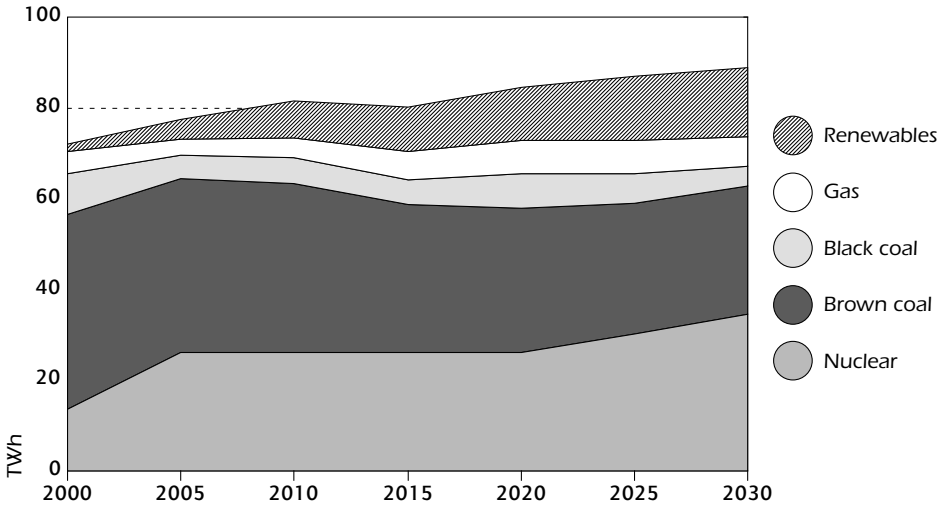
POSSIBLE FUTURES FOR NUCLEAR POWER

Among the four major goals of the SEP, one addresses ensuring the effective amount and structure of primary energy sources. This goal contains three sub-goals, one of which deals with the optimisation of nuclear energy use.

The final scenario used as the basis for the SEP assumed that the lifetime of the Dukovany power plant would be extended at least until 2030, that a 600 MW_e unit would be added by 2025, and that another 600 MW_e unit would be added by 2030. According to this projection, nuclear power's share of total electricity generation is expected to rise from 33% in 2005 to 39% in 2030. The SEP projections are shown in Figure 27.

Figure 27

Projected Shares of Electricity Generation, 2000 to 2030



Source: State Energy Policy (SEP), March 2004.

ČEZ has publicly announced that it is considering new nuclear units to add to its portfolio. Such an addition would consist of one or two units, most likely at the existing sites of Dukovany or Temelín. The company estimates that the entire process, from initial studies to commercial operation, would take approximately 15 years.

URANIUM PRODUCTION AND FUEL CYCLE

The Czech Republic, as a part of the former Czechoslovakia, started producing uranium early in the 20th century and large-scale production began in 1946. Uranium production capacity peaked at some 3 000 tU/year in the 1960s but dropped substantially, especially after 1990, because of the progressive exhaustion of economically recoverable resources. Uranium resources recoverable at less than US$ 80/kgU are estimated at around 5 000 tonnes. Since 1990, the Czech authorities have gradually phased out uranium production; 19 out of 20 mines have been closed, and staff was reduced. Dolní Rožínka, the only mine still in operation, produced 280 tU in 2004. This facility was due to close in 2002 but in November 2000 it was authorised to continue operating until the end of 2003. The government stated in the previous in-depth review that the uranium mine was to be closed in 2003; however, in July 2002 it decided by its resolution No. 689/2002 to prolong

the operation of the mine until the end of 2005. According to the government, a further extension will enable faster restoration of mining sites in Northern Bohemia, but the mine cannot produce uranium at a price competitive with the world market.

The state-owned company Diamo s.p. carries out all uranium-related activities. The Czech Republic has no domestic industry for producing nuclear fuel or providing other fuel-cycle services such as conversion and enrichment. Diamo s.p. produced 109 000 tU in its entire history, mostly in the form of yellow cake. The fuel for Dukovany is imported from Russia, where it is manufactured with Czech uranium. ČEZ a.s. has signed a contract with Westinghouse to buy five years' worth of fuel from its U.S. plants to supply Temelín.

In conjunction with the reduction of uranium production, a major programme of Diamo s.p. focuses on the decommissioning and restoration of closed mining and milling sites. It aims to mitigate the heavy damage done to the environment by past uranium production activities. The programme covers some 20 sites and is expected to last until 2040.

In the former Czechoslovakia, spent fuel from the Dukovany nuclear power plant was sent to Russia for disposal, until such time as Russia decided to accept it only for reprocessing, following which it was sent to an interim spent fuel storage facility at the Bohunice nuclear power plant in the Slovak Republic. In 1993 the Slovak utility SEP, which operated the Bohunice plant, decided to no longer accept the fuel and in 1995, the Slovak utility began shipping Dukovany's spent fuel back to the Czech Republic, aiming to return all such spent fuel by 1997.

To address this problem, Dukovany began re-racking the fuel assemblies in its spent fuel ponds, which increased capacity by about 90%. In addition, ČEZ built a 600-tonne interim dry storage facility on site, which began trial operations in March 1997. The Dukovany plant also received a building permit for the extension of the existing dry storage facility by an additional 1 340 tonnes of capacity. The normal storage capacity at Temelín is sufficient for nine years and the preparation phase for the siting of a dry storage facility was started in 2004.

In addition, the Czech government (Resolution No. 121/97) confirmed a recommendation issued by the Ministry of Environment. This recommendation prioritises additional spent fuel depository construction projects at nuclear sites and, as a depository backup option, further monitoring of construction opportunities at the Skalka location. The Skalka site serves as a reserve variant of interim storage for ČEZ (owner of the location).

In parallel with the site investigation, a communication programme to improve public acceptance has also started but it was stopped by the government because of public resistance at almost all the candidate sites. The government has not decided on the continuation of the communication programme.

WASTE AND DECOMISSIONING

The 1997 Atomic Act stipulates that the generator of radioactive waste is financially responsible for its management, from its origin to its disposal. The Radioactive Waste Repository Authority (RAWRA), established in 1997 by the Ministry of Industry and Trade, is responsible for the safe disposal of waste, including monitoring after closure of the radioactive waste repository.

The Ministry of Industry and Trade and RAWRA have developed a plan for deep geological storage of high-level radioactive waste and spent fuel. Such a facility would be located domestically and be put into operation in 2065. This facility will be treated as a final disposal site. Neither a date nor a location for the final deep geological disposal has been indicated.

The nuclear provisions for treatment of waste and plant decommissioning are divided into three categories: *i)* plant decommissioning, *ii)* interim storage and *iii)* final waste disposal.

PLANT DECOMMISSIONING

It is estimated that the cost of decommissioning the four Dukovany units would be a total of CZK 16.4 billion and the cost for the two Temelín units would be CZK 13.7 billion. These figures are in nominal terms at the time of decommissioning. Funds are accumulated to handle these expenses by contributions from ČEZ to escrow accounts equal to CZK 406 million for Dukovany and CZK 265 million for Temelín in 2003. As of 31 December 2003, the accumulated funds in this escrow account equalled CZK 4.3 billion.

INTERIM STORAGE

The interim storage in this case refers primarily to the purchase of interim fuel storage casks. The estimated cost of interim storage is CZK 5.4 billion. It is met with payments of CZK 26/MWh generated for the Dukovany units and CZK 22.5/MWh for the Temelín units. In 2003, the total contribution to this end was CZK 103 million.

FINAL WASTE DISPOSAL

Final disposal of radioactive waste and spent fuel is estimated to cost CZK 43.3 billion for both plants. A "Nuclear Account" has been established at the Czech National Bank and is controlled by RAWRA. ČEZ contributes CZK 50 for each unit (MWh) of electricity generated from either nuclear power plant. In 2003, the contributions to this account were CZK 1.3 billion.

REGULATORY AND LEGAL FRAMEWORK

Nuclear energy activities are regulated by the Act on Peaceful Uses of Nuclear Energy and Ionising Radiation and on Alteration and Amendments of Related Legislation, usually called the Atomic Act, which was adopted and entered into force in 1997.

Eighteen regulations have been developed related to the Atomic Act that are fully harmonised with the current international requirements and recommendations. In connection with the country's EU accession and in order to enable the implementation of obligations resulting from the newly concluded international treaties, the Czech Parliament amended the Atomic Act as Act No. 13/2002 Coll. Additional legislation includes the Act on Environmental Impact Assessment that sets out the procedure to be followed by each nuclear installation before commissioning.

The Ministry of Industry and Trade proposes domestic legislation, negotiates intergovernmental treaties and co-ordinates the activities in the nuclear field with national economic policy. The construction, operation and decommissioning of nuclear facilities as well as radioactive waste management are the responsibility of the ČEZ, the Ministry of Industry and Trade having the political responsibility in the above spheres.

The State Office for Nuclear Safety (SONS) is the competent body for the licensing and inspection of nuclear facilities. The Atomic Act, together with the Act on State Inspection, provides SONS with sufficient power to execute the state supervision and also the means of coercion to enforce fulfilment of legal requirements for nuclear safety and radiation protection. The SONS chairperson appoints the inspectors of the national regulatory body. SONS inspectors are present permanently at both Dukovany and Temelín nuclear power plants.

The SONS supervises three research reactors, several radioactive waste storage facilities, and a spent fuel interim storage facility and low-level radioactive waste repository both of which are operated at Dukovany.

The SONS budget for 2004 was approximately CZK 374 million which the organisation states is sufficient to fulfil its basic functions as required by the regulator under law. The budget for 2004 approves 194 jobs for the SONS. SONS issues all technical safety regulations. The management of radioactive waste is also governed by the Atomic Act, which sets out the general responsibilities of waste generators.

The Czech Republic has been a party to the 1994 Convention on Nuclear Safety since 18 September 1995. It approved the Convention on the Safety of Spent Fuel Management in 1997 and the Convention on Safety of Radioactive Waste Management on 25 March 1999. The Czech Republic has also acceded

to both the 1986 Convention on Early Notification of a Nuclear Accident and the 1986 Convention on Assistance in the Case of Nuclear Accident or Radiological Emergency. The Atomic Act incorporates third-party liability provisions in accordance with the Vienna Convention on Civil Liability for Nuclear Damage under which the nuclear operator must accept its responsibility for damages caused to any third party. This liability is limited to CZK 6 billion per nuclear installation and CZK 1.5 billion for other facilities, including transport. The nuclear operators must be insured for liability. To cover these liability claims, a nuclear insurance pool was established in the Czech Republic in July 1995. The State is obliged to compensate for amounts exceeding insurance coverage.

With regard to non-proliferation, the Czech Republic is member to the 1968 Treaty on the Non-Proliferation of Nuclear Weapons and to the Convention on the Physical Protection of Nuclear Material in 1993. The Czech Republic also ratified the Comprehensive Nuclear Test Ban Treaty in 1997.

Inspectors from the IAEA and EURATOM together with those from SONS are authorised to inspect nuclear material and the accounting and control system, according to the EURATOM treaty, the Non-Proliferation Treaty and the Treaty on the Prohibition of the Emplacement of Nuclear Weapons and Other Weapons of Mass Destruction on the Seabed and the Ocean Floor and in the Subsoil thereof.

Regarding the construction of a new nuclear installation, the licence approval process requires the involvement of five different state organisations before the local authority approval: Ministry of Environment, Ministry of Interior, Ministry of Health Care, the SONS and the Czech Industrial Safety Inspection. The Ministry of Environment is responsible for organising public hearings related to new nuclear installations or power upgrades of the existing ones.

According to the existing legislation, strategic nuclear fuel reserves should be in the form of fuel assemblies that are suitable for loading into a reactor.

CRITIQUE

Nuclear power is helping the Czech Republic to meet the major objectives of the SEP, particularly ensuring the effective amount and structure of primary energy sources and reducing the harmful impact on the environment from the energy sector. The nuclear power programme of the Czech Republic has increased diversity and security of energy supply, enabling the export of electricity while reducing GHG emissions. Furthermore, the start-up of the Temelín nuclear power plant allowed 1 965 MW_e of fossil fuel-fired generating capacity to be decommissioned resulting in reduced emissions of solid pollutants, SO_2, NO_x and CO.

The final scenario used as the basis for the SEP assumed that two 600-MW_e units would be added by 2025 and by 2030. ČEZ has also publicly announced that it is considering new nuclear units to add to their portfolio. This is understandable taking into account the important role of nuclear. At the same time, in competitive and deregulated markets in many other IEA countries, longer construction lead times and higher capital costs could make new investments in nuclear power more challenging. The government should ensure that any additional plants would be built under market conditions whereby companies invest in the plant solely as a profitable venture in a liberalised market.

In order to maintain the nuclear option, the government has important responsibilities in the fields of nuclear safety, radioactive waste management, decommissioning, legal and educational infrastructure, and basic R&D.

According to international organisations (IAEA, WANO), the safety and technical performance of both operating nuclear power plants have been satisfactory. ČEZ a.s. has made efforts to meet the safety requirements and to implement the given recommendations made by the IAEA. ČEZ a.s. has been taking a concerted approach to environmental protection. All the commissioned power stations, including nuclear plants, hold international Environmental Management System certificates demonstrating that the operation of the plants are in compliance with the ISO 14001 standard. The planned upgrade of Dukovany is expected to improve its safety and create conditions for the extension of its operating lifetime. The improvement in productivity seen from 2000 to 2003 is laudable although all such changes in operating practices should continue to be reviewed and agreed upon by SONS.

Both the government and ČEZ benefit from their associations with international organisations in the nuclear field, including the IAEA and the WANO. The country's recent accession to the EU will give further opportunities for international co-operation. All such co-operation should be fully explored and with the fullest benefit realised.

The environmental aspects of waste disposal and plant decommissioning must be addressed in pursuing the nuclear option. The government has to regularly control the adequacy of nuclear provisions to cover the future costs of waste management and final disposal of low, intermediate and high-level radioactive wastes as well as for spent fuel, and also for the decommissioning of existing nuclear power plants. As cost estimates for a high-level waste repository and the decommissioning can change over time, the government should continuously verify that funds for waste management and decommissioning are adequate.

All nuclear-related activities should be transparent with possible expanded involvement of the public in decision-making. Communication related to waste management and final waste disposal requires special focus in this

regard. The programme to improve public acceptance for the exploration of a potential deep geological disposal site was unsuccessful, in part because of a weak communication programme. The government has to find the proper ways to communicate with the public, which would be an open, transparent discussion with the involvement in decision-making of all the stakeholders to deal with public resistance. The government has to make a decision in the short term on the continuation of the communication programme. In addition, the delays in siting and developing the storage facility have likely changed the costs of this project. Such changes should be assessed and the supplements to the electricity price going to the funds to pay for the repository facilities should be adjusted accordingly.

The Czech government has given priority to the cleaning and restoring of closed uranium mines. These activities need adequate funding to be completed. The government had originally decided to extend the operation of the Dolní Rožínka mine until the end of 2003 at the latest. However, production continues at the mine and a new date will be fixed by the Government Decision No. 689/2002 at the end of 2005. The cost of the uranium extracted there is estimated at US$70 per kgU, which is much higher than the oversupplied world market price of US$ 26. As the final product of the uranium exploration activities is used entirely for fuelling the Czech nuclear power plants, the difference between the cost of domestic production and the world market price as a burden is still covered by the end-consumers. The government should act to close down this inefficient mine as it had previously planned.

RECOMMENDATIONS

The government of the Czech Republic should:

- *Maintain the nuclear option while ensuring that additional units would be built in an open market situation.*
- *Continue regular monitoring of nuclear safety in both Dukovany and Temelín nuclear power plants.*
- *Assure an atmosphere and a solid framework for open discussions on nuclear waste management issues to involve the public in the decision-making process.*
- *Continue to assure that the fund generated is in compliance with the costs of fuel backend and decommissioning.*
- *Pursue final nuclear waste storage solution.*
- *Pursue the closure and clean-up of the Dolní Rožínka uranium mine.*

ENERGY RESEARCH AND DEVELOPMENT

GENERAL RESEARCH AND DEVELOPMENT

The Research and Development Council of the government of the Czech Republic was established in 1992 under Act No. 300/1992 on State Support of Scientific Activity and Technology Development (later amended as Act No. 2/1995 on State Support of Research and Development). The council is an advisory body of the Czech government. Although not a decision-making body, it is empowered to propose solutions in the field of research and development (R&D), including funding. The council has 15 members, appointed and recalled by the government for a period of four years. Its chairman is a member of the ruling government. The council has three vice chairmen responsible for fulfilling the objectives in the field of research, development and preparing the council activities. The secretariat of the council manages a central database of state-funded R&D projects.

Among the council's functions, it acts to:

- Clarify long-term trends in progress in Czech R&D.
- Comment on legislative drafts relating to R&D, to be put forward to the government.
- Carry out regular analyses of existing R&D efforts and compare with the situation in other countries.
- Administer a research information system and manage a central database of R&D projects funded by the State.
- Assemble views from the public and other interested parties on the state of Czech R&D.
- Deal with advisory bodies for R&D related to the EC and its individual member States.
- Propose a medium-term perspective on research and development support.
- Propose the total government expenditure on research and development.

In 2003, the Czech Republic spent 1.3% of its GDP on research and development activities[21]. This includes all R&D (energy and other fields) and both public and private expenditures. In the same year, the EU as a whole spent 1.9% of its GDP on R&D, the United States spent 2.8% and Japan spent 3.1%. In the Czech

21. All data from this paragraph are derived from the Czech government report, "Analysis of the Existing State of Research and Development in the Czech Republic and a Comparison with the Situation Abroad – 2003" produced by the Research and Development Council.

Republic, the government accounted for 42.1% of the total R&D expenditures while in the EU this figure was 34.5%, in the United States 28.7% and in Japan 18.5%.

ENERGY RESEARCH AND DEVELOPMENT

There is no special programme in the Czech Republic for the support of energy-related research and development projects. "Energy for the economy and the society" is one of the four thematic programmes in the "National Research and Development Policy of the Czech Republic" approved by the government on 5 January 2000. Both the Ministry of Industry and Trade and the Czech Energy Agency provide their opinions on energy-related R&D but decisions on funding are ultimately made by the Research and Development Council. The Ministry of Industry and Trade (MIT) does not directly control any research institution, but does offer subsidies for industrial R&D which would include energy projects. Under the administration of the MIT, the Czech Energy Agency administers funds to energy R&D activities. These expenditures do not exceed 5% of its budget and thus are below CZK 1 million per year. The CEA also disseminates information on progressive technologies in the energy sectors. More basic research in the field takes place at universities.

According to the MIT, the priorities for energy R&D are:

- Increase of energy efficiency, use of non-traditional energy sources, and renewable energy.
- Nuclear safety.

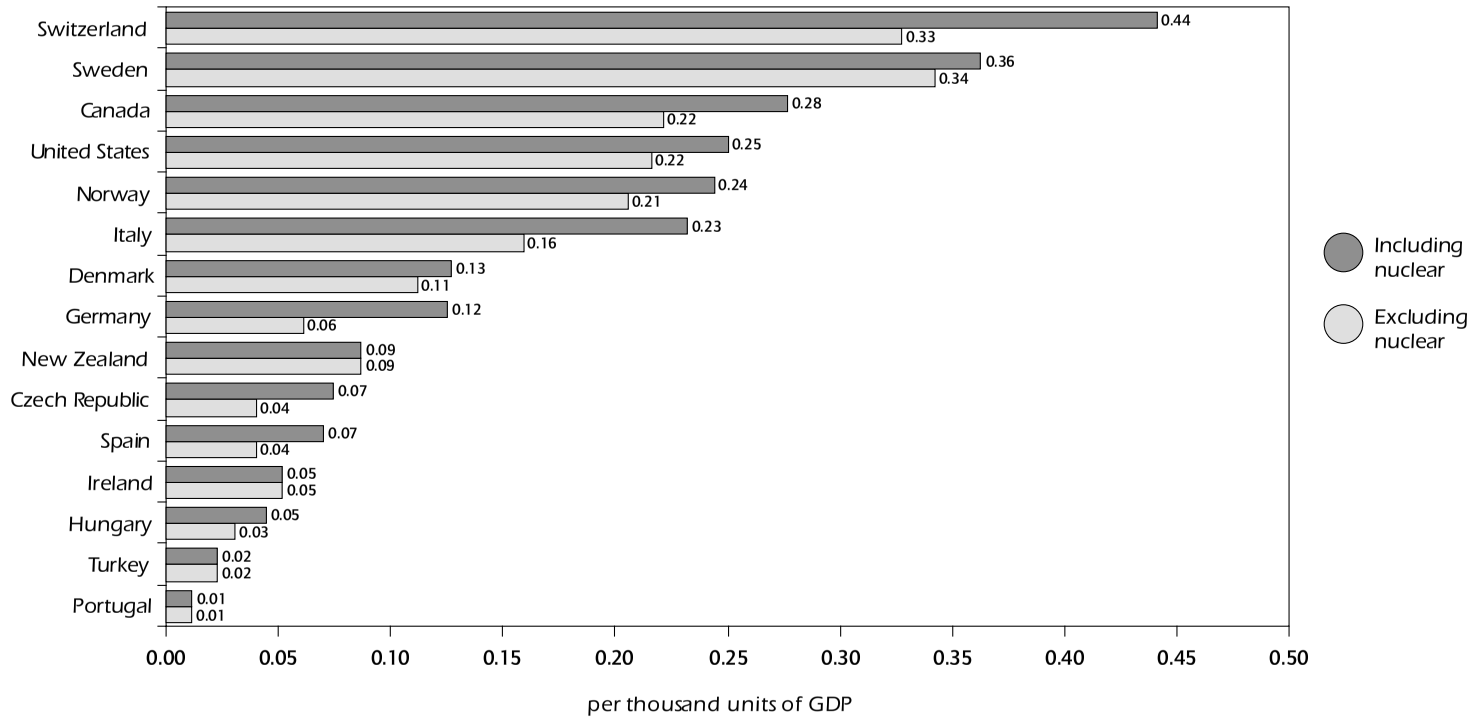
A breakdown of Czech R&D spending is found in Table 31. In 2003, the Czech government spent CZK 178.4 million on energy-related R&D. The majority of this amount was split between fossil fuels (44.6%) and nuclear fission technology (45.6%) with the remainder going to renewable energy (9.8%). These expenditures show a steadily downward trend. Spending in 2003 is 14.2% below 2002 and it is estimated that by 2005, government energy R&D spending will have fallen by a further 28.2% from 2003 levels.

On a per GDP level, the Czech government spent 0.013% of its GDP on energy-related R&D in 2002. This is below the average of 0.023%[22] for IEA countries in 2002. In 2003, Czech government energy-related R&D spending per unit of GDP fell to 0.007%. Figure 28 shows how the Czech Republic compared to other countries in 2003.

22. This average does not include data from Australia, Belgium, Luxembourg or Turkey. 2002 was used as a comparison year because the data set for that year is more complete with information from more countries.

Figure 28

IEA Government Budgets on Energy R&D per GDP, 2003*



* estimates.

Note: data not available for Australia, Austria, Belgium, Finland, France, Greece, Japan, Korea, the Netherlands and the United Kingdom. Luxembourg has no energy R&D programme.

Sources: *OECD Economic Outlook No. 75*, OECD Paris, 2004; and country submissions.

The Czech Republic is a member to one IEA Implementing Agreement: Energy Conservation in Buildings and Community Systems Programme (ECBCS).

Table 31

Historical and Projected Government Energy R&D Spending

(millions of CZK)

	2002[1]	*2003*	*2004 est.*	*2005 est.*
TOTAL CONSERVATION	–	–	–	–
Industry	–	–	–	–
Residential, commercial	–	–	–	–
Transportation	–	–	–	–
TOTAL FOSSIL FUELS	–	**79.6**	**23.0**	**23.0**
Oil & gas	–	**10.0**	**5.0**	**5.0**
Enhanced oil & gas	–	10.0	5.0	5.0
Refining	–	–	–	–
Oil shale & tar sands	–	–	–	–
Coal	–	**69.6**	**18.0**	**18.0**
Prod., prep., & trans.	29.4	19.6	3.0	3.0
Coal combustion	–	40.0	10.0	10.0
Coal conversion	–	10.0	5.0	5.0
TOTAL RENEWABLE ENERGY	–	**17.4**	**11.5**	**10.0**
Solar	–	**7.4**	**5.0**	**5.0**
Solar heating & cooling	–	7.4	5.0	5.0
Wind	–	**10.0**	**6.5**	**5.0**
Biomass	–	–	–	–
Hydro	–	–	–	–
TOTAL NUCLEAR FISSION/FUSION	**101.1**	**81.4**	**95.5**	**95.0**
Total nuclear fission	–	**81.4**	**95.5**	**95.0**
Nuclear LWR	–	10.0	10.0	10.0
Converter reactors	–	10.0	10.0	10.0
Nuclear fuel cycle	–	41.0	50.0	50.0
Nuclear support tech.	–	20.4	25.5	25.0
Nuclear breeder		–	–	–
Nuclear fusion		–	–	–
TOTAL ELECTRICITY	–	–	–	–
Electricity conversion	–	–	–	–
Transm. & distr.	–	–	–	–
Energy storage	–	–	–	–
TOTAL ENERGY RD&D	**208.1**	**178.4**	**130.0**	**128.0**

[1] Data for 2002 are incomplete. Firm data only exist for the total expenditure and activities with the nuclear and coal technologies.

Source: IEA.

NUCLEAR RESEARCH AND DEVELOPMENT

Most nuclear energy-related R&D is carried out by the Nuclear Research Institute Rez a.s. (NRI) founded in 1955. In 1971, it came under the authority of the Czechoslovak Atomic Energy Commission and in 1992 it was transformed into a joint stock company with the Czech government holding 50% of its shares and ČEZ, a.s. holding 26%. NRI deals in particular with materials, reactor physics and fuel chemistry.

The annual government support for nuclear energy R&D is around CZK 90 million. This support is given through the Ministry of Industry and Trade and the Ministry of Education mainly for studies in nuclear physics in CERN[23], JINR[24] and the Academy of Science. In addition, the government provides some CZK 20 million per year for R&D on nuclear safety issues, which are carried out under the State Office for Nuclear Safety.

CRITIQUE

Government support for energy-related research and development is declining with a more than 38% fall from the 2002 budget to the estimated 2005 budget. As a comparison with other countries, the Czech government expenditure of 0.013% of GDP on energy-related R&D is below the average in the IEA and is expected to decline. While this by no means makes the Czech Republic the lowest energy R&D spender in the IEA, it does indicate that the benefits of R&D in terms of useful energy products and the development of energy-related domestic industry will also fall in the coming years. The Czech government is encouraged to examine how reduced R&D spending will affect the chances of meeting its energy objectives and to balance the budget costs of such spending against the medium- and long-term gains that it can bring.

The Ministry of Industry and Trade does not have a tremendous influence on the course of energy-related R&D in the country which remains largely in the hands of the Research and Development Council. In this way, there is a disconnection between energy policy and energy R&D. While MIT has established energy efficiency, renewable energy and nuclear safety as the

23. CERN (Centre Européen pour la Recherche Nucléaire) is a European organisation for nuclear research, with its headquarters in Geneva. At present, its member States are Austria, Belgium, Bulgaria, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, the Netherlands, Norway, Poland, Portugal, the Slovak Republic, Spain, Sweden, Switzerland and the United Kingdom. India, Israel, Japan, the Russian Federation, the United States, Turkey, the European Commission and UNESCO have observer status.
24. The Joint Institute for Nuclear Research (JINR) is an international intergovernmental organisation located in Dubna, outside Moscow. JINR is also referred to as the Dubna Institute.

priorities for technology advancement, actual spending and research are targeting other areas. In the 2003 budget, no funding was going towards R&D in the field of energy conservation while fossil fuels received 44% of the budget. Renewables received just 9.8% and that is projected to decline in the coming years. The government is encouraged to look at better ways to integrate overall energy policy with energy R&D projects to develop technologies that could be most effectively used to address the country's energy needs. This will require more co-ordination between the MIT and the council.

The team noted the difficulty in obtaining information on energy-related R&D in the Czech Republic. This included information on specific projects, debates on the direction of energy R&D, assessments of the previous projects and their results, efficacy of private-public energy technology partnerships, assessments of promising technologies and the best use of international co-operation. Answers to these questions are important and discussion of the subject is warranted as a means of developing a comprehensive quantitative and qualitative picture of energy R&D.

Since the Czech Republic is a relatively small country by IEA standards, it benefits substantially through international co-operation in R&D projects. While such co-operation is taking place, it could be expanded. For example, the Czech Republic is party to only one out of the 40 IEA Implementing Agreements (IAs). The country's accession to the EU also offers opportunities for technology co-operation that should be pursued.

Given the move to a competitive market framework for natural gas and electricity, the priorities of the energy supply companies regarding new technology research and development may change. Pressure to provide shorter-term profits to shareholders, goals for international expansion and a decrease in guaranteed future revenue streams through provision of regulated services may encourage companies to decrease their activities in this sector. The government should adjust to these changing circumstances and continue to find ways in which the public and private sectors can work together to develop new and useful energy technologies.

RECOMMENDATIONS

The government of the Czech Republic should:

- *Examine the effect that reduced government R&D spending could have on meeting the country's energy objectives.*

- *Incorporate more fully the government energy policy into the formulation of energy R&D strategy by targeting those technologies that can help the country achieve its specific energy goals.*
- *Develop a more comprehensive qualitative and quantitative picture of current energy R&D efforts and a vision for the future.*
- *Examine possibilities for greater international co-operation in energy R&D given budget constraints and the opportunities offered by the country's participation in international entities such as the IEA and the EU.*
- *Investigate private-public partnerships to ensure continued energy R&D efforts by energy companies in the competitive market.*

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit: Mtoe

SUPPLY

		1973	1990	2002	2003P	2010	2020	2030
TOTAL PRODUCTION		**38.51**	**38.49**	**30.70**	**33.00**	**25.68**	**21.50**	**19.41**
Coal[1]		38.01	34.71	24.21	24.33	17.00	12.00	9.60
Oil		0.04	0.18	0.41	0.47	0.40	0.40	0.40
Gas		0.36	0.20	0.12	0.13	0.10	0.30	0.30
Comb. Renewables & Waste[2]		–	–	0.86	1.21	1.30	1.90	2.20
Nuclear		–	3.28	4.88	6.74	6.70	6.70	6.70
Hydro		0.09	0.12	0.21	0.12	0.16	0.17	0.17
Geothermal		–	–	–	–	–	–	–
Solar/Wind/Other		–	–	–	–	0.02	0.03	0.04
TOTAL NET IMPORTS[3]		**6.99**	**7.63**	**11.07**	**11.07**	**16.40**	**22.50**	**24.20**
Coal[1]	Exports	2.56	7.26	4.96	4.90	4.10	1.10	0.90
	Imports	0.15	1.57	1.13	1.29	1.20	1.40	1.60
	Net Imports	-2.41	-5.69	-3.83	-3.61	-2.90	0.30	0.70
Oil	Exports	0.04	6.56	1.42	1.28	1.60	1.60	1.70
	Imports	8.91	15.16	9.42	9.70	10.20	10.60	11.00
	Bunkers	–	–	–	–	–	–	–
	Net Imports	8.87	8.60	7.99	8.42	8.60	9.00	9.30
Gas	Exports	0.01	–	0.00	0.04	–	–	–
	Imports	0.73	4.78	7.92	7.74	11.00	13.00	14.00
	Net Imports	0.72	4.78	7.92	7.70	11.00	13.00	14.00
Electricity	Exports	0.44	0.76	1.80	2.26	0.70	0.40	0.60
	Imports	0.25	0.70	0.82	0.87	0.40	0.60	0.80
	Net Imports	-0.19	-0.06	-0.98	-1.40	-0.30	0.20	0.20
TOTAL STOCK CHANGES		**-0.08**	**1.25**	**-0.02**	**0.05**	**–**	**–**	**–**
TOTAL SUPPLY (TPES)		**45.42**	**47.38**	**41.74**	**44.12**	**42.08**	**44.00**	**43.61**
Coal[1]		35.59	29.84	20.51	20.87	14.10	12.30	10.30
Oil		8.91	8.94	8.53	8.77	9.00	9.40	9.70
Gas		1.01	5.26	7.76	7.84	11.10	13.30	14.30
Comb. Renewables & Waste[2]		–	–	0.84	1.17	1.30	1.90	2.20
Nuclear		–	3.28	4.88	6.74	6.70	6.70	6.70
Hydro		0.09	0.12	0.21	0.12	0.16	0.17	0.17
Geothermal		–	–	–	–	–	–	–
Solar/Wind/Other		–	–	–	–	0.02	0.03	0.04
Electricity Trade[4]		-0.19	-0.06	-0.98	-1.39	-0.30	0.20	0.20
Shares (%)								
Coal		*78.4*	*63.0*	*49.1*	*47.3*	*33.5*	*28.0*	*23.6*
Oil		*19.6*	*18.9*	*20.4*	*19.9*	*21.4*	*21.4*	*22.2*
Gas		*2.2*	*11.1*	*18.6*	*17.8*	*26.4*	*30.2*	*32.8*
Comb. Renewables & Waste		*–*	*–*	*2.0*	*2.6*	*3.1*	*4.3*	*5.0*
Nuclear		*–*	*6.9*	*11.7*	*15.3*	*15.9*	*15.2*	*15.4*
Hydro		*0.2*	*0.3*	*0.5*	*0.3*	*0.4*	*0.4*	*0.4*
Geothermal		*–*	*–*	*–*	*–*	*–*	*–*	*–*
Solar/Wind/Other		*–*	*–*	*–*	*–*	*–*	*0.1*	*0.1*
Electricity Trade		*-0.4*	*-0.1*	*-2.3*	*-3.2*	*-0.7*	*0.5*	*0.5*

0 is negligible, – is nil, .. is not available.

p: provisional.

Unit: Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	2002	2003P	2010	2020	2030
TFC	**31.66**	**35.30**	**24.89**	**26.53**	**28.58**	**30.44**	**31.04**
Coal[1]	19.25	17.43	3.46	3.80	2.70	2.30	1.60
Oil	8.06	8.09	7.80	8.39	8.30	8.40	8.70
Gas	1.81	4.19	6.19	6.32	8.70	9.70	10.70
Comb. Renewables & Waste[2]	–	–	0.43	0.87	0.70	1.00	1.20
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	0.01	0.02	0.02
Electricity	2.54	4.14	4.37	4.51	4.87	5.67	5.52
Heat	–	1.45	2.64	2.65	3.30	3.35	3.30
Shares (%)							
Coal	*60.8*	*49.4*	*13.9*	*14.3*	*9.4*	*7.6*	*5.2*
Oil	*25.5*	*22.9*	*31.3*	*31.6*	*29.0*	*27.6*	*28.0*
Gas	*5.7*	*11.9*	*24.9*	*23.8*	*30.4*	*31.9*	*34.5*
Comb. Renewables & Waste	–	–	*1.7*	*3.3*	*2.4*	*3.3*	*3.9*
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	*0.1*
Electricity	*8.0*	*11.7*	*17.6*	*17.0*	*17.0*	*18.6*	*17.8*
Heat	–	*4.1*	*10.6*	*10.0*	*11.5*	*11.0*	*10.6*
TOTAL INDUSTRY5	**18.80**	**18.63**	**10.61**	**10.58**	**12.52**	**13.12**	**13.02**
Coal[1]	11.44	10.06	2.65	2.77	1.80	1.60	1.10
Oil	5.30	4.23	2.54	2.47	3.40	3.30	3.40
Gas	0.46	2.02	2.58	2.52	4.20	4.70	5.10
Comb. Renewables & Waste[2]	–	–	0.32	0.27	0.10	0.30	0.30
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
Electricity	1.61	2.32	1.77	1.77	1.72	1.87	1.82
Heat	–	–	0.75	0.78	1.30	1.35	1.30
Shares (%)							
Coal	*60.8*	*54.0*	*24.9*	*26.2*	*14.4*	*12.2*	*8.5*
Oil	*28.2*	*22.7*	*24.0*	*23.3*	*27.2*	*25.2*	*26.1*
Gas	*2.4*	*10.9*	*24.3*	*23.8*	*33.5*	*35.8*	*39.2*
Comb. Renewables & Waste	–	–	*3.0*	*2.6*	*0.8*	*2.3*	*2.3*
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
Electricity	*8.6*	*12.4*	*16.7*	*16.7*	*13.7*	*14.3*	*14.0*
Heat	–	–	*7.1*	*7.4*	*10.4*	*10.3*	*10.0*
TRANSPORT[6]	**2.45**	**2.86**	**5.31**	**5.97**	**5.10**	**5.40**	**5.60**
TOTAL OTHER SECTORS[7]	**10.42**	**13.81**	**8.97**	**9.98**	**10.96**	**11.92**	**12.42**
Coal[1]	7.70	7.37	0.81	1.03	0.90	0.70	0.50
Oil	0.60	1.27	0.19	0.20	0.60	0.70	0.70
Gas	1.35	2.17	3.58	3.76	4.30	4.60	5.20
Comb. Renewables & Waste[2]	–	–	0.08	0.57	0.60	0.70	0.90
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	0.01	0.02	0.02
Electricity	0.76	1.56	2.42	2.55	2.55	3.20	3.10
Heat	–	1.45	1.89	1.87	2.00	2.00	2.00
Shares (%)							
Coal	*73.9*	*53.3*	*9.1*	*10.3*	*8.2*	*5.9*	*4.0*
Oil	*5.8*	*9.2*	*2.1*	*2.0*	*5.5*	*5.9*	*5.6*
Gas	*13.0*	*15.7*	*39.9*	*37.7*	*39.2*	*38.6*	*41.9*
Comb. Renewables & Waste	–	–	*0.9*	*5.7*	*5.5*	*5.9*	*7.2*
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	*0.1*	*0.1*	*0.2*
Electricity	*7.3*	*11.3*	*27.0*	*25.6*	*23.3*	*26.9*	*25.0*
Heat	–	*10.5*	*21.0*	*18.7*	*18.2*	*16.8*	*16.1*

Unit: Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	2002	2003P	2010	2020	2030
ELECTRICITY GENERATION[8]							
INPUT (Mtoe)	**9.70**	**16.54**	**21.80**	**23.29**	**21.07**	**21.58**	**20.49**
OUTPUT (Mtoe)	**3.54**	**5.38**	**6.54**	**7.12**	**6.07**	**6.37**	**6.32**
(TWh gross)	41.17	62.56	76.00	82.82	70.59	74.05	73.47
Output Shares (%)							
Coal	*85.1*	*71.8*	*66.8*	*62.3*	*47.5*	*40.5*	*39.3*
Oil	*11.3*	*4.8*	*0.5*	*0.4*	*2.0*	*2.6*	*2.7*
Gas	*0.9*	*1.0*	*3.9*	*3.7*	*9.9*	*17.1*	*17.3*
Comb. Renewables & Waste	–	–	*0.9*	*0.6*	*1.3*	*2.3*	*2.9*
Nuclear	–	*20.1*	*24.7*	*31.2*	*36.7*	*34.9*	*35.2*
Hydro	*2.6*	*2.3*	*3.3*	*1.7*	*2.6*	*2.6*	*2.6*
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	*0.0*	*0.0*	*0.0*	*0.0*	*0.1*
TOTAL LOSSES	**15.07**	**13.44**	**15.80**	**16.90**	**13.50**	**13.56**	**12.57**
of which:							
Electricity and Heat Generation[9]	6.16	9.34	11.87	12.65	11.22	11.36	10.37
Other Transformation	7.34	1.62	1.08	1.32	0.40	0.20	0.10
Own Use and Losses[10]	1.57	2.48	2.85	2.93	1.88	2.00	2.10
Statistical Differences	**–1.31**	**–1.36**	**1.06**	**0.69**	**–**	**–**	**–**

INDICATORS

	1973	1990	2002	2003P	2010	2020	2030
GDP (billion 2000 USD)	40.36	54.39	58.03	60.18	84.68	137.94	224.69
Population (millions)	9.92	10.36	10.20	10.20	10.20	10.10	10.10
TPES/GDP[11]	1.13	0.87	0.72	0.73	0.50	0.32	0.19
Energy Production/TPES	0.85	0.81	0.74	0.75	0.61	0.49	0.45
Per Capita TPES[12]	4.58	4.57	4.09	4.32	4.13	4.36	4.32
Oil Supply/GDP[11]	0.22	0.16	0.15	0.15	0.11	0.07	0.04
TFC/GDP[11]	0.78	0.65	0.43	0.44	0.34	0.22	0.14
Per Capita TFC[12]	3.19	3.41	2.44	2.60	2.80	3.01	3.07
Energy-related CO_2 Emissions (Mt CO_2)[13]	147.3	153.8	114.7	117.0	102.7	102.4	97.9
CO_2 Emissions from Bunkers (Mt CO_2)	0.7	0.7	0.5	0.6	0.6	0.6	0.6

GROWTH RATES (% per year)

	73–79	79–90	90–02	02–03	03–10	10–20	20–30
TPES	1.2	–0.2	–1.0	5.7	–0.7	0.4	–0.1
Coal	–0.3	–1.4	–3.1	1.8	–5.4	–1.4	–1.8
Oil	4.2	–2.2	–0.4	2.9	0.4	0.4	0.3
Gas	14.3	8.0	3.3	1.0	5.1	1.8	0.7
Comb. Renewables & Waste	–	–	–	39.8	1.5	3.9	1.5
Nuclear	–	–	3.4	38.1	–0.1	–	–
Hydro	13.3	–4.1	4.7	–44.4	4.3	0.3	–
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	4.1	2.9
TFC	2.8	–0.5	–2.9	6.6	1.1	0.6	0.2
Electricity Consumption	3.4	2.6	0.4	3.1	1.1	1.5	–0.3
Energy Production	2.0	–1.1	–1.9	7.5	–3.5	–1.8	–1.0
Net Oil Imports	3.9	–2.4	–0.6	5.4	0.3	0.5	0.3
GDP	2.5	1.4	0.5	3.7	5.0	5.0	5.0
Growth in the TPES/GDP Ratio	–1.3	–1.6	–1.6	1.9	–5.4	–4.3	–4.8
Growth in the TFC/GDP Ratio	0.3	–1.9	–3.4	2.8	–3.7	–4.2	–4.6

Please note: Rounding may cause totals to differ from the sum of the elements.

FOOTNOTES TO ENERGY BALANCES AND KEY STATISTICAL DATA

1. Includes lignite and peat
2. Comprises solid biomass, liquid biomass, biogas and industrial waste. Data are often based on partial surveys and may not be comparable between countries.
3. Total net imports include combustible renewables and waste.
4. Total supply of electricity represents net trade. A negative number indicates that exports are greater than imports.
5. Includes non-energy use.
6. Includes less than 1% non-oil fuels.
7. Includes residential, commercial, public service and agricultural sectors.
8. Inputs to electricity generation include inputs to electricity, CHP and heat plants. Output refers only to electricity generation.
9. Losses arising in the production of electricity and heat at main activity producer utilities (formerly known as public) and autoproducers. For non-fossil-fuel electricity generation, theoretical losses are shown based on plant efficiencies of 33% for nuclear and 100% for hydro.
10. Data on "losses" for forecast years often include large statistical differences covering differences between expected supply and demand and mostly do not reflect real expectations on transformation gains and losses.
11. Toe per thousand US dollars at 2000 prices and exchange rates.
12. Toe per person.
13. "Energy-related CO_2 emissions" have been estimated using the IPCC Tier I Sectoral Approach. In accordance with the IPCC methodology, emissions from international marine and aviation bunkers are not included in national totals. Projected emissions for oil and gas are derived by calculating the ratio of emissions to energy use for 2003 and applying this factor to forecast energy supply. Future coal emissions are based on product-specific supply projections and are calculated using the IPCC/OECD emission factors and methodology.

INTERNATIONAL ENERGY AGENCY "SHARED GOALS"

Member countries* of the IEA seek to create the conditions in which the energy sectors of their economies can make the fullest possible contribution to sustainable economic development and 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 they therefore aim to create a policy framework consistent with the following goals:

1. **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.

2. 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.

3. **The environmentally sustainable provision and use of energy** is 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 where practicable have regard to the Polluter Pays Principle.

4. **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 members wish to retain and improve the nuclear

* Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, the United States.

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.

5. **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.

6. 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.

7. **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.

8. **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.

9. **Co-operation among all energy market participants** helps to improve information and understanding, and encourage 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.)

GLOSSARY AND LIST OF ABBREVIATIONS

In this report, abbreviations are substituted for a number of terms.

a.s.	joint stock company.
ASMR	Administration of State Material Reserves.
BAT	Best available technology.
bcm	billion cubic metre.
CEA	Czech Energy Agency.
ČEPS a.s.	Czech Electricity Transmission System.
CERM	Co-ordinated Emergency Response Measures.
ČEZ, a.s.	power generation company.
CIS	Commonwealth of Independent States.
CHP	combined production of heat and power; sometimes, when referring to industrial CHP, the term "co-generation" is used.
cm	cubic metre.
CMD	Ceskomoravske Doly (hard coal mining company).
CO	carbon monoxide.
CO_2	carbon dioxide.
CSO	Czech Statistical Office.
CZK	Czech currency (koruna). 2000 exchange rates: one US dollar equivalent to CZK 39 and one euro equivalent to CZK 35.
DH	district heating.
EC	European Commission.
EIA	Environmental Impact Assessment.
ERO	Energy Regulatory Office.
EU	The European Union, whose members are Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, the Netherlands and the United Kingdom.

EU-ETS	European Union – Emissions Trading Scheme.
GDP	Gross Domestic Product.
GHG	greenhouse gases.
GJ	gigajoule, or one joule $\times 10^9$.
GW	gigawatt, or one watt $\times 10^9$.
IA	Implementing Agreement.
IAEA	International Atomic Energy Agency.
IEA	International Energy Agency, whose members are Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, the United States.
IEP	International Energy Program, one of the founding documents of the IEA.
IKL	Ingolstadt-Kralupy-Litvínov oil pipeline.
IPC	International Petrolum Consortium.
IPP	independent power producer.
ISO	International Organisation for Standardisation.
JI	Joint Implementation.
LPG	liquefied petroleum gas; refers to propane, butane and their isomers, which are gases at atmospheric pressure and normal temperature.
mcm	million cubic metres.
MERO	Oil Transport Company.
MIT	Ministry of Industry and Trade.
Mt	million tonnes.
Mtoe	millions tonnes of oil equivalent; see toe.
MUS	Mostecká ubelná spolecnost (brown coal mining).
MW	megawatt of electricity, or one Watt $\times 10^6$.
MWh	megawatt-hour = one megawatt $\times$ one hour, or one watt $\times$ one hour $\times 10^6$.
NAP	National Allocation Plan.
NESO	National Emergency Sharing Organisation.

NO_x	oxides of nitrogen.
OECD	Organisation for Economic Co-operation and Development.
OKD	Ostravsko-Karvinske Doly (hard coal mining).
PJ	petajoule, or one joule $\times 10^{15}$.
PHARE	EU technical assistance programme for Central and Eastern Europe.
PPP	purchasing power parity: the rate of currency conversion that equalises the purchasing power of different currencies, *i.e.* estimates the differences in price levels between different countries.
RAWRA	Radioactive Waste Repository Authority.
R&D	research and development, especially in energy technology; may include the demonstration and dissemination phases as well.
SEP	State Energy Policy.
SO_2	sulphur dioxide.
SONS	State Office for Nuclear Safety.
s.p.	state enterprise.
tce	tonne of coal equivalent.
TEC	Territorial energy concept.
TFC	total final consumption of energy; the difference between TPES and TFC consists of net energy losses in the production of electricity and synthetic gas, refinery use and other energy sector uses and losses.
toe	tonne of oil equivalent, defined as 10^7 kcal.
TPES	total primary energy supply.
tU	tonne of uranium.
TSO	transmission system operator.
TW	terawatt, or one watt $\times 10^{12}$.
TWh	terawatt $\times$ one hour, or one watt x one hour $\times 10^{12}$.
UED	Central Dispatch Centre.

UNFCCC	United Nations Framework Convention on Climate Change.
$	United States dollar.
USSR	Union of Socialist Soviet Republics.
VAT	value-added tax.
WANO	World Association of Nuclear Operators.
WNA	World Nuclear Association.
WNU	World Nuclear University.
WSW	warm service water.

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