INTERNATIONAL ENERGY AGENCY

Energy Policies of IEA Countries

Hungary 1999 Review

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SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

Hungary, the most recent IEA Member country, joined the IEA on 3 June 1997. Following the collapse of the former Soviet Union (FSU) and the loosening of Hungary's economic ties with the countries of the Council of Mutual Economic Assistance (COMECON), the country underwent a difficult period of transition from a state-controlled economy to a market economy. Industrial output and GDP dropped sharply and unemployment and inflation surged. Since 1996, the country has moved increasingly towards macro-economic stability, although the complete transformation and modernisation of its infrastructure will take significantly more time.

Starting in 1991, Hungary restructured, liberalised and privatised its energy sector. Today, the country's energy industry is majority privately-owned. The downstream oil market is competitive. The natural gas industry is now largely privatised, with foreign investment in gas distribution and supply. The Hungarian oil and gas company MOL retains a dominant position in natural gas production, imports and exports, pipeline transportation, and wholesale trading. Competition is to be phased in when the country accedes to the European Union, which is expected around 2003. At present, all gas prices are regulated by the Minister of Economic Affairs, based on recommendations made by the Hungarian Energy Office (MEH), the regulatory authority for gas and electricity.

Security of gas supply is an important issue because the country has long had to rely on Russia (or the FSU and CIS) as the sole supplier, and because natural gas use amounts to almost 40% of Hungarian energy use, twice as much as in IEA Europe. Hungary has only been interconnected to the Western gas grid since October 1996, via Austria through the Győr-Baumgarten pipeline. Russian gas remains the cheapest option, but the new pipeline allows the exchange of "swap gas" as well as real deliveries, and the traded volumes are increasing.

The task that lies ahead for Hungary is to adapt and prepare the gas market for competition while ensuring security of supply. Access to and pricing of essential services, and particularly gas transportation, must be made non-discriminatory. This is likely to require a greater and more independent role for the Hungarian Energy Office, including ultimate price-setting authority.

Most of the options to guarantee security of supply, including gas deliveries from Western suppliers or strategic storage, come at extra cost. Thus, a mechanism should be designed to cover these costs in the competitive gas market. It is important to make this mechanism as market-compatible as possible, since competition itself may improve security of supply to some degree.

The Hungarian electricity supply industry was restructured in such a way that electricity generation is now largely separate from transmission. There are also separate distribution/retailing companies. Generation and distribution/supply are largely owned by foreign investors. At present, the *modus operandi* of the industry is based on long-term power purchase agreements. Price regulation covers most prices in the industry, and as in the gas industry, the ultimate price-setting authority lies with the Ministry of Economic Affairs. Competitive rules are to be phased in when Hungary accedes to the European Union.

The progress made in the Hungarian power industry in the past half decade is considerable. Not only was the industry restructured and privatised, but it was also brought up to the technical standards of the Western European grid, and has been running in parallel with the latter since 1995. The electricity supply industry, more than the gas industry, has been reformed to a point which is only a few steps away from competition. These steps would require introducing non-discriminatory open access to the power grids, and adaptation of the regulatory mechanisms, as in the gas industry. These steps should be taken soon. Some further unbundling would be necessary, particularly with respect to system operation, but this unbundling would be a minor step compared to the restructuring that has already occurred.

Under Annex B of the Kyoto Protocol, Hungary is committed to reduce its CO_2 emissions by 6% in the time period 2008-2012 (six gases). Hungary's economy and its energy use collapsed at the beginning of the 1990s, and energy consumption has not yet returned to its pre-transition levels. As an economy in transition, Hungary has the right to choose its base year, and has opted for 1985-1987, the peak consumption years before the collapse, as its baseline period.

For these reasons, the country has a relatively favourable starting point for meeting its CO_2 commitments. While the inefficient patterns of energy use dating from the centrally-planned economy mean that the country must catch up with international standards, they also mean there is much room for efficiency improvements at comparatively low cost. The main precondition for rapid development in the right direction is that all remaining distortions in energy prices must be eliminated as soon as possible. Again, compared to the progress that Hungary has already made, the remaining task is clearly manageable and should be undertaken as soon as possible.

RECOMMENDATIONS

The Government should:

Energy Market and Energy Policy

☐ Define and establish effective framework conditions for competition wherever possible in the energy market.

- ☐ Separate its roles as a policy- and law-maker, as a regulator, as an owner of energy companies, and as a promoter of social cohesion. Where this has not yet been done, establish separate institutions for these different roles.

- ☐ Establish independent price regulation. Strengthen the independence of the electricity and gas regulator, the Hungarian Energy Office.

Energy Demand, Energy Efficiency, Climate Change and the Environment

- ☐ Continue its move towards improvement of environmental quality and energy efficiency.

- ☐ Make sure that all remaining price distortions in all energy markets, all below-cost pricing and all cross-subsidies are dismantled as quickly as possible.

- ☐ Phase in a balanced mix of regulation and economic instruments, such as fuel taxation, to internalise the external cost of energy use – notably environmental costs related to local air pollution and carbon dioxide emissions. Complete the basket of measures by using public information and awareness campaigns as well as voluntary agreements.

- ☐ Continue to implement progressive environmental regulation. Strive to cover all thermal power plants as soon as possible, including existing and smaller facilities, which can be major polluters.

- ☐ Ensure, as planned, that new capacity combines the best economic and thermal efficiency and lowest environmental emissions, and that efficient choice of new technology is not hampered by distorted price signals.

- ☐ Implement stringent but realistic mandatory building codes as soon as possible, and ensure effective enforcement. Seek low-cost options to improve the housing stock.

- ☐ Continue co-operation with international funding organisations, which appears to have been very successful, and continue or even extend quality control and assessment of results.

Coal

- ☐ Pursue the policy of reducing coal production subsidies with a view to eliminating them. Phase out preferential coal purchase contracts between independent mines and the power industry as soon as this is feasible. Replace both these practices with social policy measures directed at those in need, and with development efforts designed to create new employment. New recruitment in parts of the industry that survive only thanks to government support should be prevented.

Natural Gas

- In line with gas demand growth, encourage the gas industry to pursue its diversification strategy, be it through physical or contractual diversification. This diversification should be based on the Hungary-Austria gas pipeline and other routes, as appropriate.

- Monitor the development of security of supply, particularly as competition develops. Consider ways in which sufficient security of supply can be ensured in a competitive gas market. The Government should especially consider implementing a financing mechanism for security of supply, either a fee levied on pipeline transportation or interruptible service pricing with higher prices for non-interruptible supply contracts.

- Build upon the existing provisions to introduce competition into the gas industry. In particular, introduce regulated grid access. The Government should stipulate accounting separation at the least, but preferably operational separation as well.

- Design clear pipeline tariffs, and a mechanism for their regulation, to be carried out by the Hungarian Energy Office. Design access conditions and tariffs for other essential services such as storage.

- Confer the authority for gas price setting on the Hungarian Energy Office. Maintain regular price regulation. If changes have to be made, the Government should announce a clear strategy and timetable for transition to give sufficiently early warning, and adhere to its strategy and timetable.

- Continue to phase out below-cost price regulation and cross-subsidies. Work towards introducing a cost-based capacity charge into wholesale and retail prices.

- Continue to address social hardship through social policy measures, not energy policy.

Oil

- Establish clear regulations for open access to oil-product pipelines, modelled on those which will be developed for natural gas.

Electricity

- Establish clear, regulated transmission and distribution prices and non-discriminatory grid access rules as a precondition for competition in the power industry. Open the retail market to competition.

- Unbundle generation, transmission, and distribution and supply to end users. At the very least, system operation and wholesale trading should be fully unbundled from these functions by establishing an Independent System Operator. Independence of this System Operator from any particular interest, be it commercial interests or government intervention, is crucial.

- ☐ Consider maintaining the System Operator in public ownership, as this may be necessary to ensure neutrality of the System Operator and a level playing field for competition in a small country like Hungary.

- ☐ Strengthen the MEH's independence from short-term political interests, and, especially, give it full pricing authority as soon as possible. Establish Hungary's judicial system as the instance of appeal.

- ☐ In light of the country's anticipated EU membership, carefully choose a competitive model compatible with EU rules and suited to the structure of the unbundled Hungarian power market.

Nuclear

- ☐ Continue ensuring high performance and safety of operation by securing sound management practices and appropriate levels of maintenance resources and R&D.

- ☐ Continue to follow international safety standards.

- ☐ Ensure continued progress by defining comprehensive waste management and decommissioning programmes.

- ☐ Ensure that the cost of waste management continues to be covered by revenues from nuclear generation.

- ☐ Weigh the economic, environmental and security of supply effects of nuclear power against those of all other power-generating options and thus determine the role that nuclear can play in improving the environment, security and diversity of supply, and at what cost.

Technology, Research and Development

- ☐ Continue to develop the existing R&D strategy and make it more transparent. In particular, address the issues most pressing to Hungary.

- ☐ Maintain the development of energy efficiency, nuclear safety and renewables at the core of the R&D strategy.

SLOVAKIA
UKRAINE
AUSTRIA
ROMANIA
CROATIA
SERBIA
Sátoraljaújhely
Záhony
Kazincbarcika
Tisza
Ózd
Balassagyarmat
Salgótarján
Miskolc
Máteszalka
Nyíregyháza
Leninváros
Ipoly
Mosonmagyaróvár
Danube
Eger
Sopron
Esztergom
Vác
Gyöngyös
Győr
Hajdúböszörmény
Rába
Tatabánya
Budapest
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Jászberény
Kőszeg
Erd
Pápa
Püspökladány
Szombathely
Várpalota
Székesfehérvár
Cegléd
Szolnok
Törökszentmiklós
Ajka
Veszprém
Nagkörös
Zala
Dunaújváros
Mezötúr
Kecskemét
Sió
Zalaegerszeg
Boglárlelle
Békéscsaba
Kiskunféylegháza
Szentes
Gyula
Nagykanizsa
Orosháza
Kiskunhalas
Kaposvar
Hódmezövásárhely
Szekszárd
Mákó
Komló
Baja
Szeged
Drava
Mures
Pécs
Kilometres
0
30
60
0
50
100
Miles

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ORGANISATION OF THE REVIEW

An IEA review team visited Hungary in December 1998 to review the country's energy policies. This report was drafted on the basis of information received during and prior to the visit, including the Hungarian Government's official response to the IEA's 1998 policy questionnaire and the views expressed by various parties during the visit. The main author of the review is Gudrun Lammers. The team greatly appreciated the openness and co-operation shown by everyone it met.

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The team held discussions with representatives of the following organisations:

AES-Tisza Power Plant Company Rt.

Agency for Environmental Protection

Agip Hungaria Rt.

The Association of Natural Gas Utilities

Bayernwerk Hungaria

Borsodchem Rt.

Budapest District Heating Company Ltd.

Budapest Electricity plc.

Clean Air Action Group

Electricité de France (EDF)

The Energy Club

Environmental Partnership for Eastern Europe

Gaz de France (GDF) / Pannon Energia

GEA-EGI Contracting Engineering Co. Ltd.

The Hungarian Atomic Energy Authority

The Hungarian District Heating Association (MATÁZSZ)

The Hungarian Energy Office (MEH)

The Hungarian Petroleum Association (MASZ)

The Ministry of Economic Affairs

The Ministry of Environmental Protection

MOL Rt.

MVM Rt.

The National Association of Strategic and Public Utility Companies

The National Committee for Technological Development (OMFB)

Rheinisch-Westfälisches Elektrizitätswerk (RWE) A.G. Hungary

Ruhrgas / Budapester Gaswerke A.G.

Shell Hungary Rt.

System Technology Development Ltd.

Tigáz Rt.

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ENERGY MARKET AND ENERGY POLICY

OVERVIEW

Hungary is a landlocked country in the centre of Europe. It borders on Austria, Slovakia, Ukraine, Romania, the Federal Republic of Yugoslavia, Croatia and Slovenia. The country's surface area is 93 033 km^2 and its population is 10.2 million.

Hungary is the most recent IEA Member. The country was invited to join the IEA on 16 October 1996. The Hungarian Parliament ratified the International Energy Programme, the founding Treaty of the IEA, on 22 May 1997 (deposited 23 May). Membership came into force ten days later on 3 June 1997.

This initiative was one in a long list of steps the country took to accomplish the transition from a centrally-planned economy towards a Western-style market economy. Further steps are to follow, especially accession to the European Union (EU). The accession process has effectively been under way since 30 March 1998, based on a favourable opinion issued by the European Commission in 1997. On 3 April 1998, an in-depth screening process started to determine to what degree Hungary's existing legislation is compatible with the *acquis communautaire*.[1] Based on first results, the Commission considers accession possible in the medium term. Hungary assumes that it will accede by 1 January 2002. As of the year 2000, pre-accession aid from the EU will be increased substantially, complementing the current aid under the Phare[2] programme with general structural aid and special aid for agriculture.

The constitution of 20 August 1949 had made Hungary the People's Republic of Hungary (Magyar Népköztársaság). The country was a member of the Warsaw Pact and the Council of Mutual Economic Assistance (COMECON), and had close political and economic ties to the USSR. Membership in the COMECON involved trade arrangements with the Soviet Union that were based on bilateral exchanges between monopoly state trading companies, priced in non-convertible accounting roubles. Under these arrangements, which bore a close resemblance to barter, Hungary imported mainly raw materials and exported mainly industrial products.

The domestic economy was based on central economic planning with physical output targets, central administrative directives, state monopolies in wholesale and retail markets and ubiquitous official price regulation with prices that did not reflect cost. However, as of 1968, Hungary conducted a policy of careful economic

1. The *acquis communautaire* is a term used to designate the state to which the totality of EU legislation and procedures has evolved.
2. The Phare programme is an EU programme designed to provide financial assistance to the countries of Central and Eastern Europe. It was created in 1989, and directed at 11 nations in the region. At the end of 1995, ECU 5.4 billion had been provided to the Phare countries. This makes Phare the biggest grant finance programme for Central and Eastern Europe.

and political liberalisation. The government gradually withdrew from the economic process. Private economic initiative was promoted as of the early 1980s, and state-owned companies were granted greater freedom in decision-making. Prices and wages were gradually liberalised and state subsides were reduced. By 1988, a two-tier banking system had been established that separated the National Bank from commercial banking operations, a modern tax system had been established, joint-stock companies were permitted and foreign direct investment was encouraged.

In 1989/1990, the rouble accounting system with the Soviet Union collapsed, followed by the Council of Mutual Economic Assistance, and shortly afterwards the Soviet Union itself. Under the Basic Law amending the Constitution of 1949, adopted by the Hungarian Parliament on 18 October 1989, Hungary became a modern republic (Republic of Hungary, Magyar Köztársaság) in 1990. In 1991, foreign trade was liberalised.

Despite the fact that Hungary had two decades of experience with market reforms, the breakdown of the COMECON and the state-controlled economy led to a sharp drop in industrial output and GDP, and to a corresponding rise in unemployment and inflation. Total industrial output declined by 42% and employment in industry by almost 31% between 1988 and 1992. In mining and metallurgy, employment dropped by 50%. At the beginning of 1993, total unemployment had surged to nearly 12.5%. In 1995, the highest unemployment rates in the country remained in two coal mining regions, Nógrád (19.2%) and Borsod (16.2%).

From its peak in 1989, real GDP had declined by only 3.5% in 1990, but contracted by 19% between 1991 and 1993, before it started growing again in 1994. Annual inflation rose to 29% in 1990, 35% in 1991, then receded, but rose again to 28% in 1995, due to a massive demand overhang. After the introduction of a severe stabilisation package including a 9% devaluation of the forint and an 8% import surcharge, GDP growth slowed but inflation was brought back under control. In 1998, inflation had fallen to 14.3%. GDP grew by 2.6% between 1996 and 1997. Unemployment is now under 10%.

Adaptation to a market regime also resulted in major re-direction of Hungary's external trade flows. In 1985, less than 40% of its exports went to market economies, and the main export items were petroleum and meat. By 1995, the figure was 73%, of which 63% was with the EU. Today, 70% of Hungarian exports go to the EU and only 4% to Russia. The main export items are electrical machinery and meat.[3]

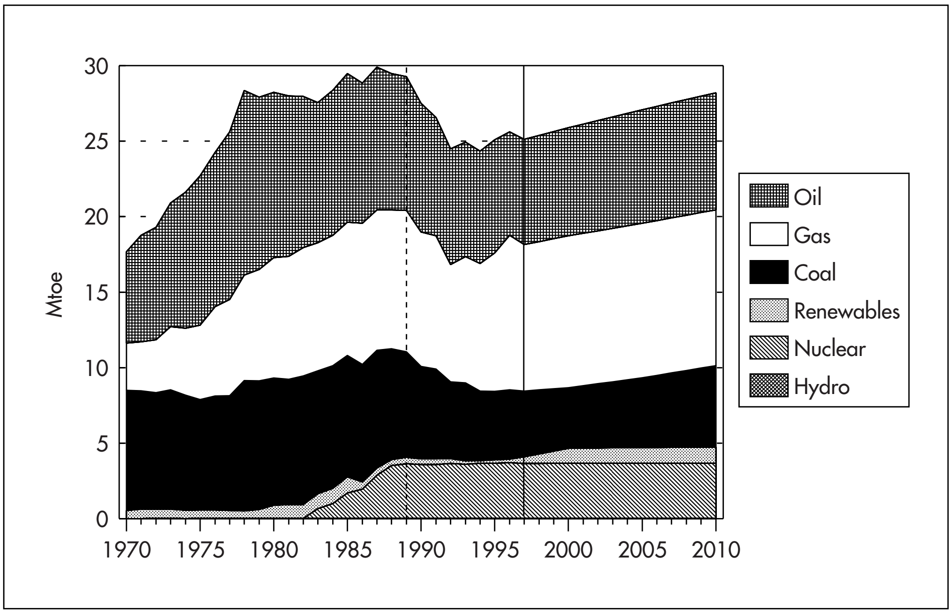
ENERGY MARKET

Figure 1 shows Total Primary Energy Supply (TPES) in Hungary. The country's main inputs in 1997 were natural gas with 9.70 Mtoe or 38.3% of TPES, oil with 6.98 Mtoe

3. Hungary is the world's biggest exporter of goose liver (*foie gras*).

or 27.6%, coal with 4.35 Mtoe or 17.2%, nuclear power with 3.64 Mtoe or 14.4%, followed by combustible renewables and wastes with 0,44 Mtoe or 1.8%, and hydropower (0.02 Mtoe or 0,1%) and net electricity imports (0.19 Mtoe or 0.7%).

Figure 1
Total Primary Energy Supply by Fuel, 1970 to 2010



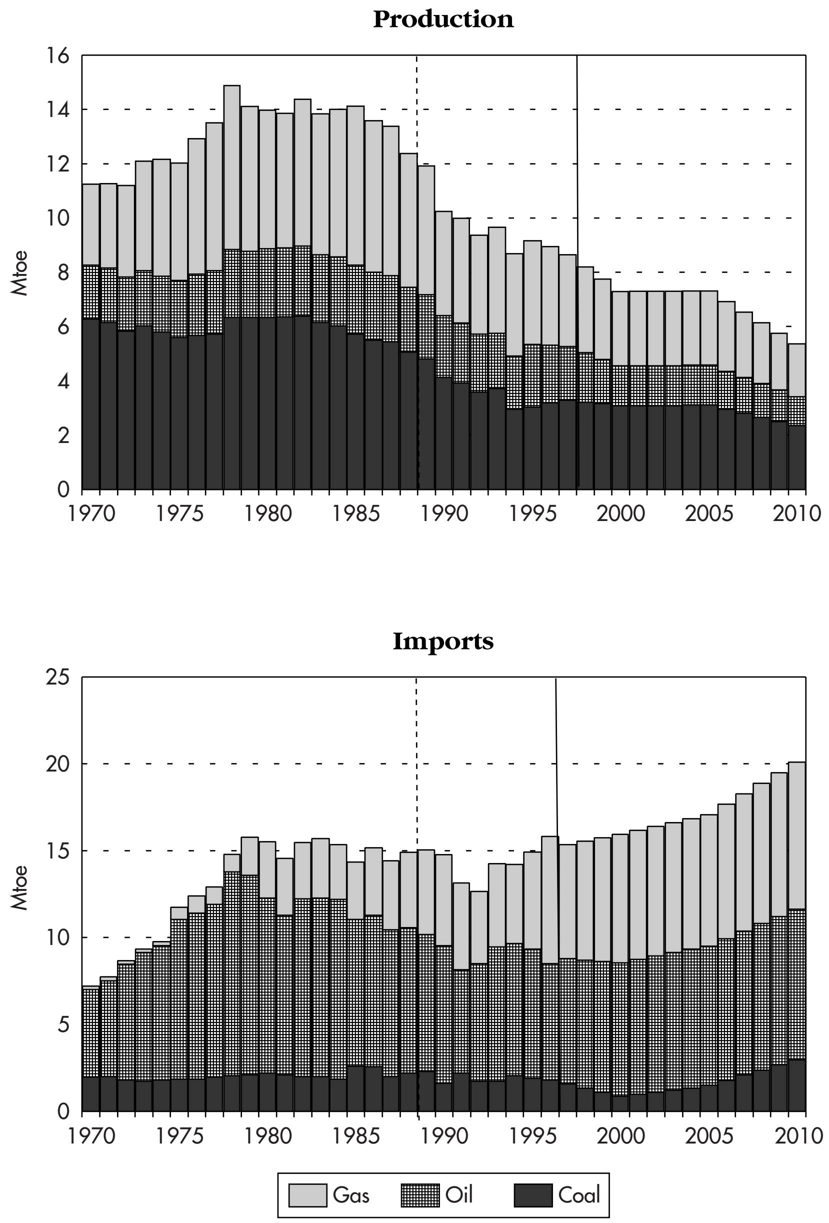
Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 1998, and country submission.

The historical development depicted in the graph is interesting in so far as it shows that Hungary was not affected by the first oil crisis: shielded by the COMECON trading system, TPES continued to grow unimpeded until 1978. The country was affected quite severely by the second oil shock, however. Energy use began to grow again in 1982, and continued to grow vigorously until the late 1980s when Hungary experienced an economic slowdown. The decline was moderate until 1989/1990, when the previous economic system collapsed and the country went through the first traumatic phase of adaptation to the changed circumstances described in the preceding section.

According to government forecasts, TPES will remain below its 1987 peak level (31.5 Mtoe) until at least 2010. But the development of the overall economy and the political and regulatory framework is unclear. Therefore, the Government has developed two scenarios according to which TPES is estimated to be between a minimum of 27.5 Mtoe and a maximum of 31.8 Mtoe.

Several other characteristics are worth mentioning. Hungary uses more gas and less oil than most other IEA countries. One of the reasons is that Hungary has historically

Figure 2
Coal, Oil and Natural Gas in Hungary, 1970 to 2010



Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 1998, and country submission.

had lower ownership and use of private cars and less road freight than other Member countries. More importantly, Hungary's domestic gas reserves are substantially greater than its oil reserves – in 1997 the gas reserves were estimated to be almost five times as high as the oil reserves – and the country was able to conclude very favourable gas supply contracts with the Soviet Union and subsequently with Russia.

It should be noted that Hungarian TPES comprises a very large amount of electricity imports from the Soviet Union before 1991, which indeed amounted to 30% of domestic power supply, a share rarely found in other IEA countries. Today, domestic generation covers all of Hungary's electricity demand, and the size of imports depends on price. In 1998, less than 5% of domestic consumption was covered by net imports.

Hungary is a producer of all types of energy; the country produces coal, oil and gas, and in the past was a producer of uranium. Figure 2 shows the development of production and imports of fossil energy resources since 1970. While domestic production was able to cover a large part of the (declining) coal demand, the figure shows a high degree of import dependence in oil and the growing degree of import dependence in gas since 1977. Due to the shock of adaptation to a market regime, total Hungarian energy production fell below its 1970 level in 1994. The outlook for coal, oil and gas production is a decline: for coal because of the scarcity of economic resources, for gas and oil because of depletion of reserves. The Government expects the reduction in domestic production to be replaced by greater imports of all three fossil fuels.

Figure 3 shows the countries of origin of Hungary's energy imports in 1990 and in 1997. The preponderance of the Soviet Union (for 1990) and Russia and Ukraine (for 1997) is clearly visible. The graph also shows the destination of energy exports to Hungary's other neighbours.

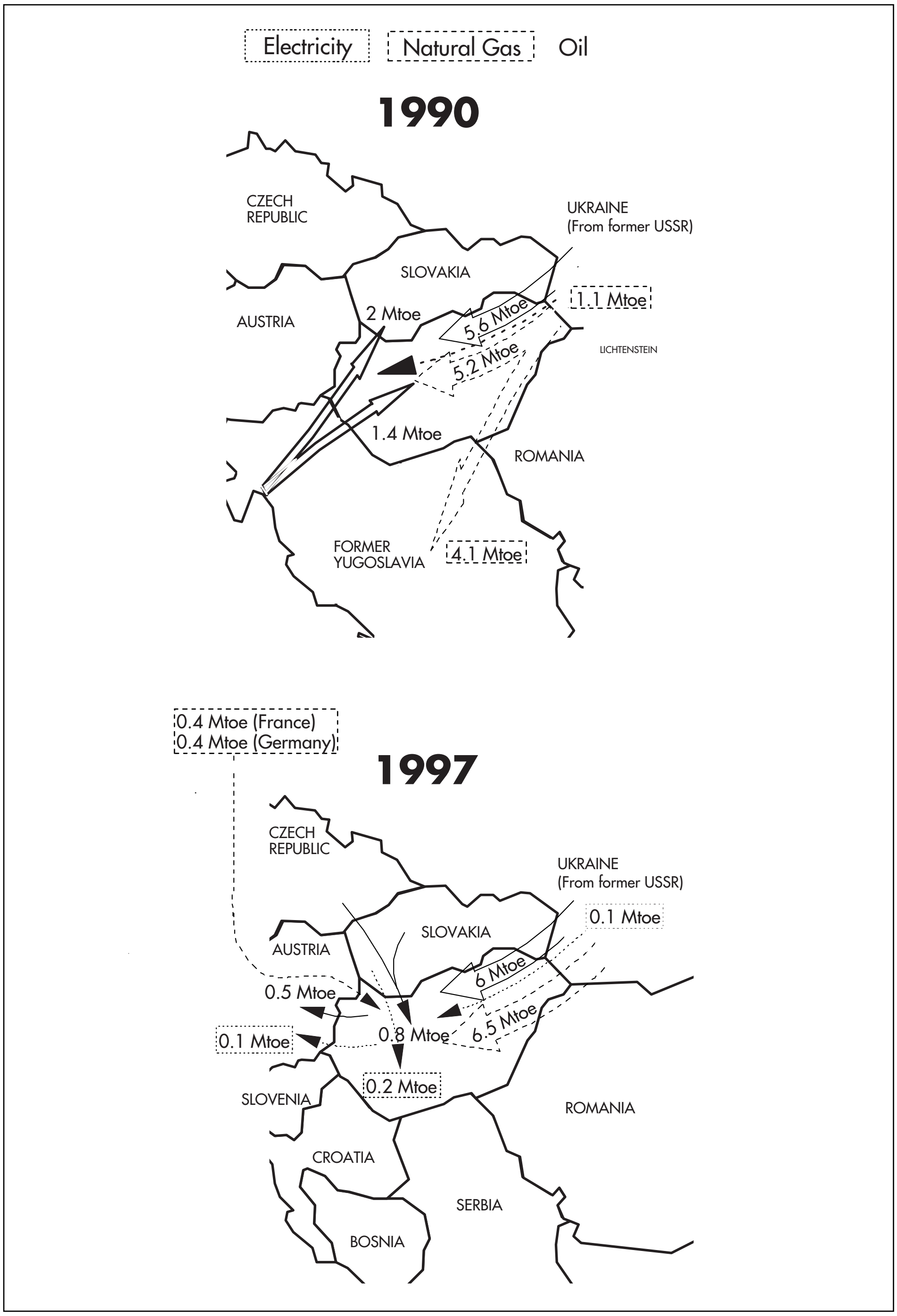
ENERGY POLICY

Principal Energy Policy Goals

The parliamentary resolution Hungarian Energy Policy (Resolution 21/1993), adopted in April 1993, is still the main document outlining the objectives and strategies of Hungarian energy policy. The main goals of this legally binding document are to

- Diversify energy supplies and eliminate import dependence on the former Soviet Union;
- Improve environmental protection and reduce pollution;
- Increase energy efficiency through modernisation of the supply structures and better management of electricity consumption;
- Improve public acceptance of new energy facilities through better information of the general public;

Figure 3
Energy Trade of Hungary



Source: IEA.

- Attract foreign capital for investment in capital-intensive energy projects with low rates of return.

In the course of the last five years, the implementation of this programme was not uniform, especially regarding the privatisation strategy. Successive governments had differing approaches regarding the purpose and the desired degree of privatisation. Following the general elections in spring 1998, a new coalition Government replaced the previous centre-left coalition. The new Government lists the following tasks in the energy policy chapter of its programme:

- Provide secure, environmentally sound and economical supply of energy;
- Give high priority to environmental protection and promotion of energy conservation;
- Exert stricter energy price control and supervision of price calculation; implement a new environmentally-oriented pricing system;
- Apply demand-side management using market-based measures;
- Diversify energy supply and promote greater use of renewables;
- Develop detailed strategies for all energy markets;
- Regulate trade in oil, oil products and natural gas more efficiently;
- Analyse the adaptation effort that Hungary has to make to implement EU energy policy and law, and prepare the liberalisation of the electricity and gas market in accordance with the EU directives;
- Strengthen the independence of the country's main regulatory body, the Hungarian Energy Office, and improve the preparation of energy policy in the Ministry of Economic Affairs.

Based on the new Government's programme, the Ministry of Economic Affairs has started to elaborate a document entitled "Basic Principles of State Energy Policy and a New Business Model". This document maintains the main objectives of the 1993 resolution but reflects on the new ownership situation after the privatisations, the EU liberalisation directives, and EU accession in the near future. It sets out practical approaches to accomplish the required adaptation, including responsibilities and deadlines.

Privatisation

To accomplish the transition towards a market economy, Hungary has made great efforts to privatise its formerly state-owned enterprises in the energy sector and in the economy as a whole. Today, some 80% of all Hungarian companies are privatised. The private sector share of GDP is roughly the same.

The energy market has also undergone major privatisation. The country's main oil and gas company MOL is 75% owned by private investors. The electricity supply industry is partly privately-owned, and managerial control of the six distribution and retailing firms was given to private investors. It has now been decided that MVM, the country's electricity wholesale and transmission company, will not be privatised. The share of private ownership in the power industry determines the degree of privatisation in the coal industry because the coal industry has been almost entirely integrated with the power industry. Further privatisation of state-owned companies is unlikely in the near future.

The approach of successive governments towards privatisation varied, and while it remained clear that major private and foreign shareholding was one of the most important objectives in the modernisation of the Hungarian energy market, the detailed strategy underwent a number of reversals. This was partly due to the fact that the Government had conflicting goals with respect to privatisation. On the one hand, it wanted to raise revenue quickly in order to reimburse foreign debts, which had become pressing in the early 1990s. On the other hand, the Government needed time to design the proper legal and regulatory framework for the energy industries. This created insecurity among potential investors about the future regulatory environment and the profitability of investments in Hungary, and resulted in low bids for energy sector companies at first.

Another difficult issue was the desire of the Government to retain a certain amount of control over energy sector companies. This desire is shared by the governments of many other IEA Member countries, but appears[4] to be somewhat stronger in Hungary. Aside from energy sector regulation, the main vehicle of this control is government ownership rights, either through majority shareholding, as in MVM, or retaining a blocking minority (25% + 1 share), as in MOL, or through preferential ("golden") shares. Throughout the privatisation process, the stance of successive governments on this issue changed, but today it is clear that golden shares represent the main method of control through ownership. The Government retains golden shares in all privatised energy companies, and in a large number of privatised companies outside the energy market as well. The box details the rights attached to golden shares in energy companies.

Energy Prices and Taxation

Removal of the price distortions that were ubiquitous under the old economic regime has been one of the main tasks in Hungarian energy policy to date. Not only

4. The use of the words "appears to", "seems to", and similar expressions indicates that the IEA had to make assessments on the basis of a limited amount of information. The terms are used in cases where the review team and author formed an impression, based on the information collected during a five-day review visit and the exchange of written documents with governmental and private organisations. The IEA acknowledges that long-standing domestic observers may interpret situations differently, based on their greater knowledge. The use of these terms is a common feature of IEA in-depth reviews and does not in any way reflect negatively on the reviewed country.

The Government's Rights Attached to Its Golden Shares in Energy Companies

1) Special rights

- Right to appoint or recall one or several members of the Board of Directors or Supervisory Board;
- Right to convene the general shareholders' meeting.

2) Right of veto

- In case of modifications of the funding charter;
- In case of transfer of strategic assets;
- In case of merger, de-merger, or acquisition by another company;
- In case of change of the legal form of the company;
- In case of closing down an activity of strategic importance;
- Waiver of the exclusive right to supply.

Source: *OECD Economic Surveys: Hungary 1996-1997*, OECD Paris, 1997.

were energy prices much too low to cover the cost of energy supply; in many cases it was unclear what exactly that cost was, since the prices for most other goods and services had been as distorted as energy prices, and cost accounting and depreciation methods had been far from the level of sophistication found in other IEA countries.

Oil-product prices were liberalised as of 1 January 1991, and coal and LPG prices as of 1 March 1992. Direct government subsidies also terminated in 1991. But natural gas, electricity and heat prices had to remain regulated, as in all IEA Member countries, at least for captive consumers. It was clear that these regulated prices had to be raised very substantially, especially for households, which had enjoyed large cross-subsidies from the industrial sector. In Hungary, where a typical annual household energy bill can represent some 30% of the household's disposable income[5], any such price increase inevitably created social hardship.

Prices were raised, moderately at first and rapidly after 1994, but the unexpectedly high inflation rate in the mid-1990s eroded much of the increase in real energy prices that had been achieved by that time. In 1995, it was estimated that average end-user prices for natural gas were still only half the level needed to cover costs, and that electricity prices had to increase by 50% to 70% or 80% in real terms. Subsequently, prices were raised drastically, as shown in Table 1. Cross-subsidies began to be dismantled, with industrial energy prices rising less than residential prices.

5. In the 1995 winter heating season, 39% of households in Budapest spent 30% or more of their disposable income on heating, and 72% spent 20% or more.

Table 1
Total Average Price Changes for Electricity and Gas, 1995 to 1999
Nominal

Year	*Electricity*	*Natural Gas*
1995	78%	65%
1996	2%	2%
1997	39%	37%
1998	13%	–4%
1999 (1st half)	7%	0%
Total	**207%**	**121%**

Source: Ministry of Economic Affairs.

Today, very significant progress has been made and prices are nearing cost-covering levels[6]. Electricity and gas prices are regulated by the Minister of Economic Affairs, based on proposals by the Hungarian Energy Office (the electricity and gas regulator). The regulator has worked towards cost-reflective, efficient and transparent price setting. At end-1998, there were still some doubts whether all prices were fully cost-covering and free of cross-subsidies. The Minister of Economic Affairs has also used this authority in the past to delay or reduce price increases suggested by the Hungarian Energy Office.

Following the energy price increase of 1 January 1999, private investors in the electricity supply industry considered that prices were by and large cost-covering, whereas gas industry investors believed that prices were still below marginal cost. The latter debated this issue with the Government. According to the most recent developments and agreements with investors, concluded between December 1998 and mid-June 1999, both energy and gas prices are now considered to be fully cost-covering and to ensure an appropriate rate of return.

These end-user price increases include value added tax (VAT), which was also raised throughout the early 1990s. VAT was 6% in 1992, but increased to 10% in August 1993, and was raised once more as of 1 January 1995 to 12%. Gasoline, automotive diesel and gas oil are subject to a higher VAT rate of 25%. Today, motor fuels are subject to four further categories of taxes: an excise duty, a contribution to the Road Fund, an environmental tax and an oil stockpiling fee.

CRITIQUE

Hungary has made tremendous progress since the last IEA review in 1995, when it was not yet a Member country. The transition the country has had to face over the

6. See Chapters 7 and 8 for further details.

last decade was far deeper than any of the structural changes that long-standing IEA Member countries have had to cope with. A number of IEA countries have gone through far-reaching micro-economic restructuring of their grid-bound energy industries, but they have done so from a position of political and macro-economic stability and long-standing experience with the benefits and challenges of the market economy.

Hungary had to carry out its reform programme at a time of a precarious macro-economic, social and political equilibrium and in the framework of a paradigm shift. The country had some experience with markets but the COMECON system and ubiquitous government control had sheltered it from the realities of the world market enough to make the full opening towards market forces a painful experience.

Today, the hardest part is over and the country has entered a period of stability. With hindsight, it is clear that the process of liberalisation in general and energy sector liberalisation in particular was not perfect. A paradigm shift like the one Hungary has gone through obviously provides a unique opportunity to introduce radical reform, and it is clear that some opportunities were missed. The privatisation strategy and the regulatory framework were not entirely clear at first. This led to repeated issuance of calls for tender for energy companies that were cancelled shortly afterwards. The confusion this caused may have delayed modernisation of the energy sector to a certain degree, and may have reduced the privatisation revenues that were eventually gained. The early 1990s also saw a momentum towards competition that had waned by 1995,[7] and the Government did not manage to transform this opportunity into competition legislation in the gas and electricity industries.

However, it must not be forgotten that a major part of the transition involved not only dealing with the legacy of inefficient companies and facilities but also learning. Much of the catching-up that Hungary had to do was simply getting used to the opportunities and challenges of market economies. This had to happen not only at the level of political decision-makers but, perhaps most importantly, at the level of the general public, who, after all, had to bear the brunt of the social hardship and support the democratic decision-making of the Government. Realising that this hardship was not caused but only triggered by the transition, and that the inefficiencies accumulated during the times of the COMECON were the real cause, was part of that learning process. Maintaining trust that, after the pain of transition, the market economy would bring a better life for the country as a whole was also important, and required a leap of faith that should not be underestimated. Seen in this light, the progress that Hungary has made is truly impressive, and stands out among its neighbouring countries that are following a similar path.

Having achieved all this, the time has come for Hungary to take the next steps. The Government needs to establish effective framework conditions for the efficient functioning of the energy market and to develop a clear definition and separation of its role in the market, including its role

7. See Chapters 7 and 8 for further details.

- as a policy- and law-maker;
- as a regulator;
- as an owner of energy companies, and
- as a promoter of social cohesion.

A clear decision is now warranted to move towards workable, effective competition in the framework of the European Union Directives on gas and electricity. An equally unequivocal decision is needed to base price regulation in the non-competitive segments of the grid-bound industries on one principle only: that prices should reflect marginal cost of supply as closely as possible. An efficient market requires that social and regional policy objectives be tackled outside the framework of energy pricing. In practice, this calls for the creation of separate institutions for the Government's differing roles, and particularly for a strong and independent energy regulator and strong competition authorities.

If Hungary accomplishes this task, it will not only develop its energy sector in a market-oriented way and increase the economic efficiency of its energy companies but also improve energy efficiency and environmental performance of the energy sector through new investment. Hungary also has a further opportunity to become a significant player in the regional energy market.

RECOMMENDATIONS

The Government should:

- ☐ Define and establish effective framework conditions for competition wherever possible in the energy market.
- ☐ Separate its roles as a policy- and law-maker, as a regulator, as an owner of energy companies, and as a promoter of social cohesion. Where this has not yet been done, establish separate institutions for these different roles.
- ☐ Establish independent price regulation. Strengthen the independence of the electricity and gas regulator, the Hungarian Energy Office.

4

ENERGY DEMAND AND EFFICIENCY

ENERGY DEMAND AND END-USE EFFICIENCY

Figures 4 and 5 depict energy intensity (energy use per GDP and energy use per capita) in Hungary, compared to IEA Europe. Hungary's energy intensity per GDP, measured in purchasing power parities, is 70-80% above the corresponding figure for IEA Europe,[8] whereas energy intensity per capita is close to or even slightly lower than IEA Europe as a whole. The reasons for this are complex and lie in the patterns of energy use and industrial production which developed in the command-and-control economy. The most obvious reason is the fact that Hungarian GDP per capita is only about one-fifth of per capita GDP in IEA Europe: the average Hungarian had a GDP of under US$ 3 300 in 1997; in IEA Europe the figure was over US$ 17 300.

More precisely, artificially low real energy prices and a policy that measured industrial performance in terms of quantity rather than quality and adaptation to consumer needs led to high energy consumption and an overemphasis on the supply side in all industries, including the energy industries. This also included a propensity to preserve an energy- and resource-intensive industrial structure based on low added value. On the other hand, this system failed to deliver economic prosperity, which led to low GDP *and* to low energy consumption per capita.

Figure 6 shows Hungary's Total Final Consumption (TFC) of energy by sector. Note that TFC has not yet reached its pre-1990 level, despite some growth in recent years. The Government does not anticipate energy demand to return to its 1987 peak before 2010, and even this is uncertain.

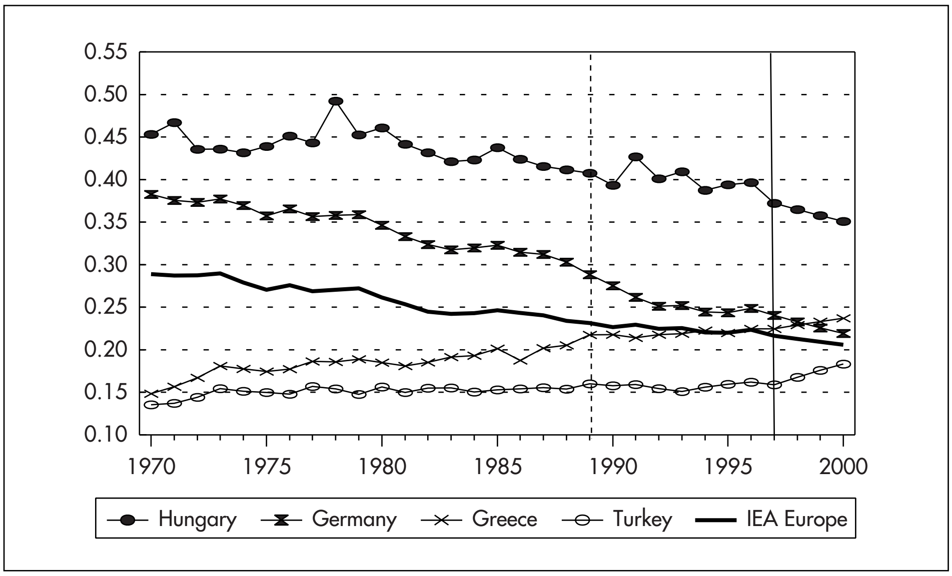
Industrial energy use accounted for only 27% of total final demand, but the graph shows that it was much higher before the transition, amounting to about 41%. This is explained by the fact that energy-intensive industries shrank more than any other sector during the adaptation process of the early 1990s.

Figure 7 shows industrial fuel use in industry in Hungary in 1989 and 1997, and in the entire IEA. Industry uses much less electricity in Hungary than in the rest of the IEA, due to the lower levels of automation, and because electricity-intensive industries such as aluminium and steel reduced their output more than other industries when trade within the COMECON collapsed.

The residential and commercial sector accounted for nearly 60% of TFC in 1997, up from 35% in 1989. This high share reflects the sharp decline in industrial energy

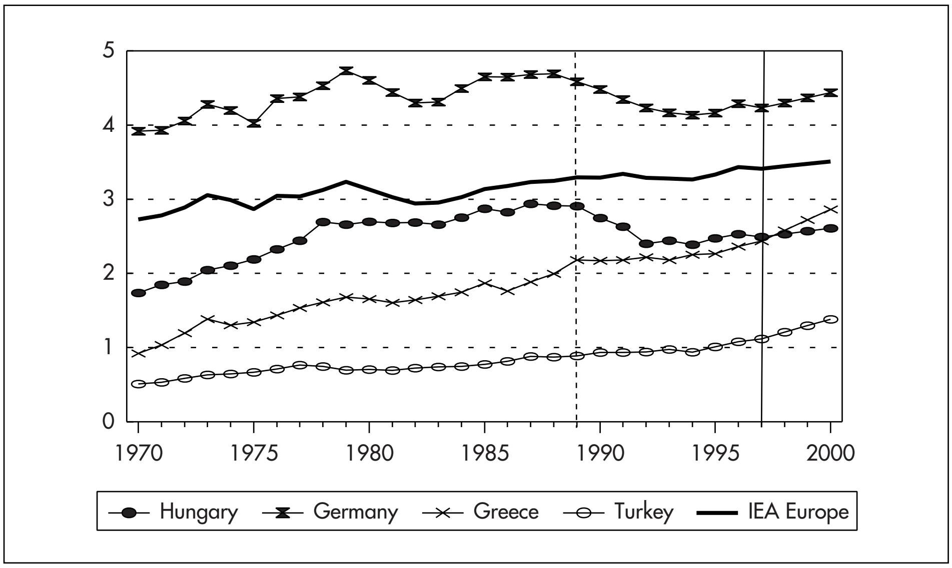
8. Because of the difficulties of estimating GDP correctly, the figures for energy intensity vary greatly. The IEA estimates, based on purchasing power parities, lie on the lower boundary of estimates. Other estimates yield energy intensities 2 $^{1}/_{2}$ to three times as high as in the IEA Europe region.

Figure 4
Energy Intensity per Unit of GDP in Hungary and IEA Europe, 1970 to 2000
TPES/GDP in Purchasing Power Parities



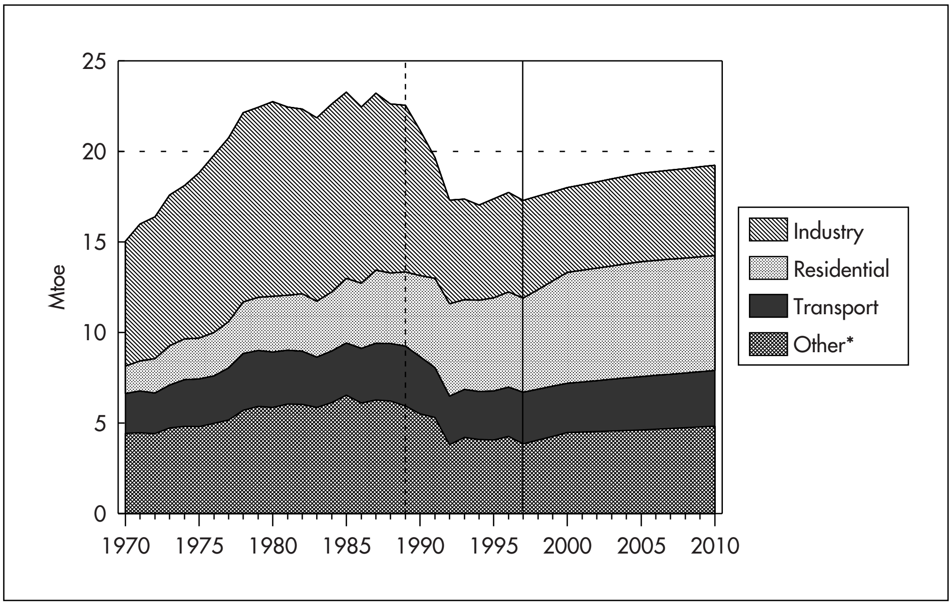
Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 1998; *National Accounts of OECD Countries*, OECD Paris, 1998; and country submissions.

Figure 5
Energy Intensity per Capita in Hungary and IEA Europe, 1970 to 2000



Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 1998; *National Accounts of OECD Countries*, OECD Paris, 1998; and country submissions.

Figure 6
Total Final Consumption of Energy by Sector, 1970 to 2010



* Includes commercial, public service and agricultural sectors.
Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 1998, and country submission.

consumption. Consumption in the commercial/residential sector itself stayed flat throughout most of the 1990s and hardly declined during the transition between systems. However, consumption data are the least reliable in this sector, due to incomplete metering. More recent data are becoming more reliable as special efforts are made to improve statistics and as meters are installed as part of energy efficiency programmes.

Figure 8 shows the fuels used in the residential and commercial sector in Hungary. It should be noted that a fairly high share of energy consumption is district heat (DH), which amounts to some 15%. Hungarian households also still use some coal for heating, a coal use that is marginal in the rest of the IEA. However, as households gain access to natural gas, the use of coal declines quickly – it was halved between 1991 and 1993.

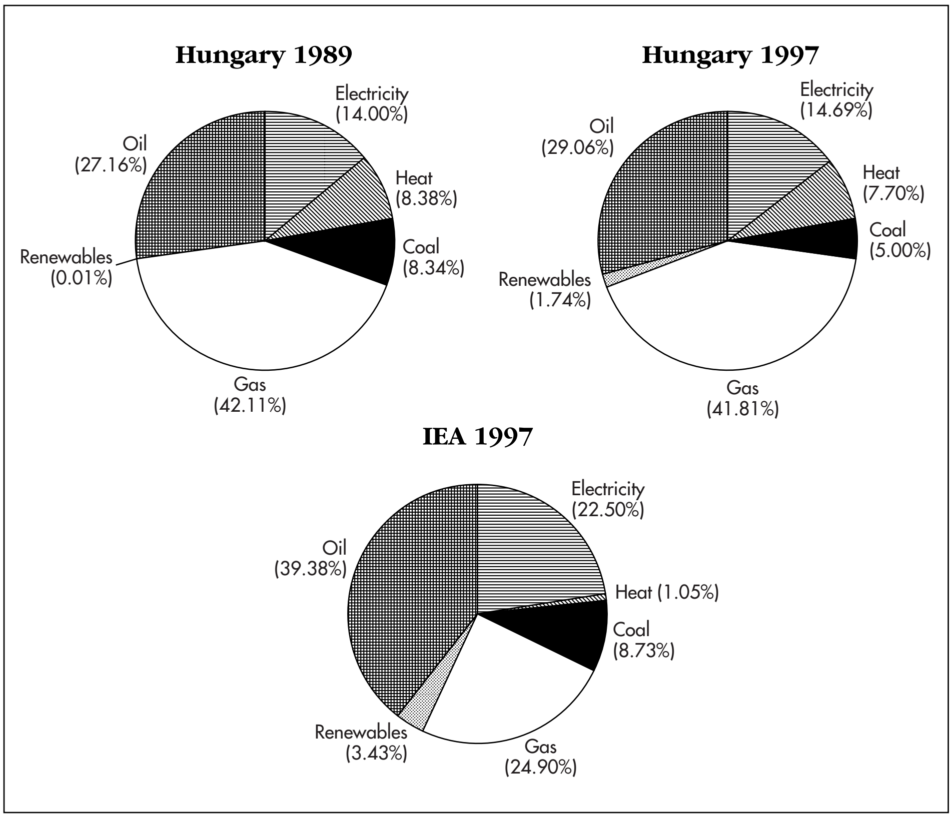
About 20% of Hungarian households live in prefabricated apartment buildings with bad insulation. Many of the buildings are deteriorating. Some 20% of these buildings are supplied with district heat via single pipe systems, which makes it very difficult to regulate temperature. Meters were lacking in most of these buildings, but were installed in some cases as part of energy efficiency programmes after the transition. At present, 10% of the heating energy used in these dwellings is metered.

The most important reason for the relatively high heating energy demand in the district heating market is the absence of undistorted price signals that reveal to consumers the real cost of their consumption. Correct relative prices throughout the entire economy would have brought about a more appropriate balance between capital expenditure for housing and for energy consumption. However, in the absence of price signals, secondary factors such as regulation might have helped contain energy consumption. But although Hungary adopted very strict mandatory building codes in 1992, and although these building codes are comparable to the strictest standards in the EU, enforcement and quality control in buildings are lacking. Under the impression that there were numerous standards in place which were not respected, the Government made the standards voluntary in 1994.

Figures 9, 10 and 11 depict electricity consumption, energy use in transport and stationary fossil fuel consumption (TFC) in relation to GDP (in purchasing power parities).

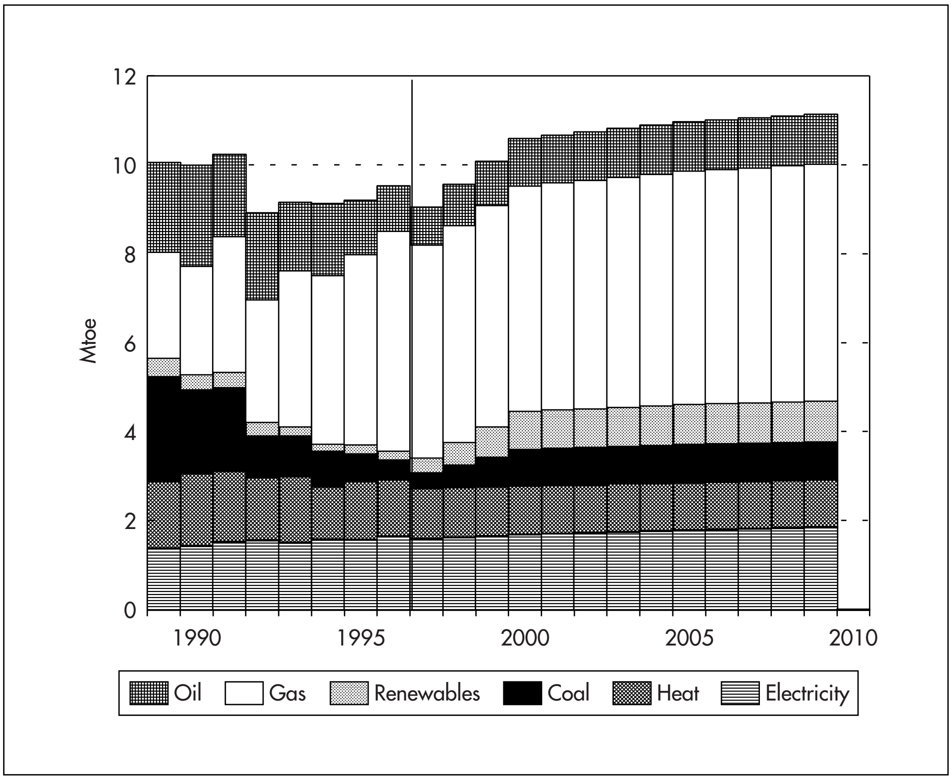
Transport energy use accounts for 16% of TFC in Hungary, compared to some 30% for the IEA. Throughout the 1980s, transport energy consumption grew by only 5%,

Figure 7
Fuel Use in Industry in Hungary and the IEA



Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 1998.

Figure 8
Fuel Use in the Residential and Commercial Sector, 1989 to 2010



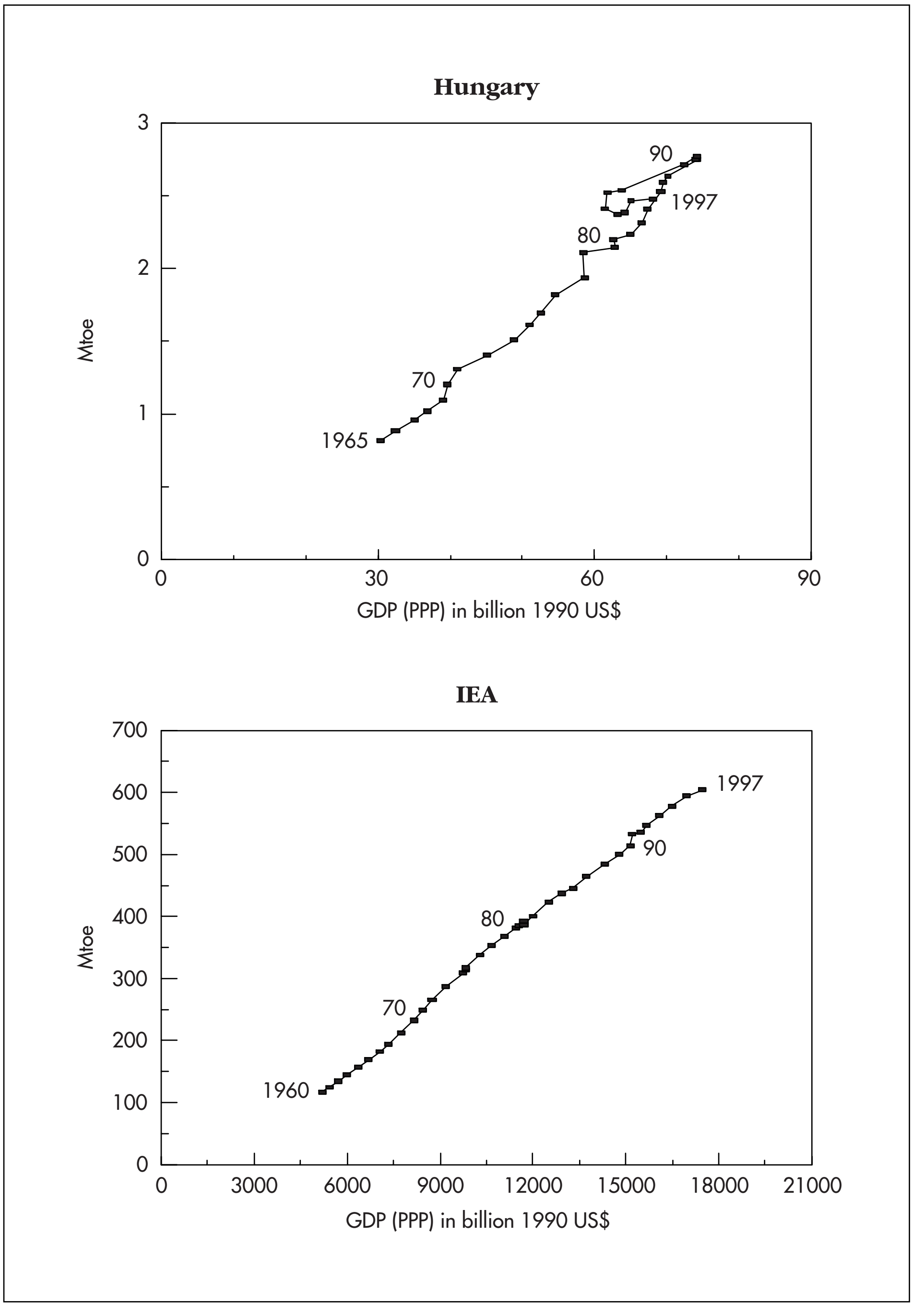
Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 1998, and country submission.

whereas GDP increased by 11%. In contrast, transport energy use in the IEA grew somewhat faster than GDP.

Car ownership was about 0.22 per capita in Hungary at the end of 1997. This compares to 0.42 in France and Austria and 0.5 in the United States. Consequently, the use of public transport was higher than in IEA Europe, with public transport dominating, but showing a declining trend since the mid-1980s due to cutbacks in subsidy levels, higher transport fees and early economic restructuring, along with rising numbers of private cars. Although the number of vehicles rose steadily since that time, mileage actually declined after 1990, due to sharp price increases. In 1991, the year when oil-product prices were liberalised, motor fuel prices rose by 20-22% in real terms, enough to discourage immoderate vehicle use. However, a large share of old, fuel-inefficient cars results in high fuel use per kilometre travelled and high levels of urban air pollution.

The trend in freight transport reflects the breakdown in trade relationships with COMECON countries. Total freight transport dropped from 39 to 27 billion tonne-

Figure 9
Electricity Consumption per GDP, 1960 to 1997
Purchasing Power Parities

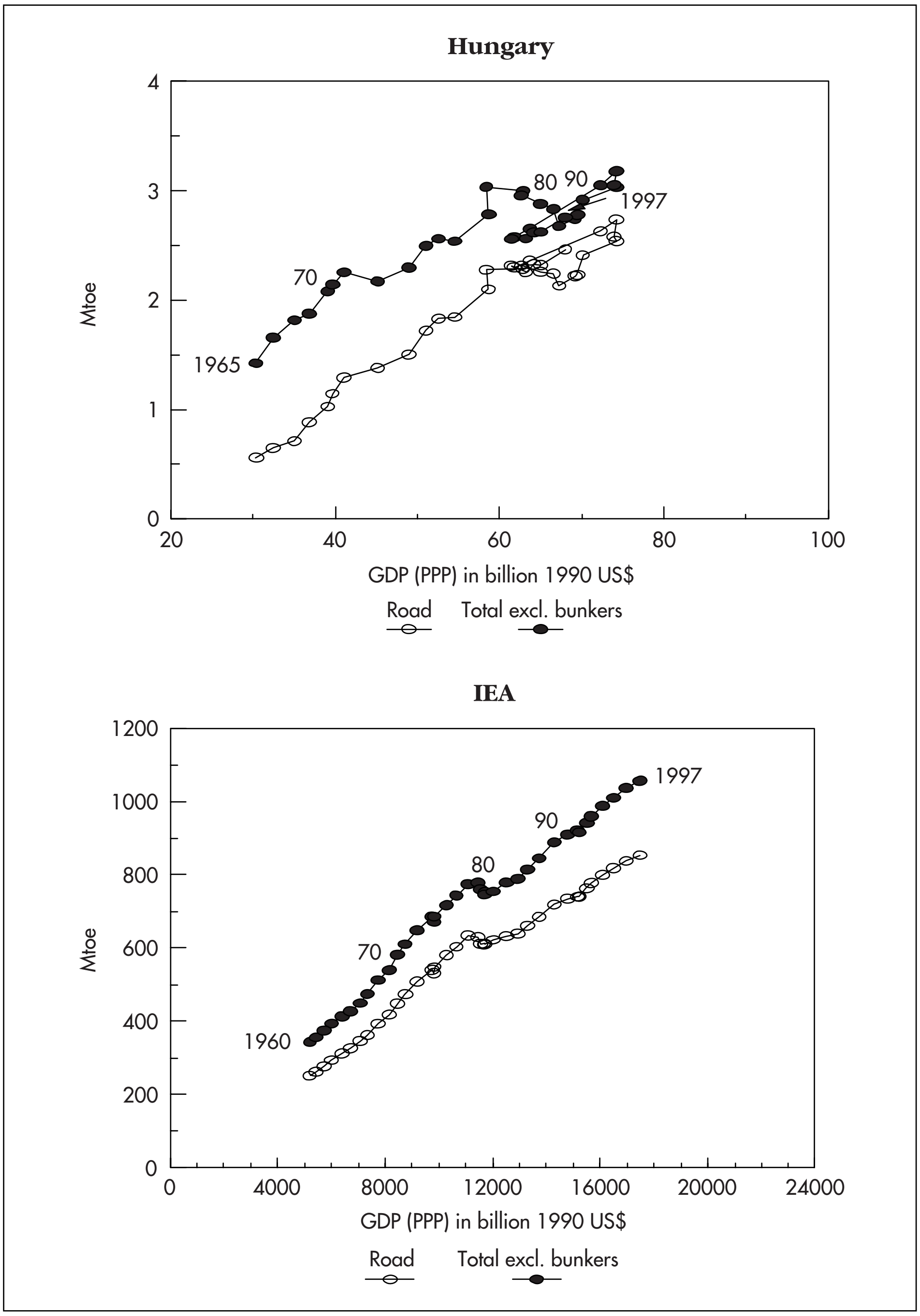


Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 1998.

Figure 10

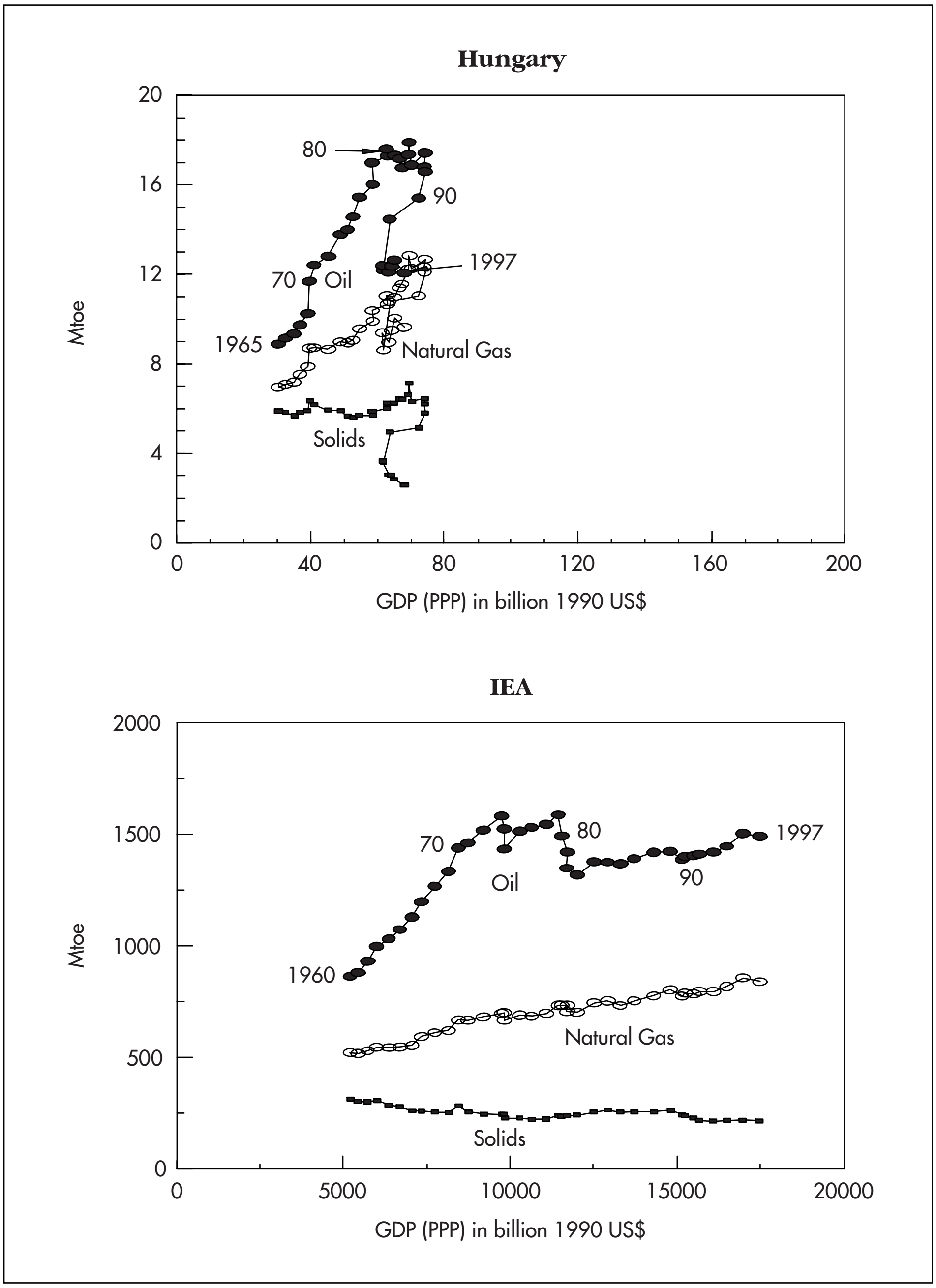
Transport Energy Consumption per GDP, 1960 to 1997

Excluding Electricity, in Purchasing Power Parities



Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 1998.

Figure 11
Stationary Fossil Fuel Use per GDP, 1960 to 1997
Purchasing Power Parities



Note: Data inputs to production of electricity and heat autoproducers in the United States are estimated until 1990.
Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 1998.

kilometres between 1990 and 1998. Rail and inland waterway transport declined sharply whereas pipeline and road transport declined to a much smaller extent. Road freight transport was reduced from 15 to 13 billion tonne-kilometres and has since begun to grow again.

CONVERSION EFFICIENCY

A large part of Hungary's energy infrastructure is old and in need of overhaul. This is reflected in the transformation losses from primary into final energy: total transformation losses account for 31% of TPES, and losses in transformation into electricity and heat for 24%. This compares to total transformation losses of 28% in IEA Europe and electricity and heat generation losses of 21%.

Hungary uses a fair amount of district heating. This tends to increase the amount of final energy that can be extracted from a given amount of TPES, provided the heat originates in combined heat and power production (CHP) facilities. Hungary effectively uses 9% of TPES for district heating, and 51% of this is from CHP.

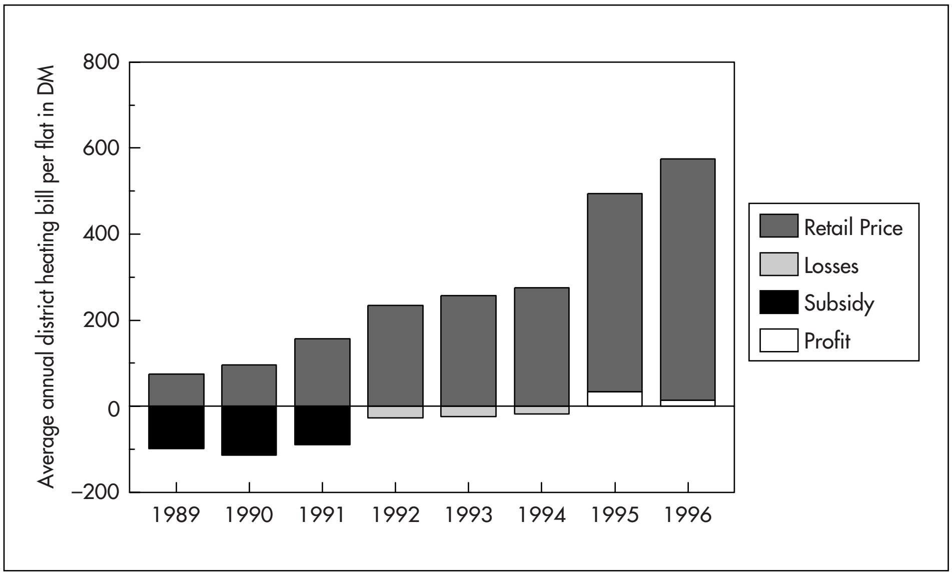
The country has more than 60 years of experience with district heating, due to its hot water springs, and the first district heating system involved geothermal steam piped from the Margit Island in Budapest. However, district heating was developed on a large scale only in the 1960s, when major housing construction programmes began.

Today, Hungary has 178 district heating companies which operate 290 systems in 103 towns and cities. These companies supply some 650 000 apartments, which represent 17% of the total of 3.9 million households in Hungary. Total Final Consumption of heat was 2.29 Mtoe in 1990, but fell to 1.42 Mtoe in 1997. Natural gas accounts for 59% of the fuel used for district heating; coal and oil account for 23% and 15%, respectively; and renewables, waste and other fuels represent 3% of inputs.

About 19 of the 103 municipalities distributing heat buy this heat via MVM from the independent generators who operate CHP plants near the big cities. An example is the privately-owned Budapest Power Plant Company, which operates several CHP plants on the outskirts of Budapest. Those municipalities who do not buy heat from MVM generally produce it themselves in CHP or heat-only plants.

District heating companies were heavily subsidised by the central Government (30-40% of end user prices). These subsidies were abolished in 1991. The product subsidy was replaced by a social fund for poor families, but the funds distributed amounted to only 1% of the district heating sales revenue. Responsibility for the municipal district heating companies, including the setting and control of end user prices, was transferred to the municipalities. Following this, some municipalities established commercial district heating companies whose goal was to make a profit. The Ministry of Economic Affairs retained the power to control heat prices set by the private generators. District heating prices increased considerably, but not in a uniform way across the country – and they still have not risen enough to fully cover cost. Figure 12 shows the development of average district heating prices in Hungary.

Figure 12
District Heating Prices in Hungary, 1989 to 1996
DM



Source: Association of Hungarian District Heating Enterprises (MaTáSzSz).

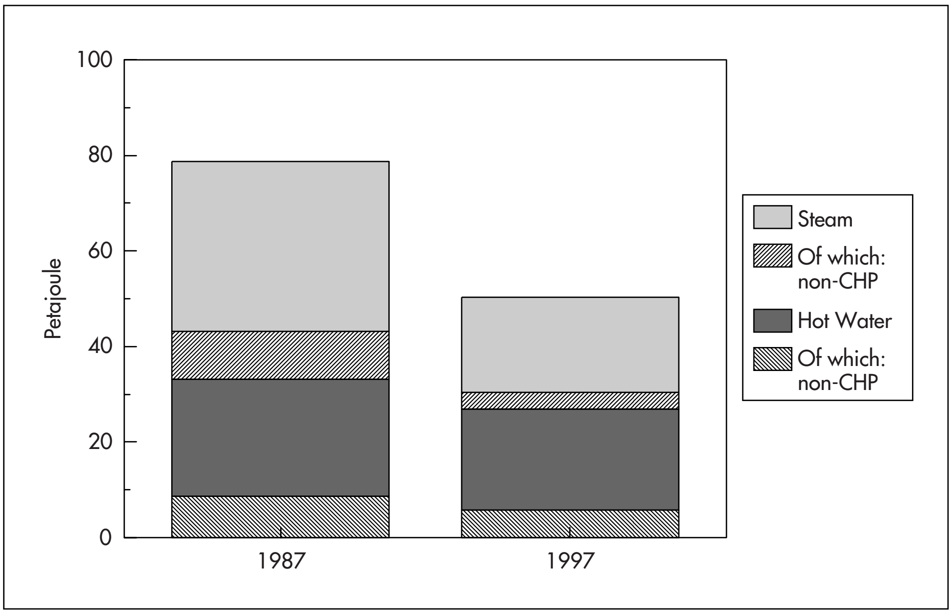
Regulation of heat prices at the national level follows the method used for gas and electricity prices: the Hungarian Energy Office (MEH) prepares regular price reviews in which updated prices are proposed, but the Minister retains the ultimate authority to set the prices. Motivated by macro-economic or distributional concerns, the Minister does not always follow the suggestions of the MEH.

At least until 1995, local district heating companies were able to benefit from subsidised residential input fuel prices, especially natural gas, whereas MVM had to pay the much higher industrial gas price for its CHP plants. This led to a situation in which the municipalities could maintain otherwise uneconomic capacity. Although the district heating companies no longer have access to subsidised input prices, the issue of strong regional price discrepancies and cross-subsidies led to consideration of a uniform, national regulatory framework for district heating. A District Heating Law was effectively adopted by the Hungarian Parliament in March 1998.

The district heating networks are in need of major refurbishment; so far, 10% of the system has been modernised. In the early 1990s, network losses in Budapest were estimated to be in the range of 30-40% for industrial heat supply. The Budapest district heating company started replacing its distribution system in 1994. Today, hot water network losses average 12%.

Simultaneously, demand for steam declined drastically throughout the last decade – a trend that has been under way since 1985 – due to reduced industrial heat demand. The demand for hot water also declined somewhat. This is indicated by Figure 13, which shows MVM's heat sales in 1987 and 1997. The figure also shows that the share of heating-only generation has declined. This is partly due to the fact that MVM has carried out a programme of replacing small-scale heating plants with small CHP facilities.

Figure 13
Heat Supply from Public Power Plants, 1987 and 1997
Petajoule



Source: MVM

The issues discussed in this chapter are very closely linked to the issues and policies discussed in Chapter 5, climate change and the environment. For this reason, critique and recommendations relating to Chapter 4 are contained in the critique and recommendations sections of Chapter 5.

5

CLIMATE CHANGE AND THE ENVIRONMENT

CLIMATE CHANGE

Hungary has been a signatory State to the United Nations Framework Convention on Climate Change (FCCC) since 1994. Under Annex B of the Kyoto Protocol, Hungary is committed to reduce its carbon dioxide (CO_2) emissions by 6% in the time period 2008-2012 (six gases). As an economy in transition, Hungary has the right to choose its base year, and has opted for 1985-1987 as its baseline period.

The transition Hungary underwent in the last decade has already led to some pronounced reductions in CO_2 emissions. Due to the sharp decline of economic activity after 1989, CO_2 emissions from fuel combustion fell by 18% between the years of peak energy consumption (1985-87) and 1994. Because of the rapid decline of domestic coal mining, emissions of coal bed methane dropped by 16% between 1991 and 1994. Figure 14 shows the development of Hungarian CO_2 emissions and the IEA average from fuel combustion since 1980.

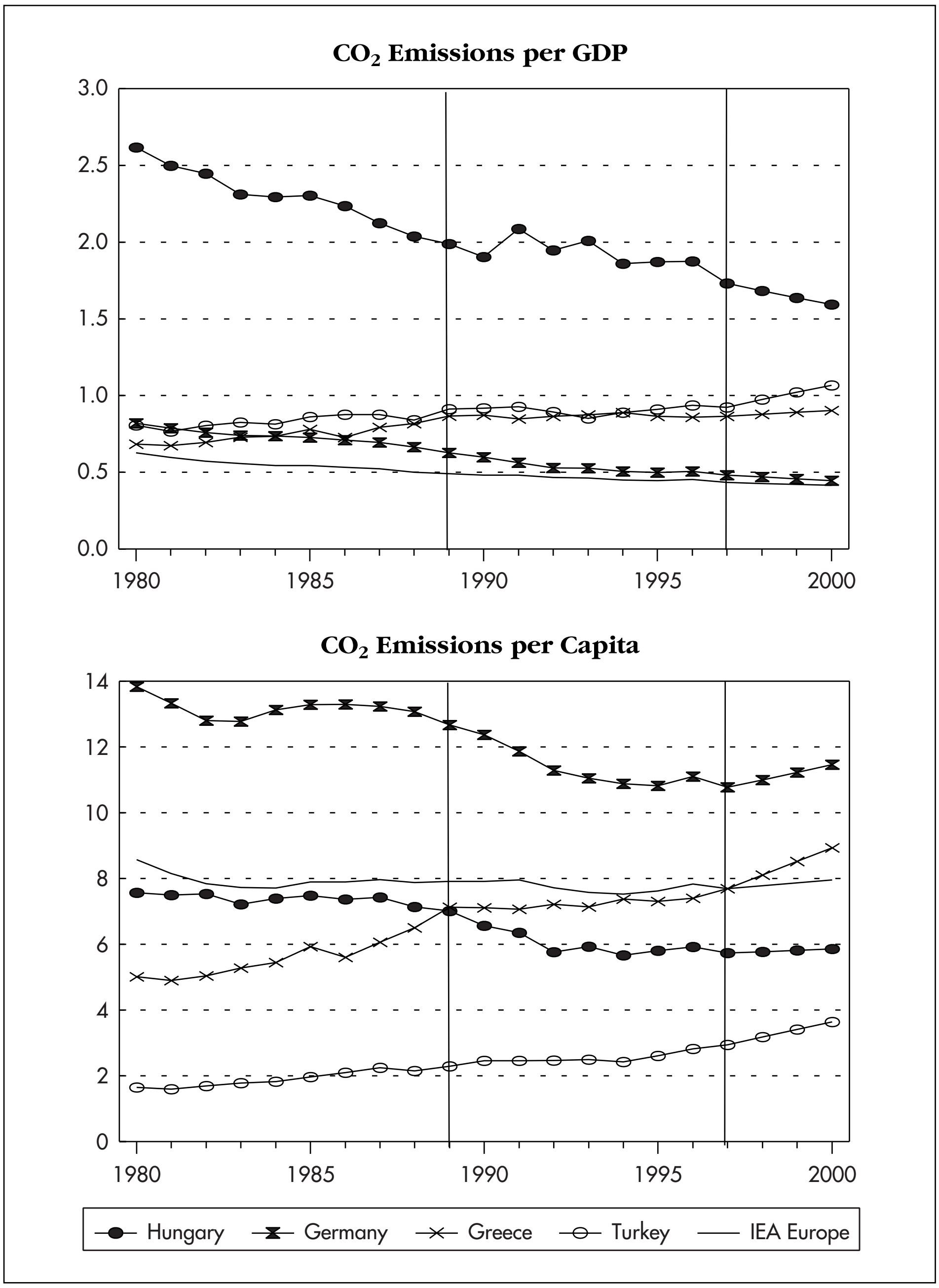
With a total of 62.0 million tonnes of carbon dioxide emissions in 1997, Hungary emits only small amounts of CO_2. Due to the rather limited energy demand growth forecast by the Government in the period to 2010, emissions are not expected to grow much. A business-as-usual scenario developed for the Second National Communication on Implementation to the UNFCCC foresees emissions of 65.5 million tonnes of CO_2 by 2002. Under very optimistic assumptions regarding economic development, this would only rise to 67.8 million tonnes. Nevertheless, the Kyoto commitment requires some improvements in energy efficiency.

The Government's policy measures in response to its commitments are set out in the National Energy Saving Programme. This programme was established in the framework of the Hungarian Energy Policy (Parliamentary Resolution 21/1993). This programme aimed at analysing the current situation, the savings potential, and the ways in which the legal, institutional and financial framework of Hungary's energy efficiency policy could be strengthened. On the basis of this document, the Government adopted the Energy Saving Action Plan in 1996. This plan specifies four sets of policy measures:

- Greater penetration of renewables;
- Promotion of energy efficiency improvements;
- Energy labelling; and
- Education, information and promotion of technological innovation.

The mechanisms used under this action plan comprise, among other things, demand-side management, price setting to encourage energy saving, establishment

Figure 14
Carbon Dioxide Emissions from Fuel Combustion in Hungary and IEA Europe, 1980 to 2000
Per Capita and Per GDP



Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 1998; *National Accounts of OECD Countries*, OECD Paris, 1998; and country submissions.

of energy statistics and information systems, modernisation of heating systems, and especially of district heating systems, development of technical regulations for buildings and supervision and enforcement of existing standards, development of energy data sheets for buildings, improving working conditions for the building authority, and improving the energy management of local governments.

The Government intends to increase the share of renewables to 5-6%, which is almost double the current figure. Although the utilisation of wind energy, geothermal energy and solar energy is possible in principle, the use of biomass is seen as having the greatest potential in Hungary. Currently, there are more than 70 biomass-fired boilers, including in CHP for district heating, with a total capacity of 31 MW. This includes a large wood-fired boiler of 12 MW in Tatabánya. However, biomass is not competitive with natural gas in electricity generation or CHP, and requires extra financing.

Promotion of energy efficiency currently focuses on energy efficiency management in municipalities and voluntary agreements with industry. Partly as a consequence of the programme, industrial companies have started recognising the link between energy waste and reduced profits, and have begun to draw up energy efficiency plans.

Hungary introduced an EU-conformity label in 1997. In the framework of its EU accession, the country is in the process of adapting its legislation to numerous EU efficiency standards for buildings, motors and appliances.

Numerous institutions are involved in educational and information campaigns. Foremost among these is the Energy Centre, established in 1997 from the former Hungary-EU Energy Centre by the Ministry of Economic Affairs and the Ministry of Environmental Protection and Regional Policy. An important role is also played by a network of Regional Energy Consumers Advisory Centres established by the Ministry of Economic Affairs, the Hungarian Energy Office and the Hungarian Technical Association. Also active are the power company MVM, the regional electricity distributors and a network of offices run by consumer organisations.

Given the discussion in the preceding chapter, it is clear that the inefficient energy use patterns developed in the past also mean that there is a correspondingly large potential for efficiency improvement – and an opportunity as well, since much of the obsolete equipment has already or will soon come up for replacement.

However, the task at hand is so large that the country is not capable of financing everything on its own. Hungary is the recipient of a large amount of international finance to help improve its energy efficiency and modernise its economy. Table 2 specifies the funding mechanisms, Hungarian and foreign.

The German Coal Aid Revolving Fund (GCARF) is a credit facility offering a preferential interest which is set at 50% of the Bank of Hungary's base rate. It came into force on 1 August 1991, and to date some 7 billion forints have been spent on energy-efficient modernisation projects. The Hungarian Government estimates that this programme has so far induced an annual reduction in energy use amounting to 4.6 PJ or the equivalent of 110 000 tonnes of imported oil, and has caused annual savings of 19 million US$.

Table 2
Energy Efficiency Funding Mechanisms in Hungary

	Hungarian Funding Mechanisms (million forints)		*International Funding Mechanisms (million US$)*	
	Central Budget	*Commercial Banks*	*Source*	*Funding*
GCARF	–	–	German Government	30 m DM
ESCP	80	800	–	–
PRF	–	–	PHARE, EBRD, EIB	6.8
PPP	300	–	–	–
HEECP	–	–	GEF	4.25

Source: Hungarian Commission on Sustainable Development.

The Energy Savings Credit Programme (ESCP) was established in 1996. It sets annual objectives which serve as the basis for the award of preferential loans. The 1997 objectives focused on implementing energy savings programmes at municipal level. The funding for 1997 is shown in the table. Total spending since the beginning of the programme was 1.7 billion forints, of which 1.1 billion were bank loans. The activities carried out in 1997 under this programme are estimated to lead to energy savings of 200 TJ in total.

For 1998, the programme foresaw continued support for municipalities, the start of a multi-annual modernisation programme of the district heating system, and the development of energy service company financing. A low-interest loan of 1 billion forints was made available for the municipalities, whereas the start of the district heating programme was delayed to 1 January 1999 to allow time to search for funding. For this project, Third Party Financing mechanisms are currently under development.

In the framework of the Phare programme, the Phare revolving fund (PRF) establishes a preferential credit scheme of some 5 million ECU for the energy sector, and a total of 30 million ECU for all sectors. The scheme started in winter 1998.

The Pilot Panel Programme (PPP), or Soft Loan System for Panel Reconstruction, established in 1996, makes low-interest funding available for the energy-efficient refurbishment of buildings constructed from prefabricated panels. The interest rate is set at below 10%. This also comprises non-reimbursable support of 300 million forints for heat insulation for 5 000 flats from the Central Environmental Fund.

The Hungarian Energy Efficiency Co-financing Programme (HEECP), was developed in 1997 by the World Bank and funded by the Global Environmental Facility (GEF). The Score Programme, not shown in the table, is a mechanism funded by the Dutch

Government which makes 165 million forints available for the establishment of energy efficiency institutions and demonstration projects. In addition to these funding mechanisms, there are numerous other EU initiatives, including support under the Thermie, Save and Synergy programmes.

In addition to the initiatives outlined above, the Ministry of the Environment has recently submitted to Parliament a bill on an environmental tax. The issue is, however, very controversial, as the tax would cause a drastic energy price increase and have a strong effect on inflation. No decision has been taken to date.

AIR POLLUTION

Hungary is a signatory to numerous international treaties and conventions regarding the environment, such as the 1979 Convention on Long-Range Transboundary Air Pollution and the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer. Moreover, Hungary joined most of these conventions soon after they were adopted or came into force.

Nevertheless, the country has a major air pollution problem stemming from the legacy of old, inefficient equipment, especially in the energy industries, and particularly related to power plants and inefficient passenger cars and freight trucks. Table 3 details the emissions of some major air pollutants.

Table 3
Air Pollutant Emissions in Hungary, 1980 to 1996
Million Tonnes per Year

	1980	*1985*	*1990*	*1995*	*1996*
SO_2	1.63	1.40	1.01	0.71	0.67
NO_x	0.27	0.26	0.24	0.19	0.2
Particulates	0.58	0.49	0.21	0.15	0.14
CO	n.a.	n.a.	n.a.	0.76	0.75
VOCs	n.a.	n.a.	0.21	0.15	n.a.

Source: Ministry of the Environment.

The power industry is one of the major polluters: about 60% of all sulphur emissions originate in thermal power plants. On the other hand, road transport accounts for 50% of all nitrogen oxide and carbon monoxide emissions. The vehicle fleet is outdated, and the road infrastructure of poor quality. Modernisation of the vehicle fleet, triggered spontaneously in the early 1990s, has significantly slowed because tax and duty regulations discourage it.

As a result, Hungary's air quality is still unsatisfactory, despite the improvements shown in the table. The air over some 3.9% of the country's territory is considered polluted and another 9.3% moderately polluted. The areas concerned are also Hungary's most densely populated areas – Budapest and Northern Transdanubia – and this means that half of the population breathes polluted air.

In 1997, the Government adopted a very comprehensive programme to combat all forms of environmental pollution, the National Environmental Programme 1997-2002 (Parliamentary Resolution No. 83/1997). This programme includes a number of principles, such as the polluter-pays-principle, and sets out detailed timetables for the adaptation of national legislation to stricter standards.

Within this framework, the Government has prepared an Inter-Ministerial Clean Air Protection Action Programme that stipulates the adoption of EU-conform, and in some cases even more stringent, standards. For example, the Action Progamme stipulates technological limits derived from the EU Large Combustion Plant Directive for power plants above 50 MW. For newly-licensed power plants, these norms are already in force, but existing units will obtain an exemption until 2004. The programme also encompasses a funding mechanism under the Central Environmental Fund.

Regarding motor cars, one of the more drastic measures taken by the Government was an import ban on vehicles more than six years old, and of all those with two-stroke engines. This measure, dating from 1994, was tightened to cover four-year-old vehicles in 1996. As in all other areas, legislation will shortly be adapted to EU legislation.

CRITIQUE

Hungary has significant room for improvement in energy efficiency, and since much of the real capital stock of the country needs to be replaced due to technical and economic necessity, Hungary has a unique chance to leapfrog to new, much more energy-efficient and environmentally beneficial technology. The best possible use should be made of this unique opportunity by choosing the best available technology which is economically viable.

Also, because of the drastic changes in its economy, Hungary has a relatively favourable starting point for meeting the target specified in the Kyoto Protocol – although this, of course, came at the extremely high economic cost of the loss of 20% of GDP between 1989 and 1993. This favourable situation, however, should not lead to complacency. Air pollution is possibly a greater concern to Hungarians than climate change at the moment, and indeed it is still a serious problem that needs to be tackled. Yet climate change and air pollution are both linked to energy use, and greater energy efficiency mitigates both problems. The country's low energy efficiency also implies high potential for improvement at relatively low cost – provided the measures can be financed.

The Government is obviously well aware of these issues, and has been able to attract a lot of international interest and financial assistance. It appears that the

Government has clear and concrete objectives for use of this assistance, that the targets are exactly those areas most in need of attention, and that the funds are generally well used. In order to address the energy-environment nexus, the country needs an energy efficiency strategy that contains all relevant mechanisms, including "softer" methods like public awareness campaigns. Hungary seems to have a fairly well-developed and comprehensive strategy in this respect.

There are only two issues that give rise to serious concern. The first one is the lax approach the Government seems to have with respect to building codes. The Government should seek low-cost options to improve the housing stock; it is encouraging that efforts to do this appear to be under way in principle. But stringent, realistic and mandatory building codes are a vital instrument and should be put back in place as soon as possible, and their effective enforcement should be ensured.

Secondly, and much more importantly, the pivotal role of the price mechanism must be recognised and taken extremely seriously. As long as energy prices do not fully cover costs and provide a reasonable return on investment, and as long as there are cross-subsidies in the market, the necessary modernisation efforts will not come about. This can be illustrated by the following example: since 1990, some 80% of the occupants of district-heated flats became the owners of their flat. Modernising one flat with an old district heating system costs 20-30% of the market value of that flat. Although it is laudable to make funds available to foster this modernisation, the owner will not have any major incentive to undertake the investment as long as district heating prices are distorted and below cost.

In the interest of energy efficiency as well as economic efficiency, and ultimately in the interest of improving environmental quality in Hungary and the health of the Hungarian people, the Government should remove all remaining price distortions, below-cost pricing and cross-subsidies. In this sense, it may be a worthwhile strategy to corporatise and privatise municipally-owned district heating companies in order to improve the economic and environmental efficiency of the district heating market.

RECOMMENDATIONS

The Government should:

- Continue its move towards improvement of environmental quality and energy efficiency.

- Make sure that all remaining price distortions in all energy markets, all below-cost pricing and all cross-subsidies are dismantled as quickly as possible.

- Phase in a balanced mix of regulation and economic instruments, such as fuel taxation, to internalise the external cost of energy use – notably environmental costs related to local air pollution and carbon dioxide emissions. Complete the basket of measures by using public information and awareness campaigns as well as voluntary agreements.

- ☐ Continue to implement progressive environmental regulation. Strive to cover all thermal power plants as soon as possible, including existing and smaller facilities, which can be major polluters.

- ☐ Ensure, as planned, that new capacity combines the best economic and thermal efficiency and lowest environmental emissions, and that efficient choice of new technology is not hampered by distorted price signals.

- ☐ Implement stringent but realistic mandatory building codes as soon as possible, and ensure effective enforcement. Seek low-cost options to improve the housing stock.

- ☐ Continue co-operation with international funding organisations, which appears to have been very successful, and continue or even extend quality control and assessment of results.

6

COAL

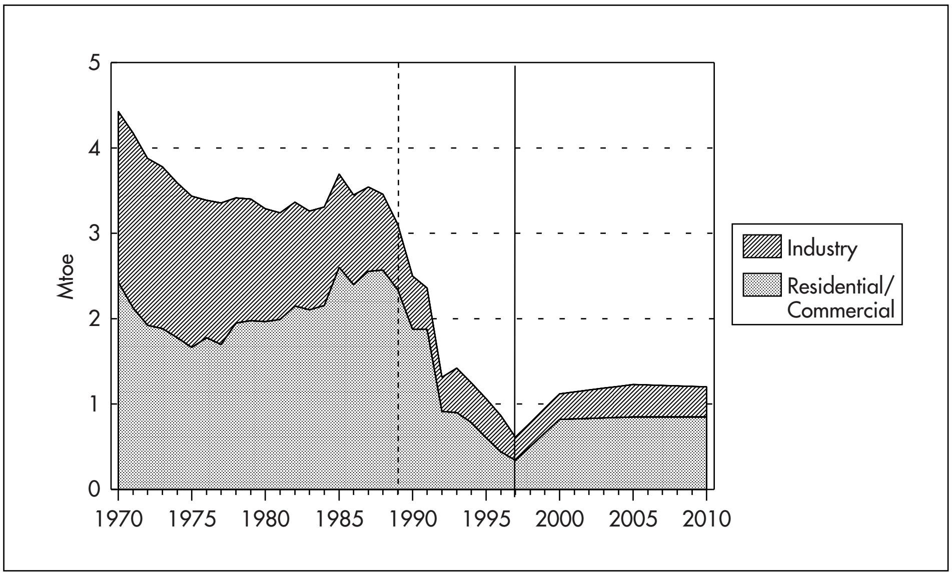
MARKET OVERVIEW

Hungary produced 3.3 Mtoe of coal in 1997, and imported 1.61 Mtoe. Imports amount to slightly over 20% of total supply and come mostly from the Czech and Slovak Republics, Poland, Russia and Ukraine. Domestic production has declined for the last two decades. The decline was almost entirely in deep pit production of hard coal and brown coal; opencast production, mostly lignite, was stable. Coal had a share of some 6% in TPES in 1997.

Figure 15 shows the use of coal by sector. Although the lion's share is used for power generation, a significant amount of coal was used for heating and cooking in households and communal facilities until the early 1990s; this use has since declined rapidly.

Figure 15

Coal Consumption by Sector, 1970 to 2010



Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 1998, and country submission.

Hungary has estimated coal reserves of more than 4.5 billion tonnes. The bulk of this is lignite, with 3 billion tonnes, followed by 1 billion tonnes of brown coal and 600 to 700 million tonnes of hard coal. The coal found in Hungary has comparatively low calorific value and high ash and sulphur content. It is produced in six opencast and ten deep mines.

Figure 16
Principal Coal Deposits and Mining Regions in Hungary

Source: IEA.

The cost of producing coal is high at many of these mines, especially at most of the deep pits. The Külfejtés hard coal opencast mine and the Visonta and Bükkábrány opencast lignite mines are profitable, and the latter lignite deposits may offer the only profitable future investment possibility in coal production in Hungary. Figure 16 shows Hungary's main coal mining regions.

Some of the other mines are kept running because they offer the only employment possibility in areas of high unemployment. This is the case for the Komló pit, which has difficult and risky working conditions and coal of low quality with comparatively low heating value and high ash and sulphur content. This mine will be closed by the end of 2001. In 1990, the Hungarian coal industry employed a total of some 50 000 people; this number was down to 18 300 in 1997.

THE PATH OF REFORM

The financial condition of the coal sector, chronically poor, deteriorated sharply after the collapse of the communist system. Immediate causes were the conversion of state capital subsidies into debt, bad investments, overmanning and controlled prices for coal. By the end of 1992, all mining companies had entered liquidation; they ceased to trade as independent companies and their debts were taken over by the Coal Mining Restructuring Centre, SZÉSZEK, established by a resolution of the Government in September 1990. SZÉSZEK's principal task was to reorganise the productive assets of the companies into financially viable corporate entities. SZÉSZEK, which is supervised by the Ministry of Economic Affairs, owns the coal mining assets provisionally on behalf of the creditors of the mines. In the government resolution on restructuring of the industry, provision was made to write off existing state allocations and loans to mining companies in liquidation. It was also recognised that it would be necessary to pay from the state budget the costs of mine closure, including claims for damage and rehabilitation of the environment.

Following this process, some coal mines were integrated with power plant companies. This integration took place in 1993 and 1994. In the process, SZÉSZEK transmitted the assets to the power plant companies and received shares in the integrated companies in return, about 25% on average. All but eight coal mines were merged with power plant companies. By 1994/95, the power industry had thus become the employer of an additional 13 800 coal miners out of a total of 19 000 coal miners. By 1997, 2 000 of them had been made redundant. Table 4 shows the principal mines, the type of coal mined, and the company owning and operating the mine.

Hence, after the integration of the mines with power plant companies, eight mines remained independent. Production in the Nógrad opencast mine began in 1996. This mine is economically viable and does not receive any subsidies. The eight independent mines were operated under the supervision of SZÉSZEK until 1993, and were subsequently transferred to three newly-formed regional mining associations (Mine Property Utilisation plcs) located in the Mecsek, Borsod and

Table 4
Principal Coal Mines in Hungary

Name of Mine (Near Town)	*Type of Coal*	*Type of Mine*	*Company*	*Supplying Power Plant*	*Merged with Power Plant Co.*
Zobák (Komló)	Hard Coal	Deep Pit	Mecsek	Pécs, Komló CHP Plant	Pécs Power Plant Co.
Külfejtés (Pécs)	Hard Coal	Opencast	Mecsek	Pécs	Pécs Power Plant Co.
Padrag (Ajka)	Brown Coal	Deep Pit	Veszprém	Ajka,	Bakony Power Plant Co.
Ármin (Ajka)	Brown Coal	Deep Pit	Veszprém	Ajka	Bakony Power Plant Co.
Jókai (Ajka)	Brown Coal	Deep Pit	Veszprém	Ajka	Bakony Power Plant Co.
Balinka	Brown Coal	Deep Pit	Veszprém	Inota	Bakony Power Plant Co.
Márkushegy	Brown Coal	Deep Pit	Oroszlány	Oroszlány	Vértes Power Plant Co.
Mány	Brown Coal	Deep Pit	Tatabánya	Bánhida Tatabánya	Vértes Power Plant Co.
Lyukóbánya	Brown Coal	Deep Pit	Borsod	Borsod, Tiszapalkonya	Energetical Ltd.
Dorog	Brown Coal	Deep Pit	Dorog	Dorog CHP Plant	–
Visonta	Lignite	Opencast	Mátraalja	Mátra	Mátra Power Plant Co.
Bükkábrány	Lignite	Opencast	Mátra	Mátra	Mátra Power Plant Co.
Putnok	Brown coal	Deep Pit	Closure foreseen by 2000		
Fékétevölgy	Brown coal	Deep Pit	To be closed by 2000		
Lencsehegy	Brown coal	Deep Pit	Operating		
Dudar	Brown coal	Deep Pit	Closure under way		
Rudolf	Brown coal	Deep Pit	To be closed by 2000		
Nógrádi Külfejtés	Brown coal	Opencast	Operating		
Szászvár (Szászvár)	Hard Coal	Deep Pit	Closed in 1995		
Várpalota	Brown Coal	Deep Pit	Closed in 1995		
Edelény	Brown Coal	Deep Pit	Closed in 1995		

Sources: IEA, MVM, Ministry of Economic Affairs.

Veszprém areas. The independent mines lie in areas of the country with high unemployment. They employed 5 000 miners in 1993; this number was reduced to 3 000 in 1998. They produce coal from existing mines using basic technology, amounting to about 8% of total production in Hungary. They receive government support partly through direct subsidies and partly through purchase contracts from the power industry concluded under government pressure on the power industry.

According to an agreement between the Government and the trade unions, five of these mines were to be closed in 1995, and the remaining three, Putnok, Fékétevölgy and Lencsehegy, located in areas of particularly high unemployment, at the end of 1997. The guaranteed sales under the contracts with the power industry were to decline from their 1995 level of 8.9 Petajoule (PJ) to 3.7 PJ in 1998 as mines were closed, and the contracts have since been renewed.

As the table shows, three of the mines were closed by 1995. Closure of most of the others is foreseen by 2000. The direct government support, scheduled of course to end at closure, was continued only for the Putnok, Fékétevölgy and Lencsehegy mines. In 1998, the subsidy amounted to 2.5 billion forints. A subsidy of 3.1 billion forints was paid to SZÉSZEK in 1998 for closure of the other mines.

It is not clear whether the production subsidy will be discontinued soon; the Government wants to examine whether the mines could have a commercial future in view of the power plant investment that is expected in the near future. The Government and the dominant, state-owned electricity wholesale company MVM are still heavily involved in determining fuel choice in power generation investment, which suggests that there are still ways to direct decisions this way. But several factors work against new capacity using indigenous coal, including the imminent preparation for EU accession and the competitive EU power market, and the possibility of using natural gas or better-quality imported coal.

Experience with the privatisation of the integrated companies shows that investors were somewhat reluctant to buy these companies. Eventually, four of the integrated companies were privatised, although the process went less smoothly than hoped for. A buyer for Vértes has not yet been found.

CRITIQUE

The Hungarian coal industry represents the problems of transition from a centrally-planned to a market economy to a sharper degree than almost any other sector. While there are staggering inefficiencies in the sector and large parts of it have to be shut down to relieve the burden on the economy, these very actions exacerbate unemployment to an almost intolerable degree in areas where there are few or no alternatives.

The Government has tried to negotiate a way through these conflicting demands as well as it could. The combination of coal mines, some economically viable, some not, with generating companies scheduled for privatisation meant taking a high risk of not finding investors or not realising the maximum value from privatisation, in both cases potentially delaying the needed modernisation of the energy market. Both risks have materialised – the generator Vértes has still not been sold, despite all attempts, and the revenue generated from the other companies is certainly below what could have been achieved if the power plants had been sold without the mines. However, because of the Government's strategy, the majority of miners are today employed by the power industry, and a large number by privatised generators, who may find it easier to carry out the necessary further cuts in due course.

Now the Government has to deal with the remaining miners, representing less than 0.1% of the workforce. But the problems should not be underestimated, because general unemployment is still high, especially in the concerned regions. The Government should pursue its policy of reducing coal subsidies with a view to eliminating them as soon as feasible, even if the phase-out takes time. The most important thing is to continue moving in the right direction; the speed of adaptation matters less.

In order to take steps into the right direction, it is important to prevent new recruitment in the independent coal mines; subsidy payments should be made dependent on this. Next, the production-oriented subsidies should be phased out and replaced by producer-oriented subsidies, in order not to distort the emergence of the competitive energy market. Lastly, and in the same spirit, the contracts involving the non-integrated mines should also be phased out, and replaced by social support for unemployed miners as soon as this is possible, and as long as necessary. If Hungary accomplishes this, it will have dealt with the necessary adaptation in the coal industry better than some long-standing IEA Member countries.[9]

RECOMMENDATION

The Government should:

- ☐ Pursue the policy of reducing coal production subsidies with a view to eliminating them. Phase out preferential coal purchase contracts between independent mines and the power industry as soon as this is feasible. Replace both these practices with social policy measures directed at those in need, and with development efforts designed to create new employment. New recruitment in parts of the industry that survive only thanks to government support should be prevented.

9. It should be noted that reducing coal production and coal support are by no means objectives in their own right. However, if market conditions exert powerful pressure towards the phase-out of domestic production of certain goods and services, the attempt to maintain those sectors can become extremely costly to society. Government support can at best slow the pace of transition and provide an opportunity to reduce the social cost of adaptation. But any such policy places a burden on society as well, first on the taxpayers who finance support programmes, and ultimately on society as a whole. Governments are, in some cases, well advised to facilitate the transition to a new market equilibrium.

7

NATURAL GAS

MARKET OVERVIEW

Overview

The creation of the Hungarian gas industry dates back to the 1960s, when Hungary's indigenous gas reserves were discovered, although distribution of manufactured gas (town gas) in Budapest dates back to the 19th century. The gas market as well as the oil market were dominated by the Hungarian Oil and Gas Board OKGT (Országos Kőolaj- és Gázipari Tröszt). The OKGT was established in 1957 as the fully state-owned and government-controlled successor of the private companies which had been active in the Hungarian oil industry before nationalisation in 1948. In the mid-1960s it was decided that OKGT should take over the responsibility for gas distribution, initially mainly town gas distribution, from the municipalities. The only exception was Budapest, where Főgáz (Budapest Gas Works), owned by the municipal authority, continued independent distribution and supply of gas. Subsequently, town gas was replaced by natural gas.

OKGT was the umbrella organisation for 22 affiliated companies and one subsidiary, responsible for almost all parts of the oil and gas industry, including exploration, development, production, storage, pipeline transportation, distribution and supply, as well as oil refining and machine manufacturing, construction and technology development. Among these, the affiliated company Gáz- és Olajszállító Vállalat (National Gas and Oil Pipeline Company, GOV) was responsible for pipeline transportation of oil and gas in Hungary and across borders to neighbouring countries. Gas distribution and supply were in the hands of five affiliated companies, Dégáz,[10] Tigáz,[11] DDGáz,[12] Egáz,[13] and Kőgáz.[14] Főgáz was the sixth gas distribution and supply company but it was independent from OKGT. The affiliated companies enjoyed a certain degree of independence from OKGT; for example, they reported profits and financial performance independently, and they had their own design, construction and services departments.

The only activity not under OKGT's control was oil and gas import and export. This was carried out by Mineralimpex, a fully state-owned foreign trade company under supervision of the Ministry of International Relations. Mineralimpex enjoyed a statutory monopoly over foreign trade in oil, oil products, and gas. This monopoly was removed, effective 1 January 1991.

10. Southern Lowlands Gas Company.
11. Trans-Tisza Gas Company.
12. South-Transdanubian Gas Company.
13. North-Transdanubian Gas Company.
14. Middle Transdanubian Gas Company.

Based on legislation passed during the first half of 1991, 12 of the 22 affiliated companies, including the distributors, were separated from OKGT and organised as independent joint stock companies, effective 1 July 1991. The shares of these companies were transferred to Hungary's State Privatisation and Holding Company ÁPV Rt.[15] OKGT and its remaining subsidiaries were formed into a joint-stock company called MOL Rt. (Magyar Olaj- és Gázipari Részvénytársaság, Hungarian Oil and Gas Company) on 1 October 1991. Their shares were also transferred to ÁPV Rt.

The Government decided to privatise MOL and the gas distribution companies separately, and to integrate Mineralimpex with MOL. These intentions were put into practice as of 1995, and MOL as well as all distributors except Főgáz are majority privately-owned today. MOL retained its other functions and is Hungary's dominant oil and gas company, responsible, on the gas side, for production, wholesale trading, and transportation. About half of MOL's business is in gas, and the other half is in oil.

MOL is also responsible for foreign trade. In September 1994, shortly before Mineralimpex became a fully-owned subsidiary of MOL (1995), an additional gas trading company for Russian gas was established. This company, called Panrusgáz, was 65% owned by Russian foreign trade companies, including the Russian firms Gazexport (50%) and DKG-East (15%). MOL held 30% of the shares and Mineralimpex 5%. Today, Panrusgáz is 50% owned by MOL, 40% by Gazexport, and 10% by Interprokom, two Russian companies owned, in turn, by Gazprom. Under the current arrangements, Panrusgáz imports Russian gas and must sell the imported natural gas to MOL at the border.

MOL is the only gas wholesaler and sells more than 70% of its gas to the distribution companies, who obtain all their gas from MOL. The remainder of MOL's gas is sold directly to power generators and large industrial consumers, especially the chemical industry. Figure 17 shows MOL's gas sales in 1997.

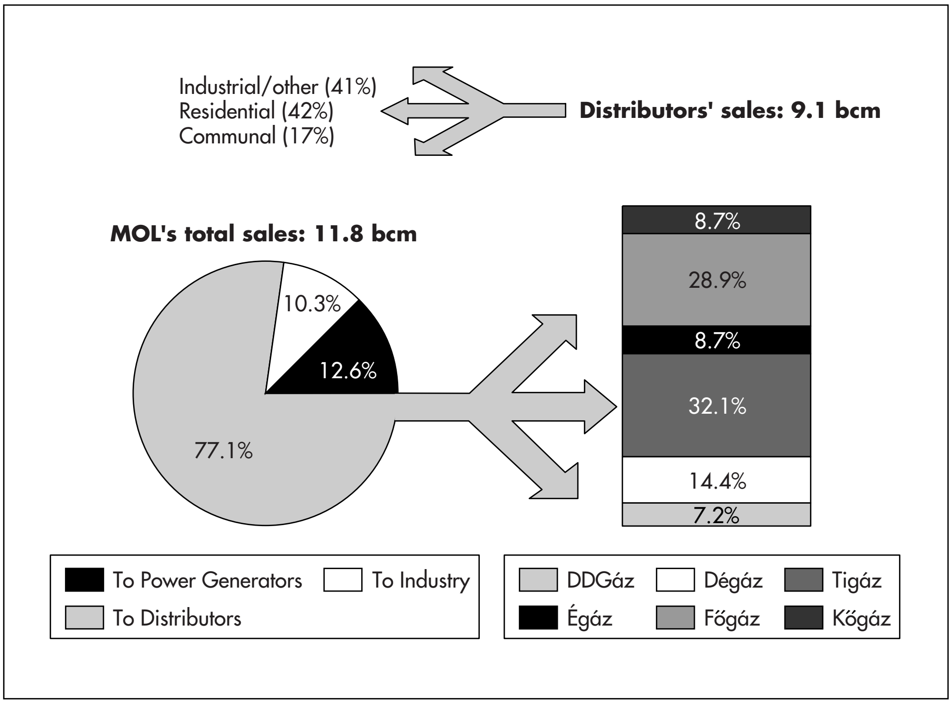
Natural Gas Demand

With 7.05 Mtoe or 40.8% of Total Final Consumption (1997 figure), natural gas use is twice as high in Hungary as in other European IEA countries, where it stands at about 20%. In 1996, absolute consumption and TFC share were even higher; they stood at 7.52 Mtoe and nearly 42%. After the collapse of the old system in 1990, gas demand shrank, especially in the industrial sector, as depicted in Figure 18, although the demand reduction was not as strong as in other energy markets. Today, only 28% of all gas demand in Hungary is from industry.

The reduction in industrial demand stemmed from industries which went through a significant contraction and whose output is not expected to return to its pre-1990

15. Állami Privatizációs és Vagyonkezelő Rt.

Figure 17
Natural Gas Sales of MOL in the Hungarian Market in 1997



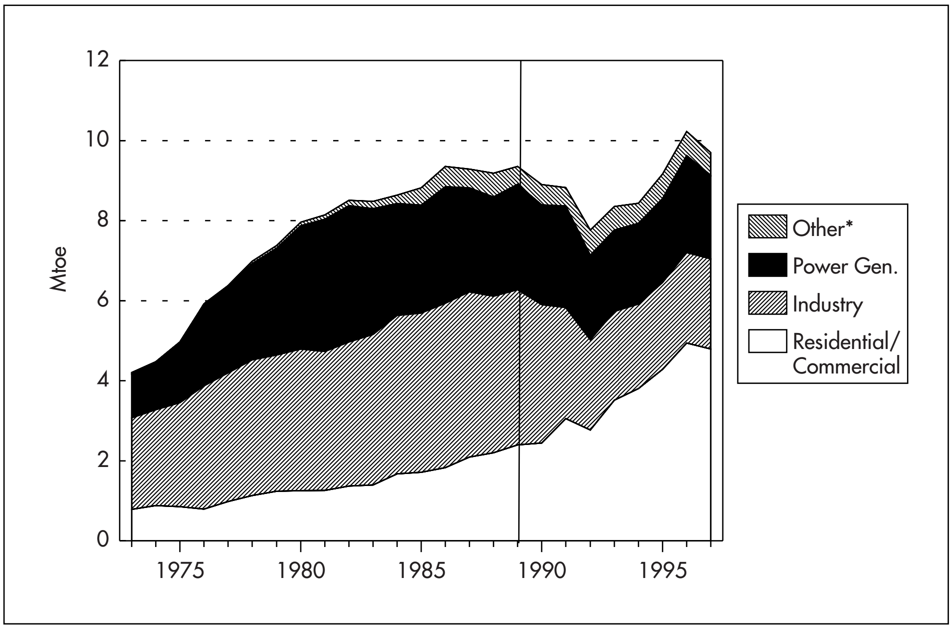
Source: MOL Rt.

level in the foreseeable future. Government forecasts do not anticipate any increase of industrial gas demand beyond current levels (about 1.9 Mtoe in 1997) until the year 2010. Both the gas industry and the Government expect the forecast demand growth – demand in 2010 is expected to stand at 7.6 Mtoe, 7.6% above the 1997 value – to come from the residential and commercial sector. A large part of the expansion in this sector will stem from newly connected customers – there are still parts of the country which are not yet connected to the gas distribution grid, but major expansion of the grid began in the last couple of years.

Since the reduction in industrial gas demand significantly reduced baseload gas demand, it has accentuated demand seasonality. At present, the principal remaining industrial markets are the chemical industry and power generation, both of which have a high load factor. Yet the bulk of the demand, supplied by the regional distributors, shows marked seasonality.

This is illustrated by Figure 19, which shows monthly gas demand and supply in 1997. The figure shows that a significant amount of peak gas demand in winter (some 35%) is met from underground storage (UGS). MOL also reduces production from its own wells in the summer months but sends large amounts of gas to storage, especially from imports under take-or-pay contracts.

Figure 18
Natural Gas Demand by Sector, 1973 to 1997
TFC in Mtoe



* Includes other transformation and energy sector consumption and transport.
Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 1998.

Production and Supply

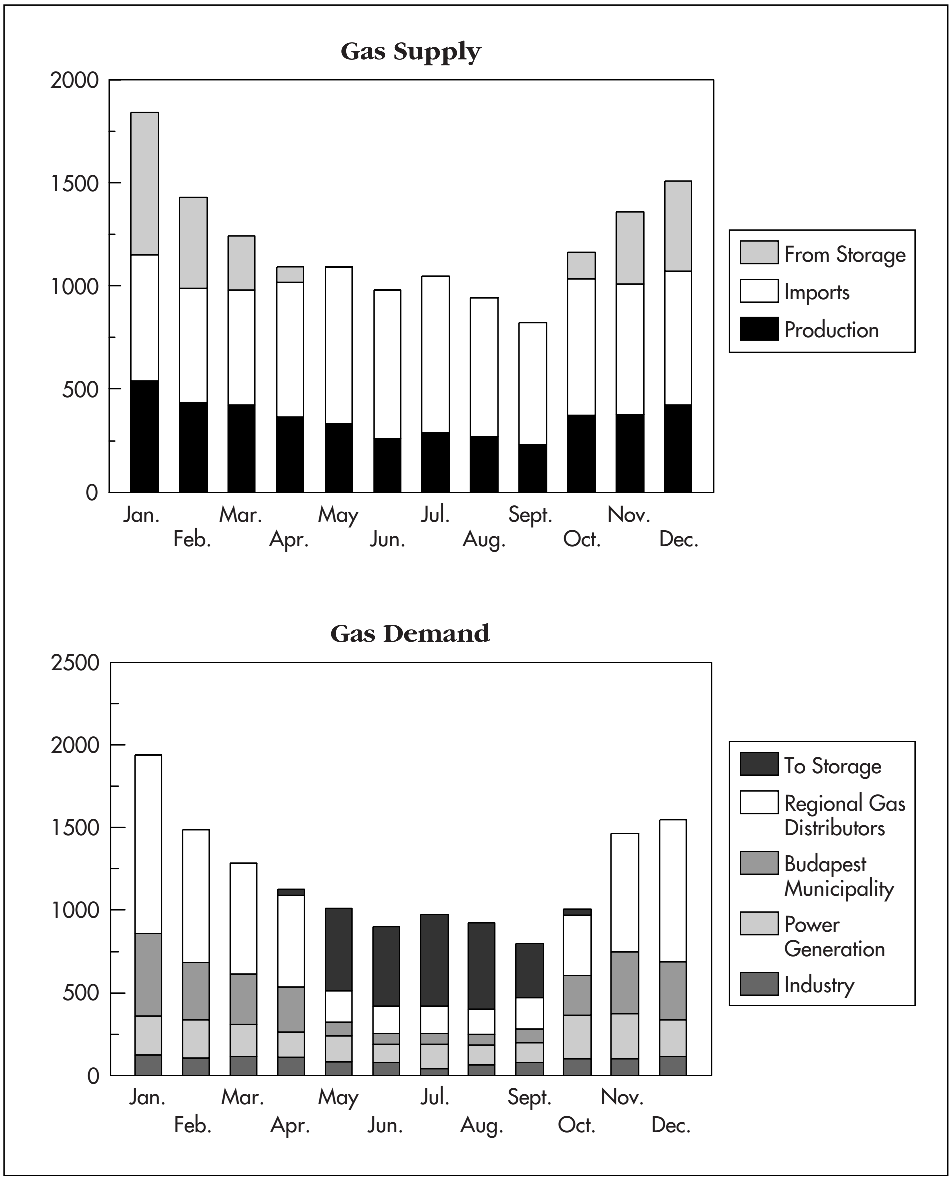
The high share of natural gas in total final energy consumption is reflected in its equally high share in Total Primary Energy Supply, 38.3% or 9.70 Mtoe. Hungary has natural gas reserves of its own but, as depicted in Figure 20, imports increasing amounts of gas, due to depletion of the country's domestic reserves in a context of growing gas demand.

Gas production began soon after the discovery of Hungary's natural gas reserves in the 1960s and peaked in 1985. In 1973, Hungary was capable of meeting 96% of its domestic demand from its own production. By 1997, the country's self-sufficiency was reduced to 35%, which meant that slightly less than two-thirds of the gas supplied to domestic consumers had to be imported: 45% of the gas was imported from Russia, 12% was purchased from Western Europe,[16] and some 8% was spot purchases made in Ukraine.

Although the long-term decline was reversed at the beginning of the 1990s, the Hungarian Government expects domestic gas production to fall from its current level of 3.36 Mtoe (1997) to 2.7 in 2000 and to 1.9 in 2010.

16. This included both swap gas and physical deliveries over the Győr-Baumgarten pipeline.

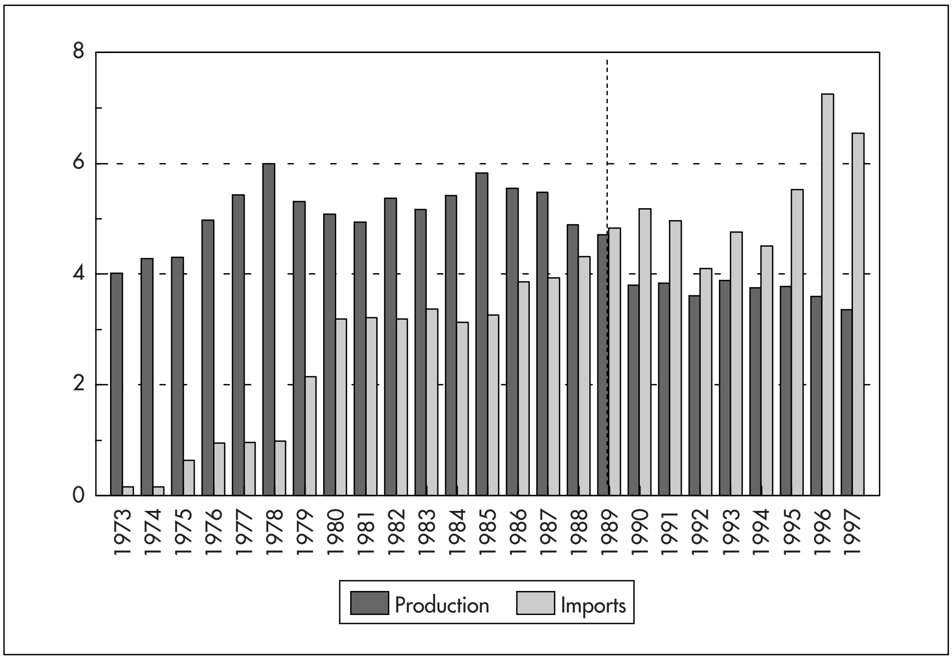
Figure 19
Monthly Gas Demand and Supply in 1997
Mcm per Month by Gas Source and Consumer Category



Source: MOL Rt.

All the gas in Hungary is produced by MOL. MOL also holds licences in more than 50 exploration blocks (exploration areas for oil and gas) in Hungary. Following a series of licensing rounds from which MOL was explicitly excluded in a move to foster the participation of other, especially foreign, companies, several foreign

Figure 20
Hungarian Gas Production and Imports, 1973 to 1997
Mtoe



Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 1998.

companies now carry out oil and gas exploration. So far, none of these other licence holders has developed any new gas field.[17] The discovery of a major new gas field is unlikely as the territory is already fairly well explored. MOL's net proven gas reserves have declined from some 39.8 Mtoe in 1994 to about 31.9 Mtoe in 1997, and MOL increasingly undertakes exploration and field development abroad, e.g. in Tunisia.

Transportation and Trade

MOL is the owner of Hungary's network of high pressure gas transportation and collection pipelines through KFÜ, its new gas transportation subsidiary and the successor organisation to GOV. KFÜ (Oil and Gas Pipeline Company) is unbundled from MOL in accounting and managerial terms but fully owned by it. The Hungarian gas pipeline network is about 5 000 km long and interconnected to Russia via Ukraine, Serbia and Bosnia through the "brotherhood" (Soyuz) pipeline. The annual capacity of this pipeline is 11.3 bcm, of which 65% was constructed for consumption

17. See Chapter 8 on Oil (Production and Exploration) for more detail.

in Hungary, the remainder for gas transit from Russia to the former Yugoslavia. Due to the political difficulties and warfare in Yugoslavia and its successor states, gas transit has been perturbed since 1992, when deliveries were suspended under the UN embargo. By 1997, the situation had returned to normal, and 2 bcm were delivered to the Federal Republic of Yugoslavia, and a further 0.15 bcm to Bosnia, amounting to some 15% of KFÜ's total gas transportation and 38% of KFÜ's revenue.

Figure 21 shows the Hungarian gas pipeline network, including gas fields and storage facilities. The grid has a comparatively large number of take-off points: at almost 400 "city gates" MOL transfers gas to the regional distribution companies.

Since October 1996, the Hungarian gas grid is interconnected to the West European grid via the HAG (Hungary-Austria Gas) pipeline between Győr in Hungary and Baumgarten in Austria. This pipeline is 120 km long, 70 km of which are on Hungarian soil, and has an annual capacity of 4.4 bcm. Construction started in September 1995, and the line was inaugurated in October 1996. Previously, only the interconnection to Russia (e.g. the USSR) via Ukraine had allowed access to gas imports, and all imports originated in Russia.

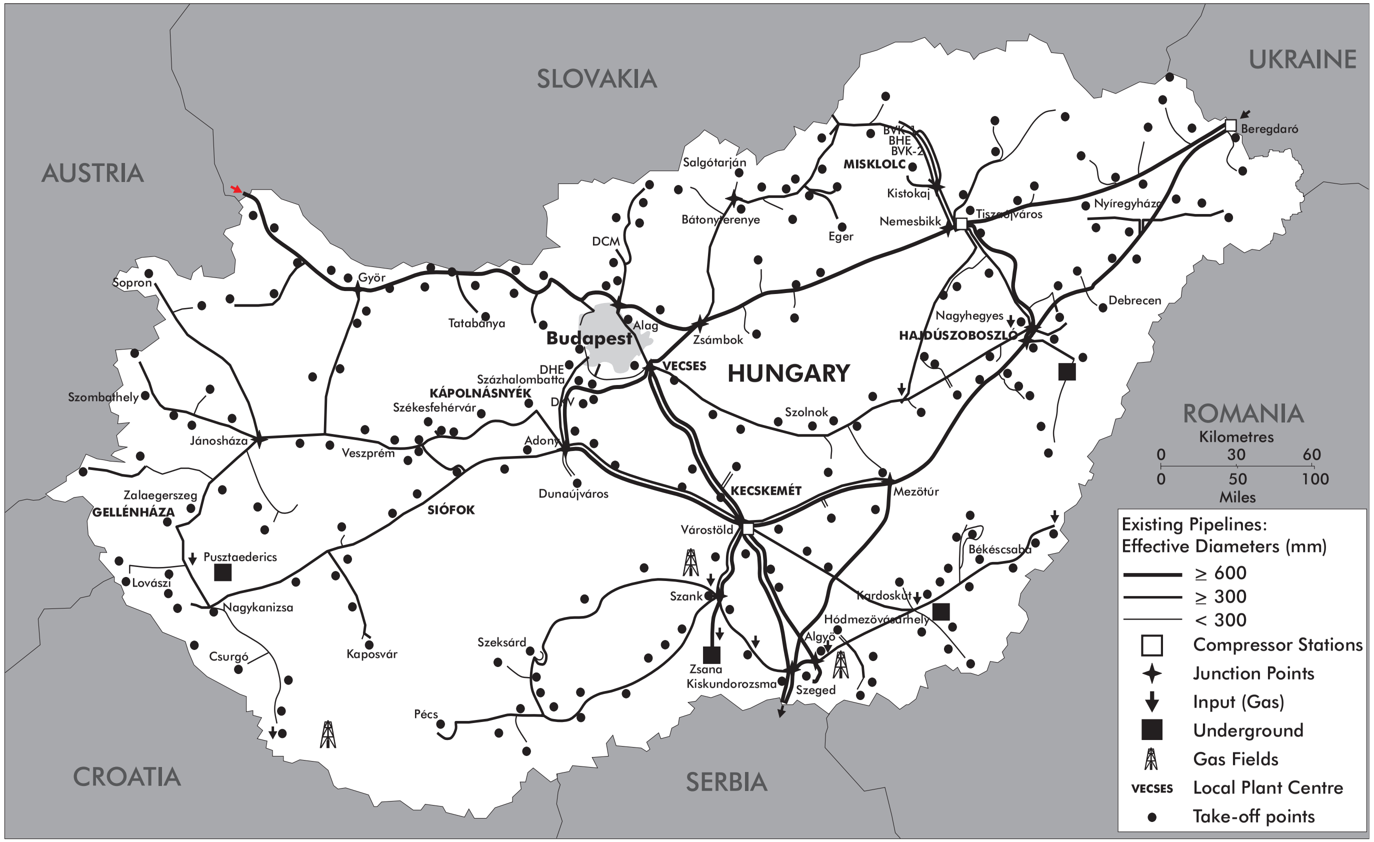
Imports from Russia started in 1975. The earliest supply contract with Russia was the Orenburg contract, concluded within the framework of the COMECON between the USSR and Hungary on 21 June 1974. Under this contract, 2.8 bcm of natural gas from the Orenburg field were delivered to Hungary up to 31 December 1998.

Subsequently, the Yamburg contract, amounting to 2 bcm of gas from the Yamburg field, was signed between Hungary and the former Soviet Union on 30 December 1985, and was extended on 9 September 1991 to 31 December 2008. Under the Yamburg contract, Russia was committed to deliver 14.6 bcm by early 1997. These volumes were due in exchange for the delivery of Hungarian goods, the re-export of pipes and building machinery made in Western countries from Hungary to Russia and Kazakhstan, and the construction of the Tengiz oil and gas plant in Kazakhstan by Hungarian companies (now Tengizchevroil). The agreement did not involve any money transfer between Hungary and Russia or Kazakhstan. Gazprom delivered 13.3 bcm by 1997; the remainder is under negotiation between the Hungarian and Kazakh Governments. Since both the Orenburg and Yamburg contracts were concluded by Mineralimpex, then under government ownership, the Hungarian Government sold the delivery to MOL, but at a very low price.

On 7 November 1996, a 20-year contract was signed between MOL and Panrusgáz for delivery of a total of 194 bcm between 1 October 1996 and 31 December 2015, with a possibility of purchasing an extra 2 bcm per annum between 2000 and 2015. This contract amounts to 10.2 bcm per year and covers the largest part of future gas needs, estimated to reach 16 to 18 bcm by 2010 (MOL estimate).

Formerly, MOL had to pay a customs duty and a statistical fee on oil and gas imports from non-WTO countries, and in particular from Russia. As of 1 January 1998, these fees were reduced by 40% for natural gas imports carried out by or for MOL, and as of the second quarter of 1998, both fees were reduced to 0%.

Figure 21
The Hungarian Natural Gas Transportation Infrastructure, 1997



Source: MOL Rt.

Based on the possibility of diversifying physical gas deliveries opened up by the HAG (Győr-Baumgarten) pipeline, MOL signed a 10-year supply agreement with Ruhrgas AG of Germany on 10 May 1995 for the delivery of 0.5 bcm/year. This agreement came into effect in October 1996 after the opening of the interconnector. On 6 December 1996, MOL signed an additional 15-year contract with Gaz de France for the supply of 0.4 bcm annually through the same pipeline, starting 1 January 1997. An additional 15-year contract was signed with Ruhrgas in October 1997, for delivery through the HAG pipeline from 1998 onwards with a starting volume of 0.1 bcm per year, to increase to 1 bcm after 2006.

At the beginning, the Western European gas volumes were essentially swap gas, i.e. Russian gas deliveries under way to France or Germany. In 1997, about 1.6 bcm of gas were actually delivered through the HAG pipeline, 0.9 bcm of which were from western sources. The majority of gas transactions on this pipeline is thus still virtual, but real deliveries are increasing.

These deliveries are priced above supplies from Russia, which are still by far the cheapest, and it is unlikely that large amounts of gas would be imported from other sources than Russia in the foreseeable future. Other supply possibilities are, in growing order of cost, Algerian gas via Austria and the new interconnector, Iranian gas via Turkey and Romania, liquefied natural gas from North Africa or Qatar shipped through a – yet to be built – LNG terminal in the Adriatic Sea, and Norwegian gas via Poland or Germany. MOL was a member of the LNG consortium until 1997, when the company decided to end its participation in that project. The HAG pipeline could offer some additional security of supply in cases where Russian gas supplies might be interrupted to Hungary alone. It is not clear how much physical supply could be expected through the western interconnector if Russian deliveries to Western Europe as a whole were curtailed.

MOL is, by far, the largest owner of storage capacity in Hungary; storage is also owned by the independent power companies, the national railways, and numerous small private companies. The country had 2.7 bcm of storage capacity in 1997, with a daily unloading capacity of 33.2 mcm. In 1999, storage capacity increased further to 3.4 bcm, with a daily unloading capacity of 42.7 mcm. This amount is relatively large, and as shown in Figure 19 in the section on Natural Gas Demand, enables MOL to meet a high percentage of peak winter demand from its own production combined with storage.

Storage has been expanded over the last years. MOL's management has had a policy of increasing storage because it is seen as a means to improve security of supply in a situation of growing imports and few diversification possibilities. This policy is set to continue: in 1997, the company decided to complete the second phase of upgrading of the Zsana storage site, the first phase of which was completed in 1996 and which increased daily unloading capacity by 8 mcm. This project will add 0.7 bcm to the country's total storage capacity and 9 mcm to daily unloading capacity. Recently, the main objective of the company's storage policy – security of supply – was complemented by the further objective of providing storage services to international companies, especially in the West European market. Table 5 shows MOL's natural gas storage capacity in 1997.

Table 5
Natural Gas Storage Capacities in Hungary, End 1997
Million Cubic Metres

Plant	*Total Storage*	*Daily Unloading Capacity*
Hajdúszoboszoló	1 400	17.0
Zsana	600	9.0
Pusztaenderics	330	2.6
Pusztaszőllősi	240	3.4
Maros-1	120	1.2
Total	**2 690**	**33.2**

Source: Ministry of Economic Affairs.

Distribution and Retail Supply

The natural gas distribution grid has expanded continuously throughout the 1980s and early 1990s and continues to grow. Figure 22 shows the areas of the six main gas distribution companies which were already active at the times of the OKGT. The supply areas of the distributors are actually less clearly delineated than indicated in the map, and networks are frequently not contiguous; for example, Főgáz supplies 11 villages in the Tigáz territory. Gaps also remain in the distribution network. As these gaps are closed, distribution and supply licences are awarded municipality by municipality, which increases the raggedness of the patchwork pattern of supply areas.

As the gaps in the gas distribution grid are closed, the number of connected municipalities and customers grows rapidly, as is shown in Table 6. Between 1990 and 1997, the number of connected towns and villages more than quadrupled, and the number of customers grew by 60%. In 1998, two-thirds of Hungary's households were connected to the gas grid, and the number is still growing.

This growth has given rise to the creation of new gas distributors and retailers. At the end of 1997, three new gas distributors/suppliers had obtained supply licences and were active in the market: Főnix-Gáz Kft., WAV-Gáz Kft. and ZAB Gáz Kft. However, these companies are very small; they account for no more than 1% of the market. Their majority shareholder is MOL.

Table 6
Total Number of Customers Connected to the Hungarian Natural Gas Grid

	1990	*1995*	*1997*	*1998*
Number of Customers	1 680	2 446	2 692	2 802
– of which households	1 630	2 343	2 564	2 662
Towns and villages	454	1 526	1 953	2 168

Source: MEH.

Figure 22
Main Gas Distribution and Supply Areas in Hungary

Source: MEH.

THE PATH OF REFORM

Privatisation and Restructuring

The Government's approach with respect to privatisation of the oil and gas industry changed considerably throughout the early 1990s. Early on, the Government decided that the gas distributors were to be fully privatised, whereas privatisation of MOL was to occur somewhat later, and only down to a blocking minority of 25% plus one share. This level is defined in the Hungarian Privatisation Act as the minimum government shareholding in strategic, previously state-owned companies.

After having separated MOL from its distribution (and other) affiliates in 1991, the Government, through ÁPV Rt., sought a strategy that would yield maximum revenue from gas industry privatisation. In 1993, this engendered plans to allow or even promote vertical re-integration between MOL and the regional distribution and retailing companies; allowing MOL to acquire shares in the regional distributors was seen as increasing the company's attractiveness to investors.

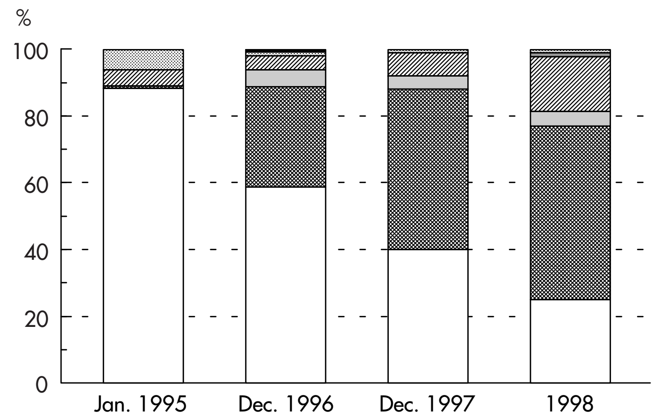
Partial privatisation of MOL actually began in June 1993 when 1% of the shares was offered to the public in exchange for privatisation vouchers. Shortly afterwards, a further 7% was sold to municipalities whose land was occupied by MOL facilities. In December 1994, the Government decided that MOL should acquire Mineralimpex, and the acquisition was completed in 1995.

In August 1995, a government resolution clarified that MOL was effectively to be privatised down to 25% plus one share. One month later the golden share was introduced. This clarified the Government's rights connected to the golden share: the Ministry of Economic Affairs retained special rights with respect to cessation of business, mergers, acquisitions, diversification and renting out of important business activities.

November 1995 saw the first major transaction, combining a domestic share offer, a "road show" to elicit an international private placement, and an employees and management share offer. As a result, ÁPV Rt.'s shareholding was reduced to 59%, and foreign investors held slightly more than 29%. The remainder was held by Hungarian investors, municipalities, and MOL managers and employees. MOL's shares were listed on the Budapest stock exchange. Figure 23 shows the development of MOL's ownership structure between 1995 and today. It illustrates that the objective set for MOL was reached in three years.

As regards the distribution companies, the Government decided at the end of 1994 to go ahead with full (100%) privatisation, except in the case of Főgáz, and to retain one golden share. After having set in motion several tendering procedures but cancelling them soon afterwards, a tender for foreign investors was finally launched in 1995. The earlier offers had been cancelled mainly because uncertainty regarding the future regulatory and pricing policy had made offers so low that ÁV Rt. found them unacceptable.

Figure 23
Privatisation of MOL
Share Ownership in %



Ownership in %	Jan. 1995	Dec. 1996	Dec. 1997	1998
State	88.3	58.7	40.0	25.0 + 1 vote
Foreign Private Investors	0.7	30.2	48.0	52.1
MOL Employees	0.0	4.9	4.0	4.3
Hungarian Investors	5.0	4.3	7.0	16.5
Municipalities	6.0	1.1	1.0	1.1
MOL	0.0	0.8	0.0	1.0

Source: MOL Rt.

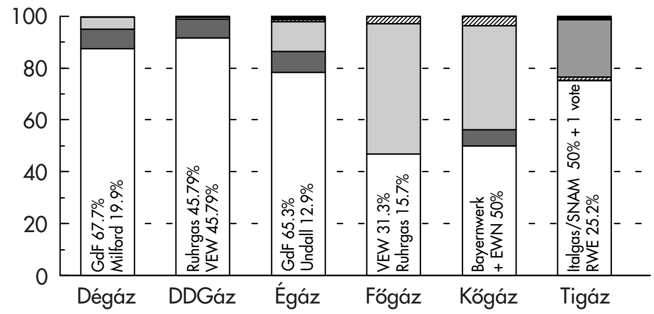
At first, the privatisation agency offered investors majority stakes of 50% plus one vote. A further 40% of the shares were transferred from ÁPV Rt. to the municipalities supplied by the companies. Soon after the gas distributors were listed on the Luxembourg stock exchange at the end of 1995, the municipalities decided to sell most of their shares as well. The only exception to this was Kögáz, where the municipality decided to keep all its shares, and where the ownership structure still fully reflects the Government's decisions. One restriction on investors was retained in order to limit market power: investors in Tigáz, by far Hungary's biggest retailer, were not allowed to obtain shares of any other retailer.

In the case of Főgáz, its owner, the Budapest municipality, decided to offer investors two choices: either they could obtain majority shareholding, but with certain management rights retained by the municipality, or they could obtain minority shareholding. As is shown in Figure 24, the investors and the municipality eventually agreed on minority privatisation.

Figure 24

Ownership Structure of the Six Regional Gas Distribution Companies

Share Ownership in %



Ownership in %	Dégáz	DDGáz	Égáz	Főgáz	Kőgáz	Tigáz
Foreign Investors	87.60	91,58	78.20	47.00	50.00 + 1 vote	75.20
Postabank Rt.	7.40	7,52	8.30	0.00	6.30	0.00
Local Government	4.80	0.70	11.30	50.00 + 1 vote	40.00	0.20
Employees	0.00	0.10	1.00	3.00	3.70	1.10
Other	0.00	0.00	0.00	0.00	0.00	22.30
State	0.10	0.10	0.20	0.00	0.10	1.20

GdF = Gaz de France

Source: MOL Rt.

The Introduction of Competition

Although MOL is still Hungary's only gas producer and transporter, and although it still vastly dominates gas imports and exports, there is a certain degree of competition in the Hungarian gas industry, at least theoretically.

Under the 1993 Mining Law (Act XLVIII of 1993 on Mining), and the 1994 Gas Law (Act XLI of 1994 on Gas Supply), MOL has to provide access for third parties to its high-pressure gas transportation infrastructure under two conditions:

- There has to be spare pipeline capacity; and
- The gas shipped must stem from Hungarian production.

In addition, a Government Decree from 1991 stipulates that MOL must offer the same gas transportation tariffs to third parties as it uses in its own internal accounts. Regarding access to gas storage facilities, the legal framework provides that access must be given where the storage facilities are independent from producing gas wells.

In practice, these provisions have not given rise to effective competition for the supply of end users. Yet, the Hungarian Energy Office's approach towards attribution of new gas supply licences has led to some competition for the licensed area. As outlined in the section on Distribution and Supply, not all of the country's territory was covered by the six distribution companies' supply areas. In areas where gas supply is new, supply licences are attributed separately, municipality by municipality. This includes cases where there are simply gaps between two main distributors' territories. Municipalities have in the past sought investment by new companies because of their own resource constraints. They have an interest in seeking out the licensee who can build and operate the new sections of the distribution network as cheaply as possible, which lends the process some resemblance to franchise bidding. The new gas distributors/retailers, Főnix-Gáz Kft., WAV-Gáz Kft. and ZAB Gáz Kft., acquired their supply areas this way. The heterogeneous pattern of supply areas, already present under the previous system, is thus enhanced, which may be a good starting position for competition.

The Hungarian Government has decided that the EU Gas Directive (98/30/EC) will be implemented by the time the country is a full member of the EU. The Hungarian Government and the MEH are currently investigating the ways in which the Hungarian gas market can be adapted to the EU Gas Directive. The following issues are under debate in the country:

1. *Eligibility of the regional distribution companies.* MOL supplies the 18 largest customers above 5 mcm per year directly; 12 of these that are not distributors will be eligible for competition according to the rules of the Directive. The Government's current policy is that the distributors should not be eligible for competition except for that part of their own market which is eligible. At present, the gas suppliers sell some 31% of their gas to industry and 7% to power generation. The rationale for this is that there is a fear that the regional gas distributors could massively lose customers to new market entrants and to MOL, creating stranded cost and social hardship. The rather dense Hungarian high-pressure gas grid, and its many take-off points, is thought to give MOL an easy opportunity to outcompete the distributors with respect to their eligible industrial customers.

2. *Take-or-pay contracts.* The issue of take-or-pay (TOP) contracts, and especially the possibility that Gazprom may outcompete MOL in its downstream market, is another area of concern. If this happened and MOL lost sales volumes, this would of course trigger MOL's take-or-pay obligations with respect to either of the companies. A solution currently under discussion is to reduce the TOP obligation by exactly the amount lost to Gazprom due to competition, although this solution would only work in the case of bilateral conflicts of interest.

3. *Security of supply.* Hungary and Austria have traditionally used strategic storage to address these concerns, and Hungary especially has an explicit policy of responding to its declining domestic gas production and the increasing import dependency on Russia via strategic storage. As previously noted (in the section on Transportation), gas from Russia will remain the least expensive in the foreseeable future. In the absence of an EU policy on strategic gas storage, this

raises the question of how to recoup the cost of such storage, which is considerable, in the competitive gas market. One possible solution could be to make use of the Directive's public service obligations clause and implement a levy on all gas consumers. A longer-term solution would be an import diversification policy, but the details of such a policy would require careful consideration.

REGULATION

The Minister of Economic Affairs and the Hungarian Energy Office are responsible for regulating the natural gas industry. This regulation is carried out via two instruments, licensing and price regulation. There are currently 10 companies in Hungary that hold a gas licence, issued by the Hungarian Energy Office (MEH): MOL and the nine distributors, i.e. the six large traditional distributors and the three small new ones.

The Hungarian Energy Office (Magyar Energia Hivatal, MEH)

The Hungarian Energy Office was established in August 1994 under Act XLI of 1994 on Natural Gas Supply and Act XLVIII of 1994 on the Production, Transmission and Supply of Electricity. It is the regulatory authority for both electricity and natural gas in Hungary. It has the following core duties :

- Licensing of gas transportation, distribution and supply;
- Licensing of electricity generation, transmission, distribution and supply;
- Participating in and supervising the tendering process for new electricity generating capacity and issuing the respective licences after approval by the Minister, the Government and the Parliament;
- Supervising wholesale and retail prices, and especially preparing the Minister's price setting for gas customers and electricity consumers in the general public electricity system (smaller-scale customers);
- Ensuring consumer protection, adequate customer service, and reliability.

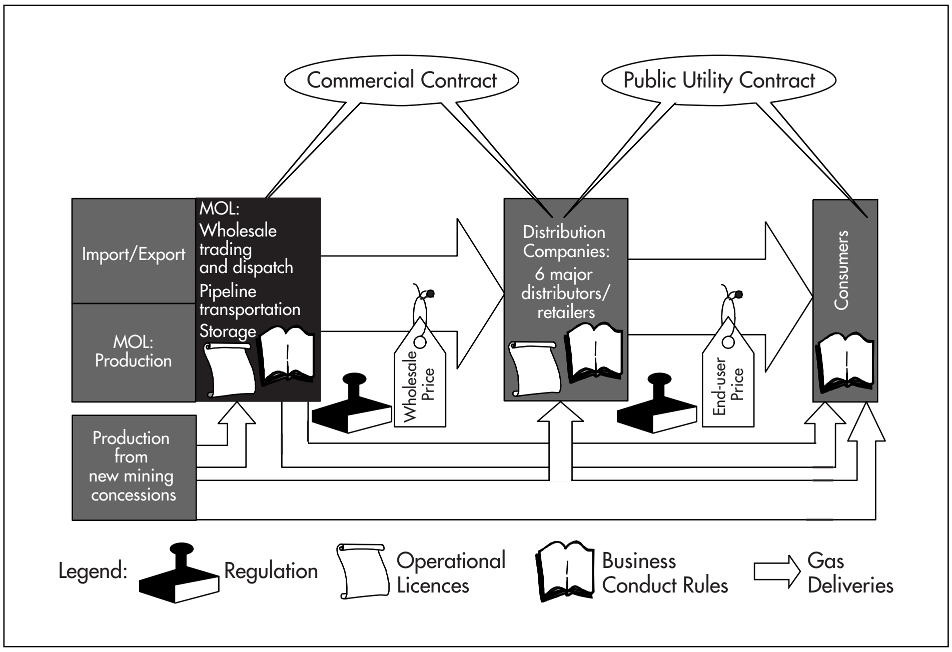
The Hungarian Energy Office is a government body with nationwide authority and responsibilities regarding the regulation of the grid-bound industries. It is supervised by the Government through the Minister of Economic Affairs. The Minister appoints the President, the Vice Presidents, and the Director of Administration for an indefinite term of office. The Minister exercises the right of employer with respect to them. The Hungarian Energy Office has 85 staff, of which 13 are executives, 46 have higher education, 24 have secondary education, and 2 are manual workers.

MOL is the country's only licensed gas wholesaler, which authorises it to carry out production, foreign trade, transportation, storage and direct supply of gas to distribution companies and large industrial consumers. The licence confers the right upon the Hungarian Energy Office to regulate MOL's sales under commercial contracts to distributors and industrial consumers, and especially to regulate the respective prices.

The nine distributors hold gas supply licences, which form the basis for MEH's regulation of their retail sales under public utility contracts. This regulation includes price regulation but also other regulation relating to safety and quality of service as well as to the so-called restriction order lists, which detail the order in which consumers are cut off from supply in the event of a curtailment. Figure 25 provides an overview of the current structure and functional model of the industry.

Figure 25

Functional Model of the Hungarian Gas Industry



Source: MEH.

Price regulation is carried out based on the 1994 Gas Supply Act and Gas Pricing Decree. The regulatory framework set out in this legislation applies between 1 January 1997 and 31 December 2001. Price reviews are triggered by demands of interested parties as well as through the quarterly price adjustment mechanism which adjusts prices every July, October, January and April. Prices are calculated based on the following factors:

- Justified operational cost including an 8% real return on equity;
- The domestic industrial sales price index without the food and energy industries;
- The exchange rate of Hungarian forints versus the US dollar, and forint devaluation versus a currency basket;
- Domestic gas production costs;
- The price of imported gas; and
- An efficiency improvement factor, forcing the gas industry to reduce costs by reducing allowable prices. It can range between 5 and 15%.

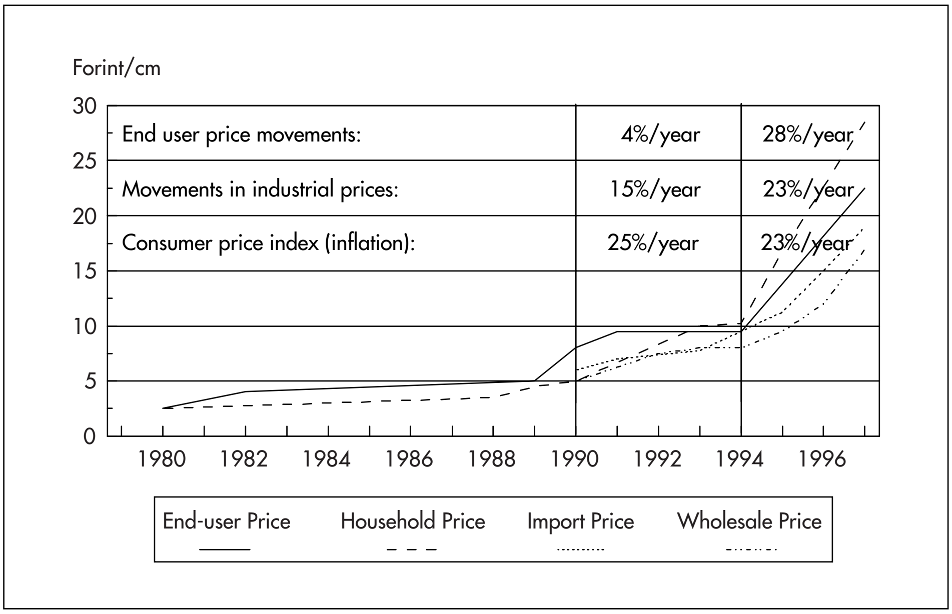
In 1998, the year of Parliamentary elections (held in May), the quarterly price adjustment was suspended twice, once by the outgoing government at the end of March, and once by the new Government at the end of June. The subsequent price increases at end-September and end-December were larger than usual, but the foreign investors threatened to sue the Government over this issue. An out-of-court settlement was found. The quarterly price adjustment mechanism was abolished at the end of 1998, but the annual revision remains in place and is carried out as described above.

Figure 26 illustrates the development of several price indices since 1980. It is clearly visible that the previously stable and very low, subsidised end-user prices that had prevailed throughout the 1980s started to rise relatively quickly in 1989, with accelerated increases after 1994. It is also clear from the graph that end-user gas prices kept falling in real terms until 1994, and that residential gas prices were too close to import and wholesale prices in 1994 to be cost-covering. Since then, residential prices were increased above average end-user prices, which is justified by their higher cost of service, resulting, among other things, from the marked seasonality in residential demand, and the resulting low load factor and high storage requirement, as indicated in the section on Natural Gas Demand.

CRITIQUE

Hungary is concerned about the security of its gas supply, and there are good reasons for this concern. The relatively high share of gas in the country's energy supply and the anticipated growth, the declining domestic resources, and the fact that nearly all gas physically stems from just one exporter – Russia – are reason enough to take security of supply seriously. Moreover, the future growth of consumption will be in the residential sector, which is not typically equipped with facilities that allow rapid fuel switching as in industry. On the other hand, being a transit country may convey a certain degree of security to Hungary because supply shortfalls would also affect clients further downstream.

Figure 26
Gas Prices in Hungary, 1980 to 1997
Nominal



Source: MEH.

The country has improved its gas supply security by constructing the HAG pipeline to Austria, providing a link to the Western European gas grid. This allows both the implementation of cross-border trade under the EU Gas Directive as well as diversification of supply routes – physically, but more importantly, contractually. It is commendable that the number and volume of contracts on the HAG route are increasing, allowing both "virtual" diversification of gas supply through swap contracts with Western suppliers as well as, increasingly, physical flows from the West. This is one indication that security of supply is well managed. It must not be forgotten, however, that all contracts involving the HAG pipeline, as well as potential gas deliveries through the Adriatic pipeline, are more expensive than gas from Russia. In this respect, security of supply comes at extra cost. A mechanism would have to be found to cover this extra cost in a more competitive gas market. This could take the form of an insurance premium paid by those customer groups who prefer high security of supply. Those consumers would conclude a (more expensive) non-interruptible supply contract, whereas other consumers who can accept supply interruptions would conclude cheaper interruptible contracts.

Increasing gas storage capacity also plays an important role in supply security. Hungary has a competitive advantage because of its possibility of storing gas in depleted gas fields. Storage is well developed in Hungary for two reasons, traditionally for security of supply and load balancing, and more recently for commercial considerations – MOL sees an interesting business opportunity in developing storage in Hungary as a service for the EU gas market.

Yet storage is expensive. Therefore, additional storage for security of supply reasons should cover only gas demand which cannot be covered otherwise, e.g. demand from customers who are not interruptible and who have no opportunity for fuel switching. Offering storage in Hungary to the EU gas market may be an interesting idea but the business prospects must be carefully mapped out because of its high cost and because neighbouring Austria has similar plans.

The Hungarian gas industry has been put through radical change since the beginning of the 1990s, and it appears that the change has been successful. The transition towards a market economy was painful for the whole economy, and the Government often found itself confronted by conflicting demands with almost no solution. Nevertheless, in a process that required quick learning and necessarily involved some errors, the Government ended up finding viable solutions which went in the right direction. For example: despite the pressure to raise funds quickly in order to pay back foreign debts, the Government has tended to delay privatisations if the offers from investors lay grossly below what was estimated to be the firm's real value, and generally a more satisfactory solution could be found later on. This approach is commendable.

As a result, the gas industry as a whole is now 62% privately-owned, and MOL is a largely privately-owned monopoly – statutory in wholesale trading and gas import and export, *de facto* in production. The next hurdle is the introduction of effective competition into the market in order to keep market power in check. Introduction of competition is necessary due to Hungary's intention to join the European Union, but in the form of the access provisions of the Mining Law, the Government already put in place some limited attempts at competition as early as 1993. In fact, under the initiative of the Ministry of Economic Affairs, an Open Access Committee was active from 1992 to 1994. But the time was not yet ripe for regulated network access: MOL was the only producer, Russia was the only gas source, and end-user prices were still heavily subsidised and distorted. Consequently, there was little interest in going further. There was a need to learn to walk before learning to run. There is still a need to take the special circumstances of the country into account when the system is opened to competition.

Now that the situation has developed, the Government needs to make sure that the structure and rules of the market are consistent with the EU Gas Directive. Third Party Access rules should be introduced, and the accounts of the different parts of the gas business should be separated, i.e. MOL should be required to separate its exploration, production, trade, transportation and storage businesses; and the distributors should separate the accounts for distribution and supply.

To prepare for competition, the country also needs revised, efficient and cost-based tariffs to be applied by MOL for transportation and storage services used both for its own gas as well as for gas shipped for others. In principle, these tariffs should already exist today, but a clear mandate for the Hungarian Energy Office to supervise these tariffs, a clear design for the structure of pipeline tariffs, and a clear regulatory formula must be developed.

There is a lot of concern in Hungary that the initial market opening required under the EU Gas Directive, i.e. for consumers using more than 15 mcm per year,[18] would lead to a market opening greater than the 28% stipulated in the Directive. If Hungary enters the EU in 2003, it would also have little time until further opening is required. There is a need to design a viable eligibility criterion for the country. The Government is inclined not to declare distributors universally eligible customers.

Another area of concern is take-or-pay contracts. It is clear that a solution must be found since it is the philosophy of TOP contracts to protect the seller's long-term investment in infrastructure and ensure stable long-term cost coverage against the possibility of reduction in the buyer's consumption or erratic demand. But of course this does not hold true any more if the seller causes the demand reduction himself. The implementation of the Directive in Hungary will have to take this into account, and the current import contracts might have to be renegotiated to this effect. An important first step would be not to conclude additional contracts with large take-or-pay requirements until the EU Gas Directive comes into effect.

Another issue is the way in which the detailed implementation of the Directive can take Hungary's security of supply concerns into account. Specifically: storage, which appears to be the means chosen by MOL and the Hungarian Government to enhance security of supply, is costly. The cost of addressing security of supply is an externality. A way has to be found to distribute this externality efficiently and equitably among all market participants, including new entrants. In principle this also applies for gas deliveries through the HAG pipeline. One way of doing this would be a charge on the transportation infrastructure, which should be covered by the public service obligation clause of the Directive. In this case, the amount of storage capacity that is financed must qualify as strategic storage required for security of supply, which should be ensured by the Government through the Hungarian Energy Office.

Another way would be to design non-interruptible contracts for customers with high priority for secure supply which would include a special price element for the desired degree of security. The customers who would sign such contracts are generally smaller customers who do not have easy options for substitution. The funds which are generated through this mechanism would allow the gas suppliers to select the cheapest option to ensure sufficient security, be it storage, more diversified gas sources, or a mix of several such approaches. In this case, interruptions of supply to customers who have demanded (and paid for) non-interruptible supply would be a breach of contract, liable to litigation in the commercial courts and to appropriate compensation payments.

18. It is assumed that Hungary will accede to the EU during the first phase of market opening.

Regarding all those areas which remain "captive", i.e. which will not be opened to competition in the foreseeable future, price regulation will have to be maintained. Hungary's record regarding adaptation of gas prices to real cost levels is encouraging: the recent past has seen strong price rises that have at least raised retail prices above import and wholesale prices. Since all price rises inevitably cause social hardship, this adaptation process has been difficult, but it gives consumers a better idea of the true cost of their consumption and avoids the accumulation of losses and debt elsewhere in the system.

It appears that some of the scheduled quarterly price adjustments were not carried out in the election year 1998. This is due to the fact that the politically appointed Minister of Economic Affairs has ultimate pricing authority; the Hungarian Energy Office merely prepares price proposals. Residential prices are now higher than industrial rates (and average rates), but the gap between them is still much smaller in Hungary than in other IEA countries. In light of the pronounced seasonality of the Hungarian gas market, this indicates that the cross-subsidies which existed between industry and households have been reduced but not yet eliminated. The Government should strive to maintain the regularity in its price regulation which it had attained previously. To achieve this, the Hungarian Energy Office should be given ultimate price-setting authority. If justified changes have to be made, the Government should announce a clear strategy and timetable for transition to give sufficiently early warning, and adhere to its strategy and timetable. Competition provides an excellent incentive to adopt cost-reflective prices for gas and security of gas supply. Transportation and distribution will continue to require strong regulation.

The Government should continue to lower subsidies and cross-subsidies, and phase out below-cost price regulation as quickly as it is possible. When the gas market is opened to EU competition, remaining cross-subsidies could have very negative effects. Social problems are best handled by social policy, not energy policy instruments. The Hungarian Government has acknowledged this in the past, e.g. when the revenues from the 1995 increase in value-added taxation were to a large degree redistributed to alleviate social problems. It should continue to adhere to this principle.

Most importantly, the price structure currently in force for all users except large industry does not contain a capacity charge; there is only a single, linear price element which varies with consumption. This makes it difficult to recoup the cost of covering winter peaks from those (small) consumers who cause them. In the same vein, there is no price element to cover cost elements which are consumer-related, not consumption-related (e.g. connection costs) correctly. The structure of all gas prices, intermediate as well as end-user prices, should be amended so as to include capacity charges and consumer-related cost elements as soon as possible.

RECOMMENDATIONS

The Government should:

- In line with gas demand growth, encourage the gas industry to pursue its diversification strategy, be it through physical or contractual diversification. This diversification should be based on the HAG pipeline and other routes, as appropriate.

- Monitor the development of security of supply, particularly as competition develops. Consider ways in which sufficient security of supply can be ensured in a competitive gas market. The Government should especially consider implementing a financing mechanism for security of supply, either a fee levied on pipeline transportation or interruptible service pricing with higher prices for non-interruptible supply contracts.

- Build upon the existing provisions to introduce competition into the gas industry. In particular, introduce regulated grid access. The Government should stipulate accounting separation at the least, but preferably operational separation as well.

- Design clear pipeline tariffs and a mechanism for their regulation, to be carried out by the Hungarian Energy Office. Design access conditions and tariffs for other essential services such as storage.

- Confer the authority for gas price setting on the Hungarian Energy Office. Maintain regular price regulation. If changes have to be made, the Government should announce a clear strategy and timetable for transition to give sufficiently early warning, and adhere to its strategy and timetable.

- Continue to phase out below-cost price regulation and cross-subsidies. Work towards introducing a cost-based capacity charge into wholesale and retail prices.

- Continue to address social hardship through social policy measures, not energy policy.

8

OIL

OVERVIEW

Total Primary Energy Supply of oil was 6.98 Mtoe in 1997, which represents only 27.6% of TPES. This is low in comparison to most IEA countries. Of this, 1.99 Mtoe were produced domestically. 7.20 Mtoe were imported, and 1.90 Mtoe exported, yielding net imports of 5.30 Mtoe. This means that Hungary's import dependence stands at nearly 72%.

MOL is Hungary's main oil company and to date the only oil producer in the country. It also owns and operates Hungary's three refineries, all crude oil and most of the oil-product pipelines, and most storage facilities in the country. The company dominates the wholesale market. Today, the oil market is liberalised and there is competition in oil-product retailing.

As described in Chapter 7, MOL was formed from the restructured OKGT, the Hungarian Oil and Gas Board. MOL's non-core activities such as machine manufacturing were separated, but the companies active in the core of MOL's business remained integrated with the company to increase its value to potential investors.

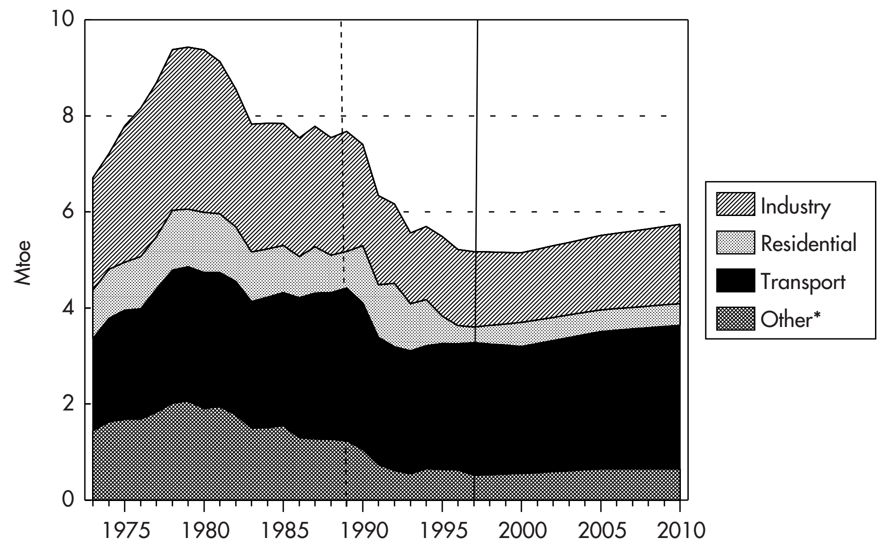
This strategy targeted companies like Mineralimpex, which was the main foreign trading organisation in the oil market as well as in the gas business, and which had been corporatised in 1992. It also concerned several newly formed subsidiaries involved in exploration and drilling or gas trading. At first it even included the gas distributors. As noted earlier (in Chapter 7), Mineralimpex effectively became a fully-owned consolidated subsidiary of MOL in 1995. Chapter 7 also describes the privatisation of MOL.

Another company that was affected was Áfor, which had been the OKGT's oil-product sales affiliate. The company had dominated the product wholesale market but also had a dominant market share in retail sales of gasoline, diesel fuel, home heating oil and fuel oil sales to industry and power stations. In 1990, Áfor owned slightly more than half of Hungary's 780 petrol stations and controlled 60% of all gasoline sales. When MOL was created, Áfor was integrated with MOL, but more than 100 Áfor filling stations were divested. The Government's explicit intention was to create a competitive retail market for oil products. Meanwhile, the number of filling stations in Hungary has increased to over 2 500.

OIL DEMAND

Transport accounted for 2.85 Mtoe of oil use in 1997, which corresponds to some 40%, a comparatively low figure that is explained by the relatively high oil consumption in other sectors, especially power generation. Figure 27 shows oil consumption by sector.

Figure 27
Oil Consumption by Sector, 1973 to 2010



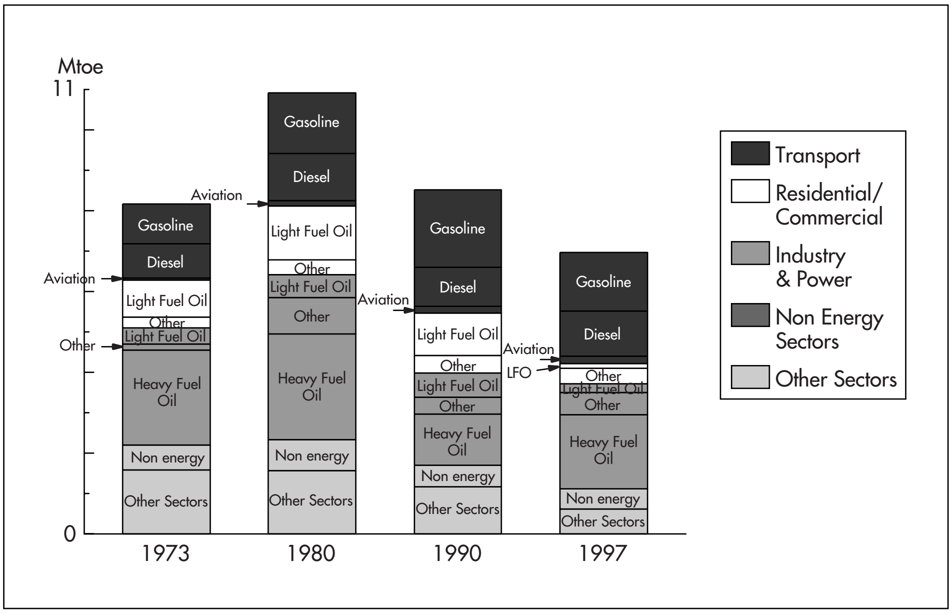
* Includes commercial, public service and agricultural sectors.
Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 1998, and country submission.

Throughout the recent past, the number of cars and their annual average mileage have increased rapidly, although they still have not reached the Western European average. Therefore, demand for petrol and diesel is expected to grow faster than demand for other oil products. MOL expects the demand for high-sulphur heavy fuel oil for power generation to fall after the implementation of EU emissions standards for power plants. Due to a high excise duty levied on heating oil, its use in industry and households is also expected to decline. In addition, increasing numbers of its users are connected to the natural gas grid or use LPG. Figure 28 shows sales of oil products in Hungary in 1997.

PRODUCTION AND EXPLORATION

Hungary is a mature oil and gas production area and has been well explored. As its resources are gradually being depleted, both oil and gas production have declined

Figure 28
Sales of Oil Products in Hungary, 1973 to 1997



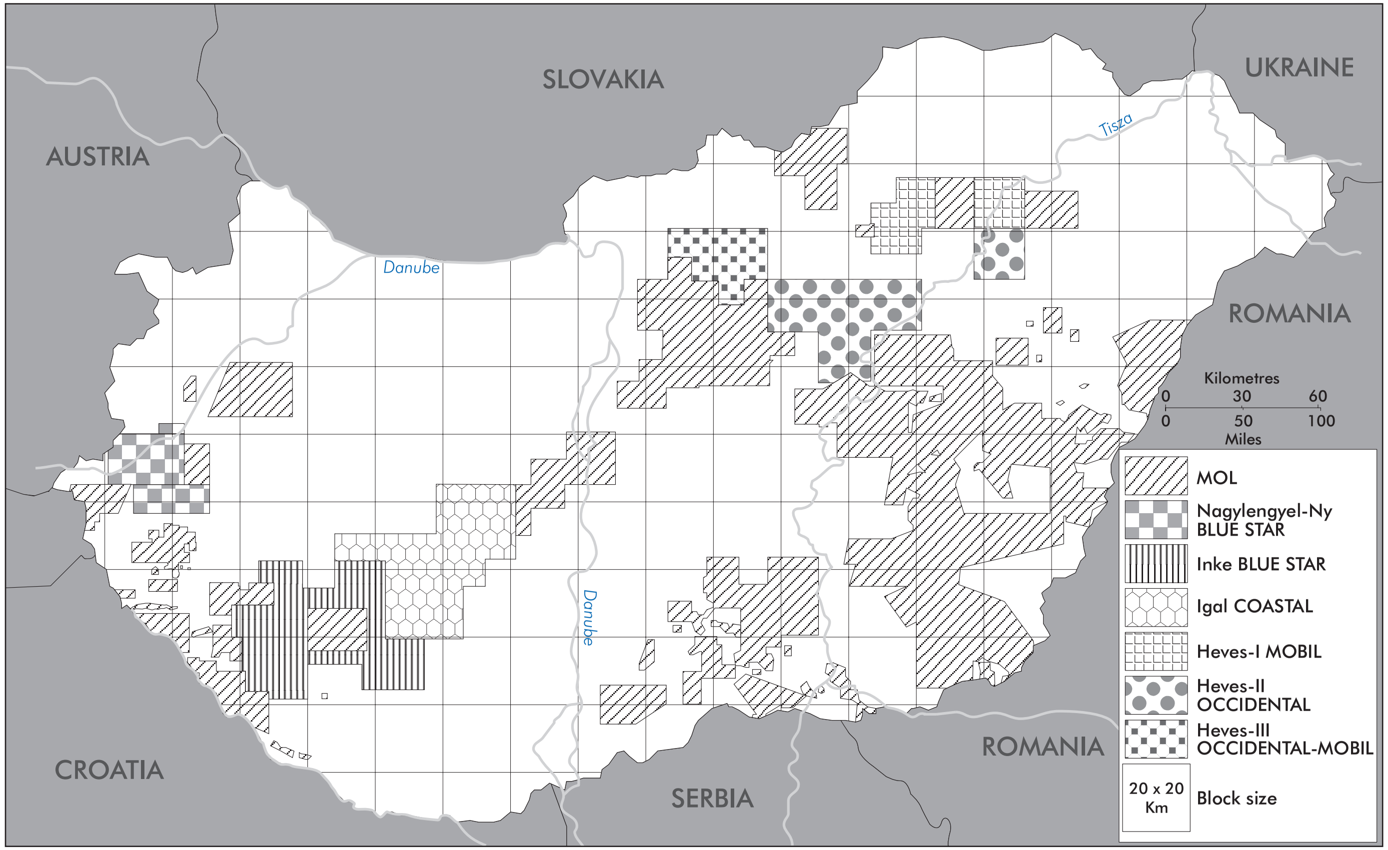
Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 1998.

since the mid-1980s. At that time, oil production had been slightly more than 2 million tonnes per year. In 1997 it was about 1.6 million tonnes. Natural gas production was 7.5 bcm in 1985, but under 4.5 bcm in 1997.

Net proven reserve figures have also declined. Hungary's combined gas and oil reserves had been estimated to be 375 Mtoe in 1994; of this amount, 75 Mtoe was oil. By 1997, the total figure was down to 290 Mtoe, with 50 Mtoe for oil. In light of the shrinking resources, MOL has increasingly focused its exploration and production efforts abroad, mainly in North Africa, the Middle East, the South of Eastern Europe, the CIS and the Far East.

Until 1994, MOL was the only holder of a production and exploration licence in Hungary. This changed after the adoption of the Mining Law in June 1993 (Act XLVIII of 1993 on Mining), which established the framework for exploration and development of oil and gas fields in Hungary. The Ministry of Economic Affairs then organised a licensing round in 1994. MOL was explicitly excluded from this bidding round. The entire land surface of Hungary was subdivided into blocks of 20 by 20 km, and bids were restricted to a maximum area of 3 200 km^2 in no more than eight blocks. Since the 1994 round, four foreign companies have held exploration licences in six exploration areas, but they have not yet started production. The licences were awarded by the Government without a public bidding procedure. Figure 29 shows the new exploration areas.

Figure 29
Oil and Gas Exploration Concession Areas



Source: IEA.

The Mining Law also included a schedule for oil and gas royalty reduction, from 40% to 12% by 1998 for producing fields. This rate has been effectively in use since 1997. The royalties for new fields were made negotiable, but not below 12%.

In 1997, the Mining Law was amended to require competitive public bidding procedures for oil and gas exploration and production. Companies that are under state control, such as MOL or energy companies owned by municipalities, need not go through the competitive bidding process. This holds true for companies with majority government shareholding as well as with minority shareholding, provided the Government owns a preferential or golden share. In these cases, the Hungarian Mining Office simply awards the licence for 35 years, extendable once by 17 years. Prospecting of the area must be completed four years later, extendable by another two years; otherwise, the licence expires.

Although Hungary is already fairly well explored, a new hydrocarbon forecast was prepared for the entire national territory in 1997. This forecast specified several areas which promise new finds. Based on this, a new tendering round is under preparation.

TRANSPORTATION AND TRADE

As Figure 30 shows, Hungary has three crude oil import pipelines, linking it with Ukraine (Friendship II line), Slovakia, and the Adriatic Sea. Over the last five years, only the Friendship II line has been in constant use. This line has an annual capacity of 8.3 million tonnes and runs to the Tisza and Duna refineries. The line to Slovakia is rarely used, and the Adriatic crude oil pipeline was closed in 1991 due to conflict in the former Yugoslavia.

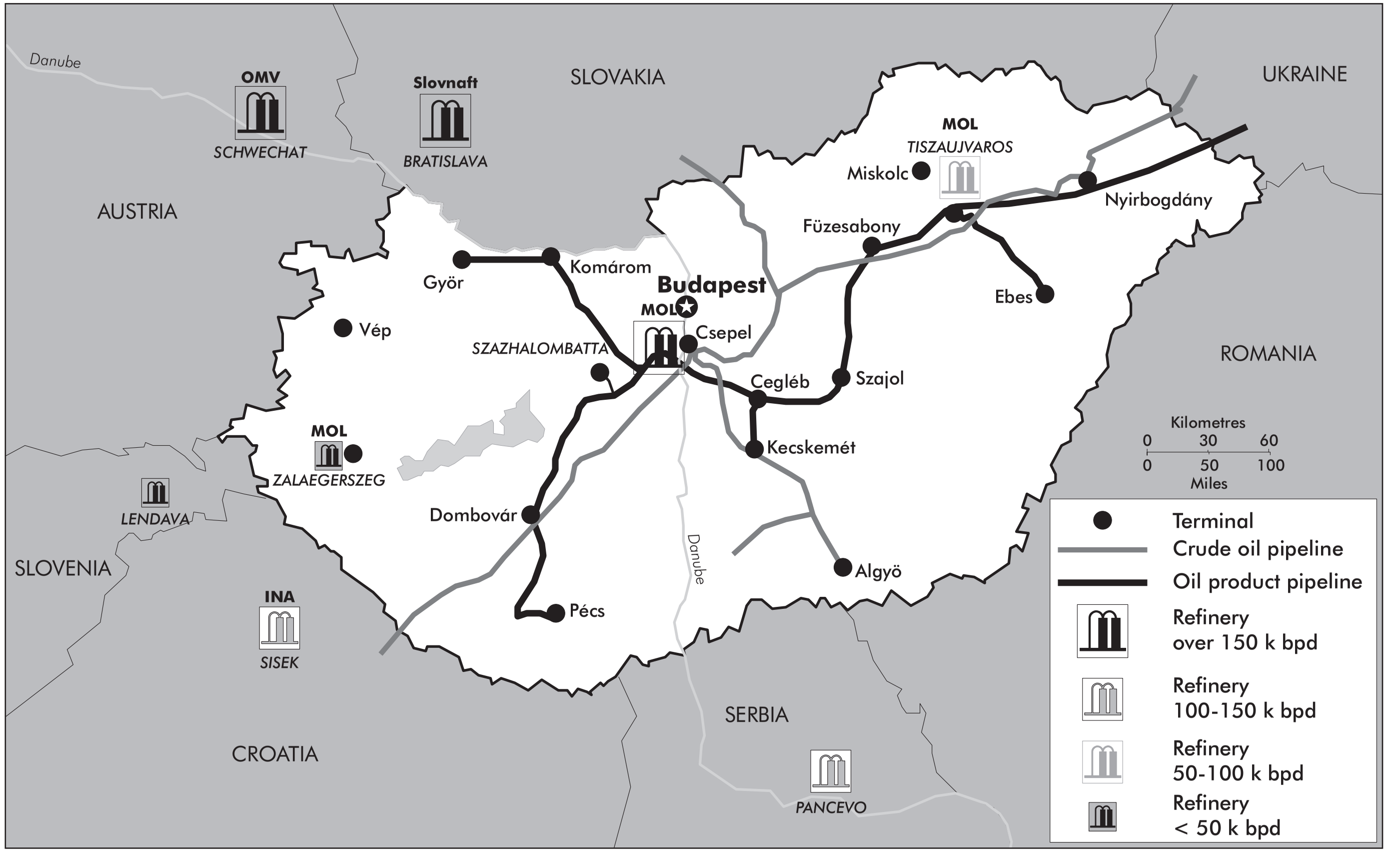
The Adria pipeline was re-opened at the end of 1995. It runs from the Krk Island off the coast of Croatia to the Duna refinery and has an annual capacity of 10 million tonnes. The pipeline was originally intended to deliver Middle Eastern or African crude oil to Hungary but it has mainly been used for flows in the other direction, i.e. to export Russian crude, since it is reversible up to Sisak (Croatia). A fourth gathering pipeline runs from the Hungarian oil fields near Szeged in the South to the Duna refinery. There are no plans to build a pipeline that would link the Hungarian system to the West, because of high cost.

All crude oil pipelines are owned by MOL. MOL also owns Hungary's 1 200 km of oil-product pipelines, with an annual transportation capacity of 7.5 million tonnes. MOL has 17 product distribution sites. Except for one pipeline running to Ukraine, which is inactive at present, all product pipelines are on Hungarian territory only. Total oil storage capacity is 4.1 mcm, which includes 3.4 mcm of product storage. The remainder is stored at the refineries.

The 1993 Mining Law stipulates a right of access of third parties to oil pipelines under the same conditions as gas pipelines. This means that access should be

Figure 30

Oil Infrastructure in Hungary



Source: MOL Rt.

granted, provided there is spare capacity. Access to refinery capacity for importers is not stipulated under the Mining Law, although the Government had directed MOL to provide this access prior to adoption of the Law. There were attempts in 1993 and 1994 to develop a set of rules which would guarantee non-discriminatory access and use-of-system charges, but these attempts were abandoned.

MOL purchases most of its crude oil under short-term agreements with Russian suppliers, the cheapest source of crude imports. Russian imports are mostly Ural blends. In 1997, 60% of MOL's crude oil purchases came from the Russian supplier Yukos. A large number of companies import oil products, but MOL remains the main exporter of oil products to date. Its exports go mostly to Austria, Germany, Romania and Slovakia.

REFINING

MOL owns and runs Hungary's three refineries, a large one and two smaller ones. The large, modern Duna (Danube) refinery at Százhalombatta, 30 km south of Budapest, has a crude oil processing capacity of 160 000 barrels/day or 70% of Hungary's total refining capacity of 11 million tonnes per year. It began production in 1965 and has been upgraded several times. Throughout the early 1990s, this refinery was used at high capacity. In 1997, it processed some 6.5 million tonnes of petroleum and condensates, which amounts to 83% of capacity.

The Tisza refinery in northeastern Hungary is much smaller and less sophisticated. It was used at less than 30% of its capacity throughout the early 1990s. The third refinery, Zala in western Hungary, is small and produces mainly bitumen. In 1997, 20% of the crude oil processed in MOL's refineries was produced domestically; the rest was imported from Russia.

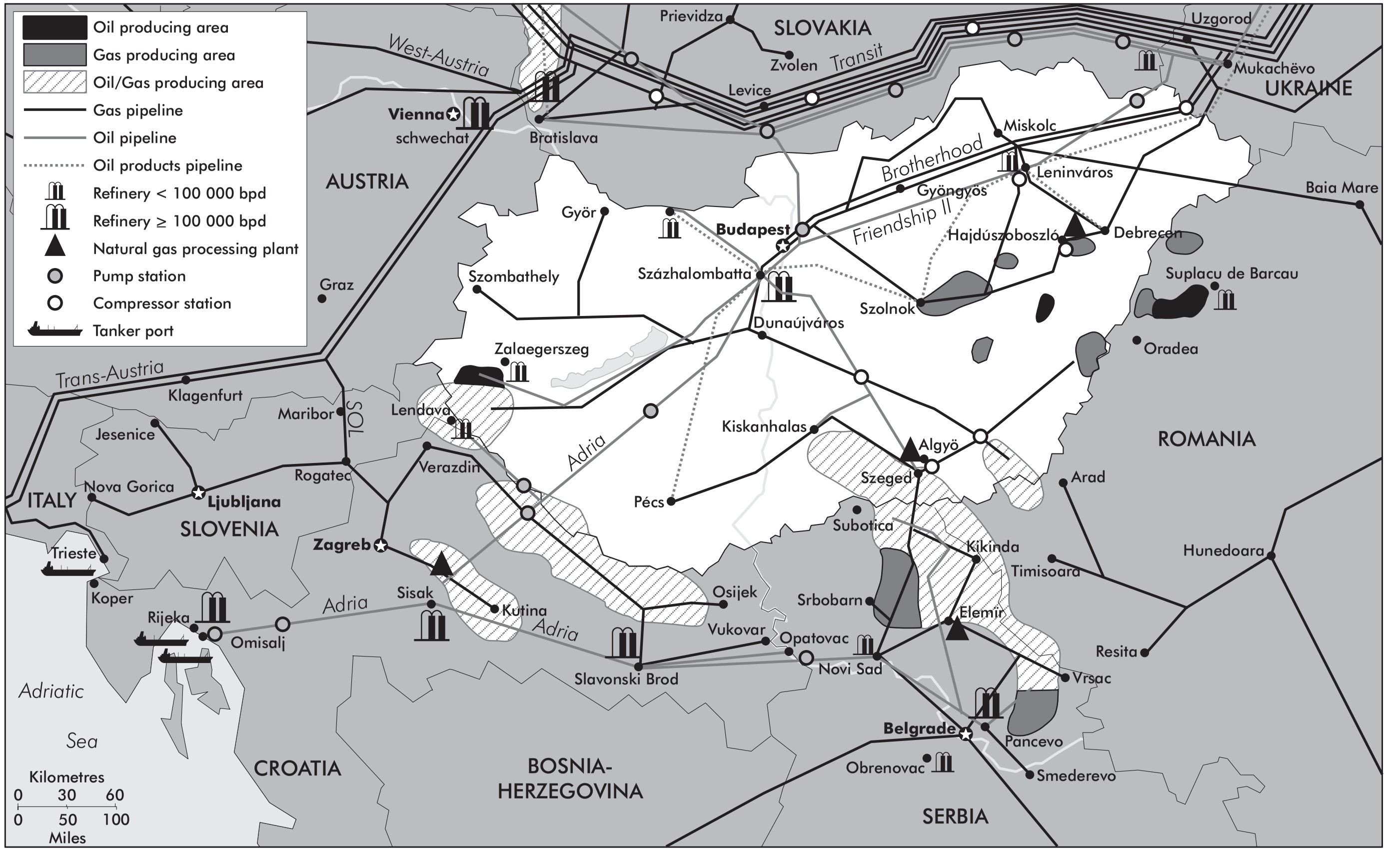
The Duna and Tisza refineries are under uniform management and are actually operated as an integrated unit. Intermediate oil products are exchanged between them through the product pipelines linking them. For example, Tisza has a desulphurisation plant, and some of the diesel produced at Duna is shipped to Tisza for desulphurisation. Duna and Tisza also share storage.

Figure 31 shows refineries in Hungary and in the surrounding countries. There is excess refining capacity in the region. MOL tries to address this problem through a comprehensive programme which includes improving efficiency and cutting cost, implementing, for example, advanced process control and more flexible pricing mechanisms to maximise profits. Focusing increasingly on the production of lighter and higher-value distillates and entering strategic partnerships with foreign investors, MOL wants to remain the majority shareholder in its own refineries or in any joint venture. Most of the other initiatives in MOL's programme are already under way. For example, MOL is investing in a delayed coking plant at the Duna refinery, to open in 2001.

Throughout the early 1990s and most recently in 1997, Hungarian oil-product standards were tightened. As of October 1999, they are as stringent as those in force

Figure 31

Refineries in Central and Eastern Europe



Source: IEA.

in the European Union. The new Hungarian standards are even more stringent regarding the maximum allowable benzene content, pre-empting the EU standards which will come into force in the year 2000. According to the new EU standards, the sulphur content of gas oil and heating oil must be below 0.05% and 0.2%, respectively. MOL is striving to adhere to all the quality norms for oil and diesel which will come into force in the EU in 2000.

Hungary has also phased out regular leaded gasoline. Unleaded gasoline production started in 1989 and increased from 1% to 72% in 1997. As from 1 April 1998, leaded gasoline has been phased out. MOL's refineries now produce leaded gasoline only for special export needs.

In order to comply with the new standards, MOL had to invest at the Duna refinery, using external financing but also incurring debt. Between 1990 and 1997, MOL spent 27 billion Hungarian forints on upgrades to meet fuel standards, as well as on environmental clean-up, such as restoration of soil and groundwater quality at the Duna refinery and improvement of waste treatment procedures. MOL plans to spend another 19.3 billion forints on environmental clean-up and an additional 20 billion forints on investment in order to meet the higher EU environmental standards in this area.

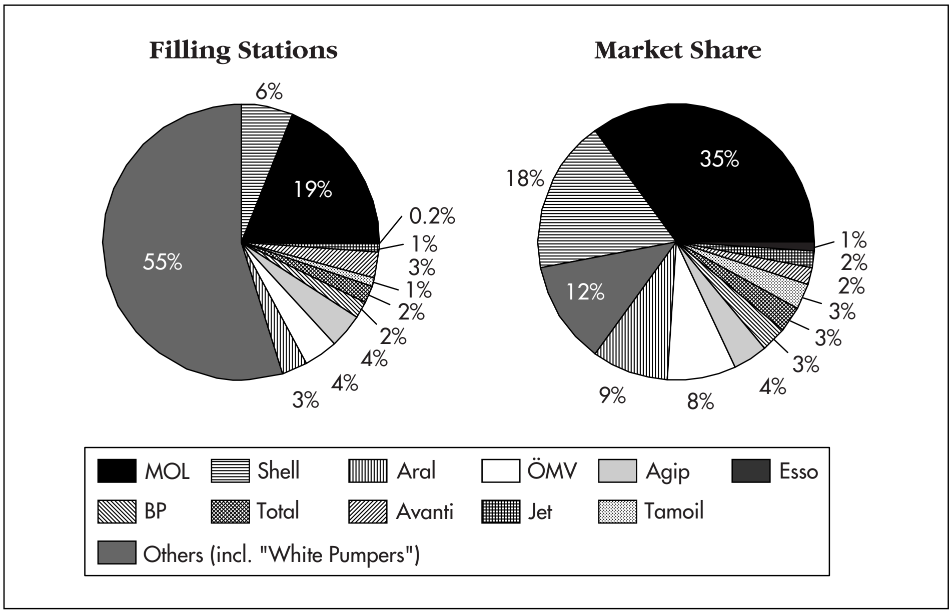
RETAIL SUPPLY

The import and export of oil products was liberalised on 1 January 1991. Licences for oil-product trade were issued almost automatically by the Ministry of Economic Affairs. The explicit intention behind this policy was to create a competitive retail market in Hungary as fast as possible.

This quickly led to the emergence of a very competitive retail market which stood in stark contrast to the wholesale and upstream market dominated by MOL. Whereas MOL's subsidiary Áfor had had a market share of slightly more than 50% in 1990, ten different international oil companies were active in the retail market soon afterwards, due, among other things, to the early sale of a large number of state-owned Áfor service stations. A large number of small domestic, non-"branded" oil-product retailing companies also entered the market. Soon after, Hungary had the highest proportion of international (foreign-owned) filling stations in Central and Eastern Europe: more than 30% in 1996. The Czech and Slovak Republics had 17-18%, and Poland had less than 5%. In 1998, the number of foreign companies active in the Hungarian retail market declined to nine, as BP sold its retail network and left the market.

MOL is also still very active in the retail market. In the early 1990s, MOL-Áfor had a number of downstream joint ventures, including six with foreign investors (Agip, Esso, Mobil-Áfor, OMV-Áfor, Kuwait-Áfor and Total). MOL gave up its participation in Kuwait-Áfor in 1995, and Kuwait Petroleum Hungary Ltd. (Q8) sold its filling stations network and left the Hungarian market in 1996. By this time, MOL had liquidated all joint retail operations. Figure 32 shows the approximate market share of the largest retailers in 1997.

Figure 32
Market Shares of Oil-product Retailers in Hungary



Source: MOL Rt.

Development of the retail market did not occur without problems. After the drastic market opening, a huge number of small and very small domestic oil retailers sprang up, the so-called "white pumpers". Most of them imported oil products from abroad, notably from refineries in other Central and Eastern European countries. Based on deliveries from these refineries, which were cheaper but often did not match Hungary's higher and increasingly tight product standards, household heating oil was sold as automotive diesel in Hungary. A significant portion of these products was smuggled into Hungary.

These activities not only involved tax fraud and violation of environmental regulations, but they brought the diesel market to the brink of collapse in 1992. The losses to MOL and to the other established companies active in the Hungarian retail market were estimated by the Hungarian Petroleum Association to amount to several hundred billion forints, not including losses of tax revenue to the Government. As of 1993, falsification of motor gasoline became a problem, too.

Starting in 1995, numerous measures were taken against these activities. In that year, nationwide inspection of filling stations was carried out, and the results demonstrated a large degree of fraudulent behaviour. In 1997, the Parliament adopted an amendment to the Tax Law which stipulates that retailers must have a certain amount of storage capacity.

Following these measures, the number of "white pumpers" has decreased sharply over the last years: while they had a market share of 23% in 1995, this declined to 14% in 1996 and 12% in 1997. During the same time span, the illegal sale of household heating oil as diesel at filling stations became marginal while diesel sales increased continually. Today, illegal market activity is marginal in the Hungarian oil market.

PRICING AND TAXATION

Figure 33 shows end-user fuel prices in 1997. Gasoline production and distribution costs amount to 25%, and the excise duty and a stockpiling fee together account for another 50% of consumer prices. The excise duty comprises a regular excise duty, a Road Fund tax, and an environmental tax. VAT, amounting to 25%, is levied on the sum of the above elements.

EMERGENCY PREPAREDNESS

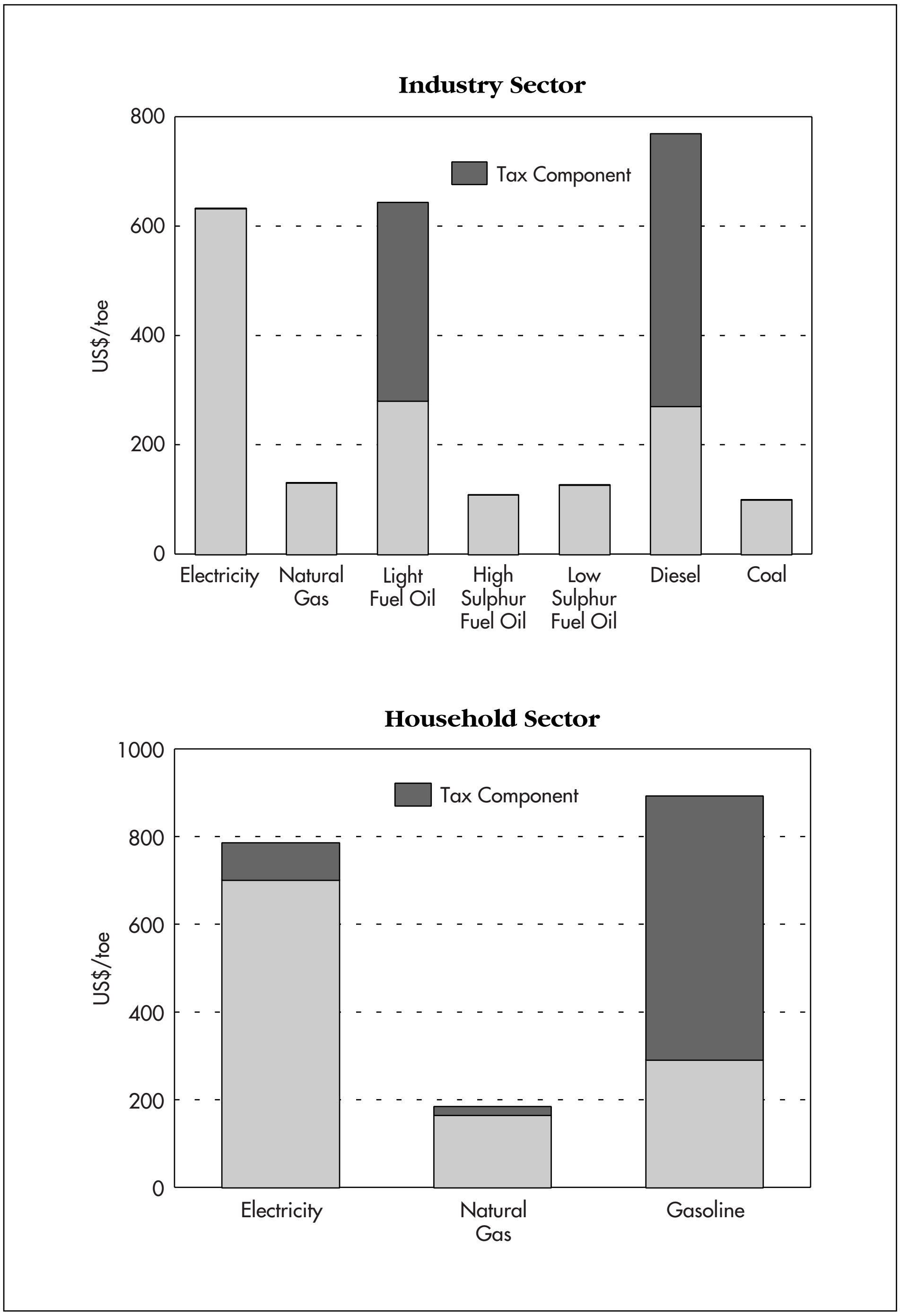
In line with the schedule set up by the law "On the Security Stockpiling of Imported Crude Oil and Petroleum Products", approved in 1993, Hungary had reserves sufficient to meet 70 days of net imports at the end of 1997. In order to meet the storage requirements, with the participation of the Stockpiling Association created by the law, five storage companies were established. The Stockpiling Association has concluded 15-year leasing agreements with the storage companies.

CRITIQUE

The Hungarian oil market presently is very concentrated upstream but very competitive downstream. MOL undoubtedly holds a very dominant position – it can obtain exploration and production licences without having to go through competitive bidding rounds, and it owns all of the country's producing wells, almost all pipelines, all refineries and most of the storage. Moreover, the provisions of the 1993 Mining Law regarding open access to pipeline infrastructure cannot be expected to lead to any significant access because they lack enforceability. The political will has obviously been lacking to implement rules that would guarantee open access.

All of this would normally give rise to a lot of concern, were it not for the wide open, competitive retail market. In fact, in light of recent history it appears that the Government, with very laudable intentions, relinquished too much control, leading

Figure 33
Fuel Retail Prices and Taxes, 1997



Source: *Energy Prices and Taxes*, IEA/OECD Paris, 1999.

to wide-spread fraudulent behaviour. It is commendable that the Government was able to design and put in place effective measures without stifling competition altogether. It is also commendable that attempts are being made to open up exploration and production, although the amount of non-MOL oil production in Hungary will certainly remain very marginal.

Three small points would deserve attention, though. First, in any new bidding round for oil (and gas) exploration, the bidding process must be made entirely non-discriminatory against foreign investors. Second, MOL's ownership of most of the product pipeline network gives MOL a cost advantage over downstream competitors who have to use rail, road or barges to transport their oil products across the country. This could tilt competition in the retail market slightly in MOL's favour. However, competition in the retail market is the only guarantee in the long run that consumers will be served at competitive prices with high quality products, and that MOL's upstream operations will attain the highest level of efficiency. Therefore, the initiative to implement access rules for the product pipelines should be renewed, especially since EU accession requires the Government and MOL to go through such a process for natural gas under the Gas Directive. Of course there is no EU legislation formally providing for open access to oil pipelines.

Third, it is very laudable that Hungarian oil-product standards are so well adapted to EU standards, and Hungary will be able to meet their tightening in 2000 without problems. The Government should make sure that the tighter benzene standard is not used to keep competitors away from the Hungarian market. However, this is merely a transitory concern since the EU-wide benzene standard will be raised to the current Hungarian level by 2000.

RECOMMENDATION

The Government should:

- Establish clear regulations for open access to oil-product pipelines, modelled on those which will be developed for natural gas.

9

ELECTRICITY

MARKET OVERVIEW

Introduction

The Hungarian electricity supply industry consists of 12 generating companies and six distribution and supply companies. The high-voltage transmission network is owned by MVM Rt., the country's state-owned incumbent monopoly power supplier. MVM also owns Hungary's nuclear power plant Paks which accounts for almost 40% of domestic power generation, 34% of the shares of the Vértes coal plant, as well as stakes in two generating companies (Mátra and Dunamenti). Generation is on average 50% foreign (mainly privately) -owned; the remainder is owned by Hungarian private owners, the Hungarian Republic, MVM, municipalities, and other state-owned institutions. Distribution is owned to 70% by foreign, in all but two cases private, investors. Much of the existing generating capacity is very old, and, due to high air pollutant emissions and tightening environmental standards, about 30% will need to be retrofitted with environmental control technology or be replaced in the next decade. Hungary uses twice as much natural gas than the IEA Europe, most of which is imported from Russia.

At present, the Hungarian power market is not competitive. Generators sell power to MVM under long-term contracts, and distributors buy it from MVM under long-terms contracts. Under the current legislative framework, the main regulatory responsibility lies with the Minister of Economic Affairs who regulates end-user prices. The Minster's decisions are prepared by an energy regulator (the Hungarian Energy Office) and the competition authorities. The Hungarian Energy Office also controls major ownership, and capital transactions. A draft Bill aiming to introduce competition according to the provisions of the EU Electricity Directive is currently under discussion.

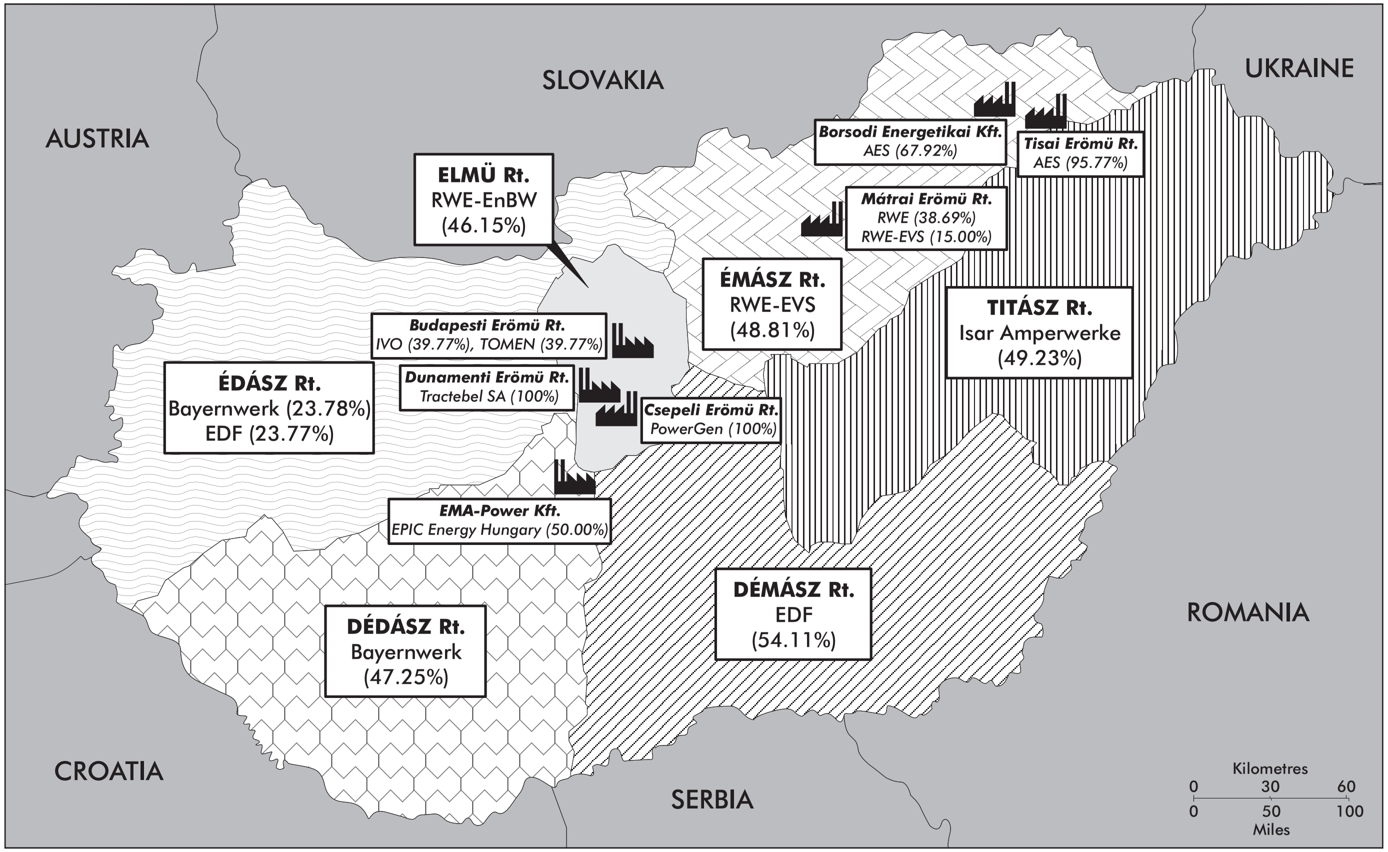
Historical Overview

The Hungarian electricity supply industry has undergone dramatic change over the last five years. The industry had been nationalised after the Second World War. The nationalised system, which consisted of a multitude of individual entities, had been combined into the government-owned Magyar Villamos Művek Tröszt (MVM T., Hungarian Electricity Board), which was formed in 1963. MVM T. had 22 subsidiary companies. Of these, 11 were power stations and one a repair company, six were regional distribution companies, one was responsible for the high-voltage electricity grid (OVIT), and the remaining three were responsible for investment, construction and installation.

After the collapse of the Soviet Union, MVM Tröszt was corporatised. Based on proposals developed by the Ministry of Economic Affairs and submitted to the Government in April 1991, it was to be reorganised into a two-tier structure. In the upper tier, a central organisation was to be responsible for technical and economic

Figure 34

Electricity Distributors and Retailers in Hungary



Source: MVM Rt.

management and overall co-ordination. This organisation was to function as a financial holding company owning and managing the second tier, the generation and network companies, which would become independent corporations. The objectives of this reform were to render transparent the economic situation of MVM T.'s individual corporate parts, to attract foreign capital for new investment, to separate ownership and operation, and to "loosen" the monopolistic structure of generation and supply. Control over the new structure was also to be given to Parliament and regional and local governments.

The proposal was accepted by the Government, and on 1 January 1992, MVM T. became Magyar Villamos Művek Részvénytársaság (MVM Rt., Hungarian Electricity Companies Ltd.). The subsidiaries responsible for generation, transmission and distribution/supply of electricity were formed into independent joint stock companies, but they continued to be owned by MVM Rt. and by the Government.

The next step was taken in 1994, when the 1994 Electricity Act (Act XLVIII of 6 April 1994 on the Production, Transport and Supply of Electric Energy) came into force. This Act describes the tasks and responsibilities of the Hungarian Energy Office (Magyar Energia Hivatal, MEH).[19] MVM's generation side was reorganised into eight different generating companies, the Vértes, Mátra, Tisza, Bakony, Budapest, Dunamenti, Paks, and Pécs power companies. Except for the Mátra, Dunamenti and Paks companies, all power companies comprise several power plants. Paks Power Co. owns and operates Hungary's 1 840 MW nuclear power plant.

Operation and construction of the transmission grid and system operation, including dispatch of power plants, are the responsibility of Országos Villamostávvezeték Részvénytársaság (OVIT Rt., National Power Line Co.), which is a fully-owned subsidiary of MVM. The distribution and supply side was organised into six different companies with exclusive supply areas: Édász Rt.[20], Elmű Rt.[21], Émász Rt.[22], Titász Rt.[23], Démász Rt.[24], Dédász Rt.[25]. Figure 34 shows the supply areas of these companies.

In December 1994, it was decided that all generating companies except Paks (Paksi Atomerőmű Rt.) and all six distribution and supply companies should be privatised. MVM was to retain the Paks plant and the grid company OVIT. MVM would also continue to be responsible for import and export of electricity, wholesale trading, reliable power supply, system development and investment in generation, and the operation and development of the transmission grid. All of these functions are to be carried out at minimum cost.

19. Important legal provisions for the establishment of the Hungarian Energy Office were also established earlier through the 1994 Natural Gas Act.
20. Észak-dunántúli Aramszolgáltató Rt. (Northwest Hungary Electricity Supply Co.).
21. Budapesti Elektromos Művek Rt. (Budapest Electric Co.).
22. Észak-magyarországi Aramszolgáltató Rt. (Northern Hungary Electricity Supply Co.).
23. Tiszántúli Aramszolgáltató Rt. (Eastern Hungary Electricity Supply Co.).
24. Dél-magyarországi Aramszolgáltató Rt. (Southern Hungary Electricity Supply Co.).
25. Dél-dunántúli Aramszolgáltató Rt. (Southwest Hungary Electricity Supply Co.).

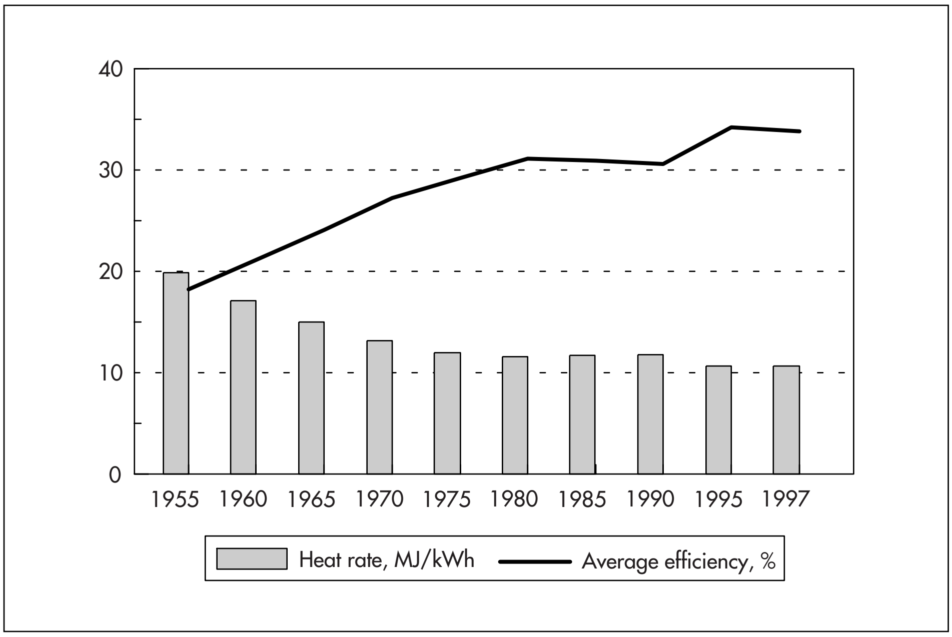
By early 1998, all distribution and supply companies and all generating companies except Paks and Vértes (Vértesi Erőmű Rt.) were at least partly privatised. According to the draft energy programme of the Government in office since spring 1998, MVM and Paks are to remain in state ownership, but no official decision has been taken yet.

Generation

The Hungarian electricity supply industry comprises 45 power plants for public electricity supply, amounting to 7 352 MW of capacity. In addition, there are 182 MW of industrial autoproduction; these comprise two power plants owned by foreign investors, the Csepel plant (owned by PowerGen) and the Dunaújváros (owned by EMA Power). The size of the power plants, their age and geographical location, and the fuel they use reflect the pattern of past investment in generating capacity which occurred in distinctive waves in Hungary.

Plants burning brown coal were mostly commissioned in the 1950s and 1960s, although some date back to the 1930s and 1940s. They are generally very small and located near

Figure 35
Average Thermal Efficiency in Hungary's Power System
Public Supply, in %



Source: MVM.

the coal mines. Their thermal efficiency is very low. Figure 35 shows the average thermal efficiency (η) of the Hungarian power supply system between 1951 and 1997.

The next wave concurred with the development of Hungary's lignite deposits, situated in the northeast of the country. This fuel was used in the Mátra (formerly Gagarín) power plant, which has generating units of 100 and 200 MW. Around the same time, larger "hydrocarbon" (oil and gas dual-fired) boiler plants were built, e.g. the Dunamenti and Tisza II plants, each with larger block sizes of above 200 MW.

Hungary's nuclear power station at Paks was commissioned between 1981 and 1987 and consists of four double blocks of 2 × 230 MW each, yielding 1 840 MW total capacity. The reactors are of the Soviet VVER-440 design. Originally there were plans to build two more nuclear units of 1 000 MW each at Paks in the early 1990s, but the plans did not materialise due to the political events. Table 7 shows the size distribution of power plants in Hungary.[26]

Table 7

Size Distribution of Generating Units in Hungary

All Input Fuels, Public Supply

	< 20 MW	*20-49 MW*	*50-99 MW*	*100-200 MW*	*> 200 MW*
Number of Units	41	16	12	12	18
In Number of Power Plants*	8	7	4	5	3
Capacity (MW)	334	451	740	1 787	3 990

* Note that this table does not list very small power plants below a capacity of 3 MW.

Source: IEA estimate based on MVM statistics.

It is important to note that electricity demand, which had stood at a maximum of 40.7 TWh in 1989, collapsed after 1990 as a consequence of the breakdown of the centrally-planned economy. Although demand started growing again in mid-1992, consumption had not yet reached its 1989 level in 1997: gross consumption amounted to 35.6 TWh, 7.7% less than in 1989. Despite these rather drastic demand swings, net domestic generation continued its growth trend almost unbroken, and rose from 27.0 TWh in 1989 to 32.4 TWh in 1997. This is because imports from the Soviet Union (Ukraine) fell to about 10% of their previous amount during the same time and had to be replaced by domestic generation to a large degree.[27] Total imports now stand at about 20% of their values in 1990. Figures 36 and 37 illustrate the development of power demand and supply over the last 2 ½ decades.

26. The Paks plant and the matter of nuclear energy in Hungary are treated in greater detail in Chapter 10.

27. These issues are described in more detail in the following section, Transmission, Interconnection and International Trade.

Figure 36 highlights the collapse of industrial electricity demand after 1990. Residential and commercial demand continued its growth unabated; electricity demand for transport stayed flat.

Figure 37 shows electricity generated by input fuel. The growing importance of the Paks nuclear plant is clearly discernible. It accounted for some 39.5% or 13.97 TWh of generation in 1997. The second most important fuel was coal, with 26.5% or 9.73 TWh. Oil and gas were at a par, with 16.6% (9.59 TWh) each. Renewables played a very minor role: hydro generation, almost all run-of-the-river, accounted for 0.6% (0.179 TWh) and combustible renewables accounted for only 0.3% (0.3 TWh).

Transmission, Interconnection and International Trade

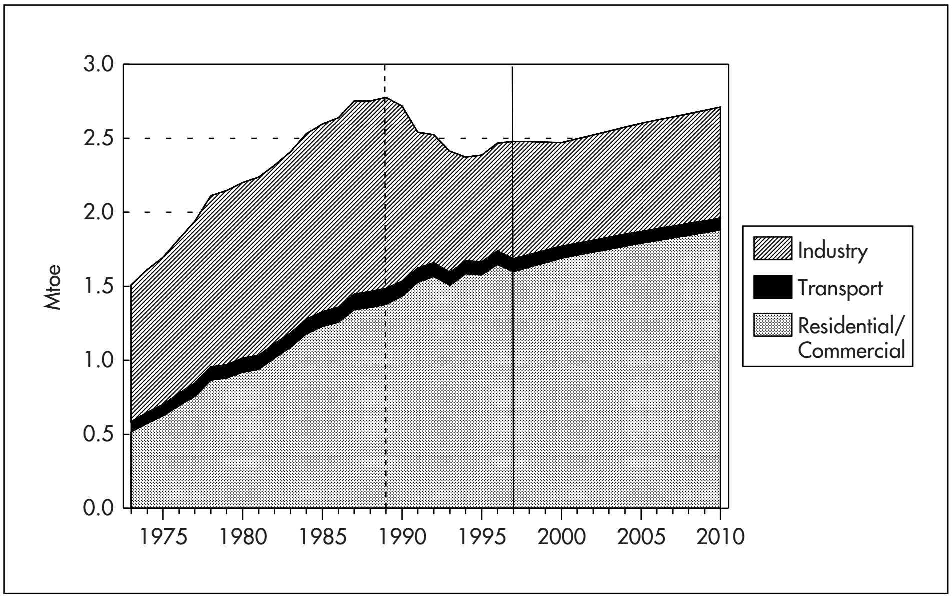
The Hungarian transmission system also underwent dramatic changes during the last nine years. Figure 38 shows the current state of the transmission system and the main power plants connected to it.

The map shows one high voltage alternating current (AC) power line of 750 kV and about 2 000 MW capacity, entering Hungary from Ukraine and ending at the Albertirsa substation. Long-distance transport of electricity over this type of transmission line is economic only for very large amounts of electricity. There are only a few other cases elsewhere in the IEA.[28] The power line is typical of the trade relationships prevailing in the former UPS/IPS (United Power System/Integrated Power System), which connected the Former Soviet Union and its neighbouring States within the framework of the Council of Mutual Economic Assistance (COMECON). This power line, which came into service in the late 1970s, is part of a whole 750 kV network that linked Hungary, Poland and Bulgaria to the large-scale power plants of the Former Soviet Union, including the Chernobyl power plant in Ukraine.[29] Hungary had contributed financially to the construction of this line and some of the power stations it connects. There are two other power lines, one 400 kV line and one 220 kV line along a parallel corridor, terminating at the Sajószöged substation in eastern Hungary.

28. It is generally cheaper to transport the input energy and convert it into electricity closer to the demand centres than to transport electricity over long distances – provided the input is mobile. This is obviously not the case for hydro power, and some of the existing very high voltage power lines are consequently used to transport hydro-electricity.

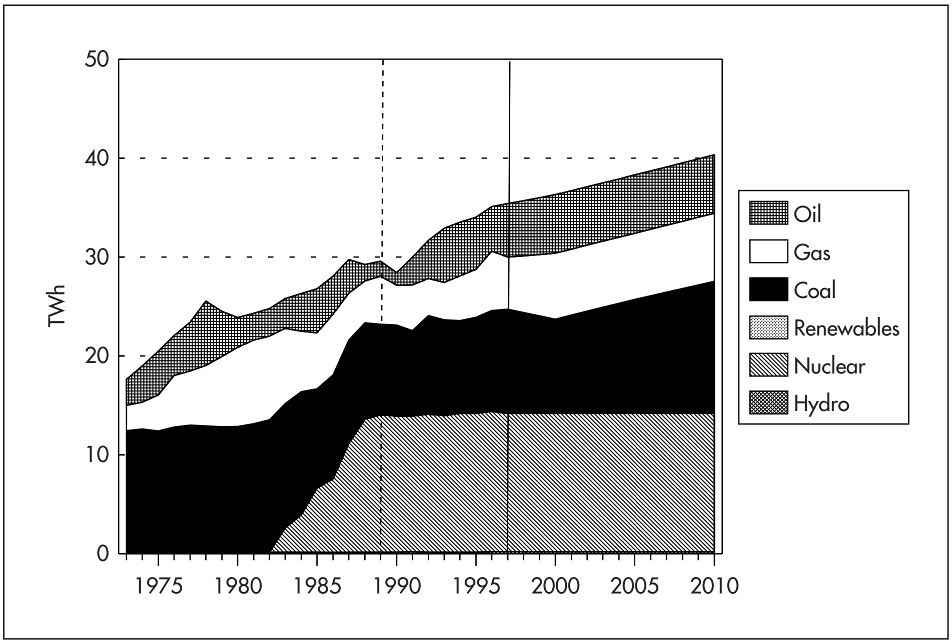
29. There are two distinct ways of transporting electricity over long distances: along alternating current (AC) lines, or along direct current (DC) lines. The average cost of DC transmission falls significantly with distance, which makes this method cheapest for moderate amounts of power transported over long distances (above 1 000 km). The average cost of AC transmission falls with the amount of power transported, but this decline is much steeper than the distance-related decline for DC. For this reason, even very long-distance power transmission is cheapest via AC lines, provided the amount of power carried is high enough. The 750 kV AC network linking the countries of Central and Eastern Europe and the Former Soviet Union was well adapted to the power flows it supported: 1 000 to 2 000 MW transported over several thousand kilometres.

Figure 36
Electricity Demand by Consuming Sector, 1973 to 2010



Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 1998, and country submission.

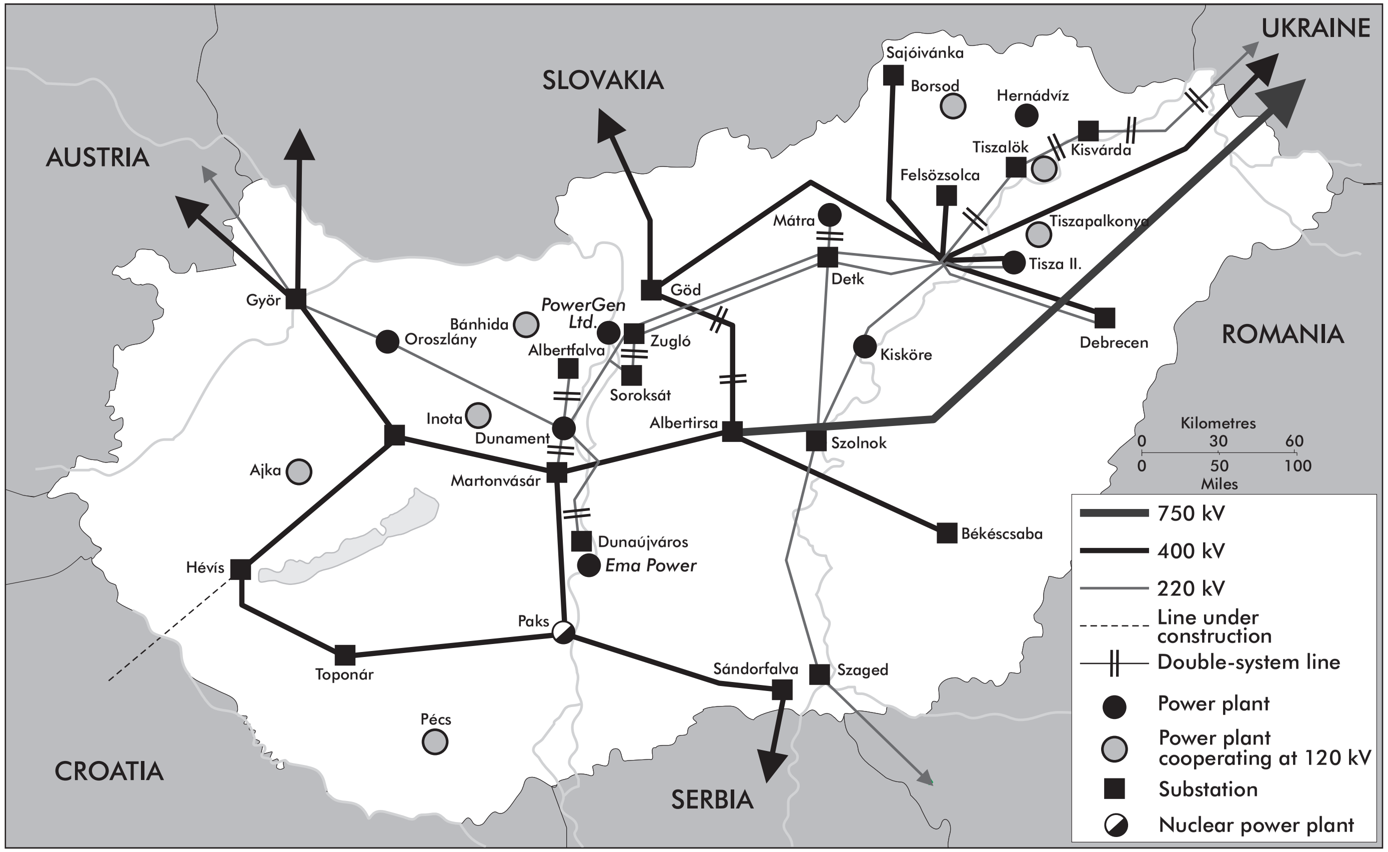
Figure 37
Electricity Generation by Fuel, 1973 to 2010



Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 1998, and country submission.

Figure 38

The Hungarian Transmission Network and Main Power Plants



Source: MVM.

The total import capacity of these lines was 4 000 MW, amounting to more than twice the capacity of the biggest Hungarian power plant, the Paks nuclear plant, and over 60% of peak load in 1990. At the apex of electricity imports in the same year, 12.2 TWh of electricity were imported (net imports) from the Soviet Union (Ukraine) over these lines, amounting to exactly one-third of gross electricity consumption in Hungary. In comparison, electricity imports account for less than 10% of electricity consumption in the countries of IEA Europe, and less than 2% in IEA North America. The net imports of Italy, the largest electricity importer in the IEA, amounted to only 13% of its power consumption in 1997.

In addition to power trade with the Soviet Union, Hungary also traded comparatively small amounts of electricity with Czechoslovakia, Romania, Yugoslavia and Austria. It was a net importer only from Austria, and to a very minor extent (17 GWh in 1990).

These imports from the Soviet Union occurred under long-term contracts which were originally to expire in 2004. After 1990, and most markedly in 1992, imports from the Soviet Union were reduced because of increasingly unattractive prices and unfavourable terms but also because of unreliable supply. One year later, Ukraine suspended all exports to Hungary due to domestic shortages. Shortly afterwards, the Ukrainian power system was isolated from the UPS/IPS system. As a consequence, Hungary's annual imports from Ukraine fell further and today stand at 1.37 TWh (net imports). As imports from the East were reduced, Hungary increasingly imported Slovakian electricity, part of which originates in Polish power plants.

At the beginning of the 1990s, Hungary sought to leave the UPS/IPS power system and connect itself to the Western European UCPTE (Union pour la coordination de la production et de la transmission de l'énergie électrique) system. Poland, the Czech Republic and Slovakia had the same objective, and together these countries founded CENTREL, the Association for the co-ordination of Polish, Czech, Slovak and Hungarian electric power companies. The objective of CENTREL was to improve those countries' power systems quickly to reach the much more exacting UCPTE standards, to synchronise[30] their networks with them, and to become members of UCPTE as soon as possible.

Synchronisation with the UCPTE meant first and foremost disconnecting the CENTREL system from the UPS/IPS system. The CENTREL countries achieved this in 1993, after which their possibilities for trading with electricity suppliers outside CENTREL were greatly reduced. Trade could still take place across direct current (DC) lines and the appropriate converter stations; Hungary's trade with Austria could continue over the DC line connecting Győr and Vienna and the respective converter station in the south of Vienna which came into service in December 1992.

30. Synchronisation refers to power systems using alternating current (AC). All parts of such systems must run synchronously, i.e. the electrons in all interconnected AC wires must move backward and forward in lockstep. This issue does not arise for direct current (DC), as it only flows in one direction.

Another possibility for imports was from power plants which were isolated from their own system and synchronised with the CENTREL system. This is the method that allowed, and still allows, continued – though greatly reduced – imports from Ukraine although the Ukrainian system and the CENTREL system have not been synchronised since 1993.

Subsequently, Hungary had to improve certain aspects of its power system. AC interconnection requires the systems of member utilities to be "in phase". This means that the flow direction of electrons in the wires must change synchronously. In Europe, the frequency of these oscillations is 50 cycles/second or 50 Hertz (Hz). The UCPTE system requires frequency control in a narrow band of ± 0.1 Hz; greater frequency variations can cause problems ranging from breakdown of computer systems to brownouts and blackouts in large areas of the system. Compliance with these technical requirements generally means that additional power plant capacity has to be installed. This capacity delivers so-called ancillary services, e.g. it generates only to maintain frequency or voltage at the required levels, and therefore has to be able to start generation very quickly. For Hungary, this meant that the objective was to be able to increase power generation by 8-10 MW per minute per unit, whereas its best performance was 5 MW per minute and per unit. In response to these requirements, several gas turbines were installed – Hungary does not have mountainous areas suitable for hydro plants with storage capacity. MVM is at present building two more gas turbines as secondary reserve in Sajószöged and Litér.

After several encouraging test runs, the CENTREL and UCPTE systems were synchronised in October 1995 and continue to run in parallel. Utilities from the CENTREL countries are associated members of UCPTE, but their objective is to become full legal members in the near future. Figure 39 shows Hungary's and CENTREL's interconnections at the end of 1997. The converter station to the south of Vienna is out of operation today.

In 1997, net annual imports from Slovakia stood at 1.79 TWh. Power exchanges with Austria are balanced. Total net imports were drastically reduced: in 1998, they amounted to 0.74 TWh per annum, representing less than 1/5 of their amount on 1990 and less than 6% of today's total gross consumption, which can be considered very normal. Nevertheless, the Minister of Economic Affairs and the Minister of International Economic Relations still retain the powers, attributed to them under the 1994 Electricity Act as a precautionary measure against renewed import dependency, to control the amount of electricity imports and exports. Figure 40 shows the gross trade flows in 1997.

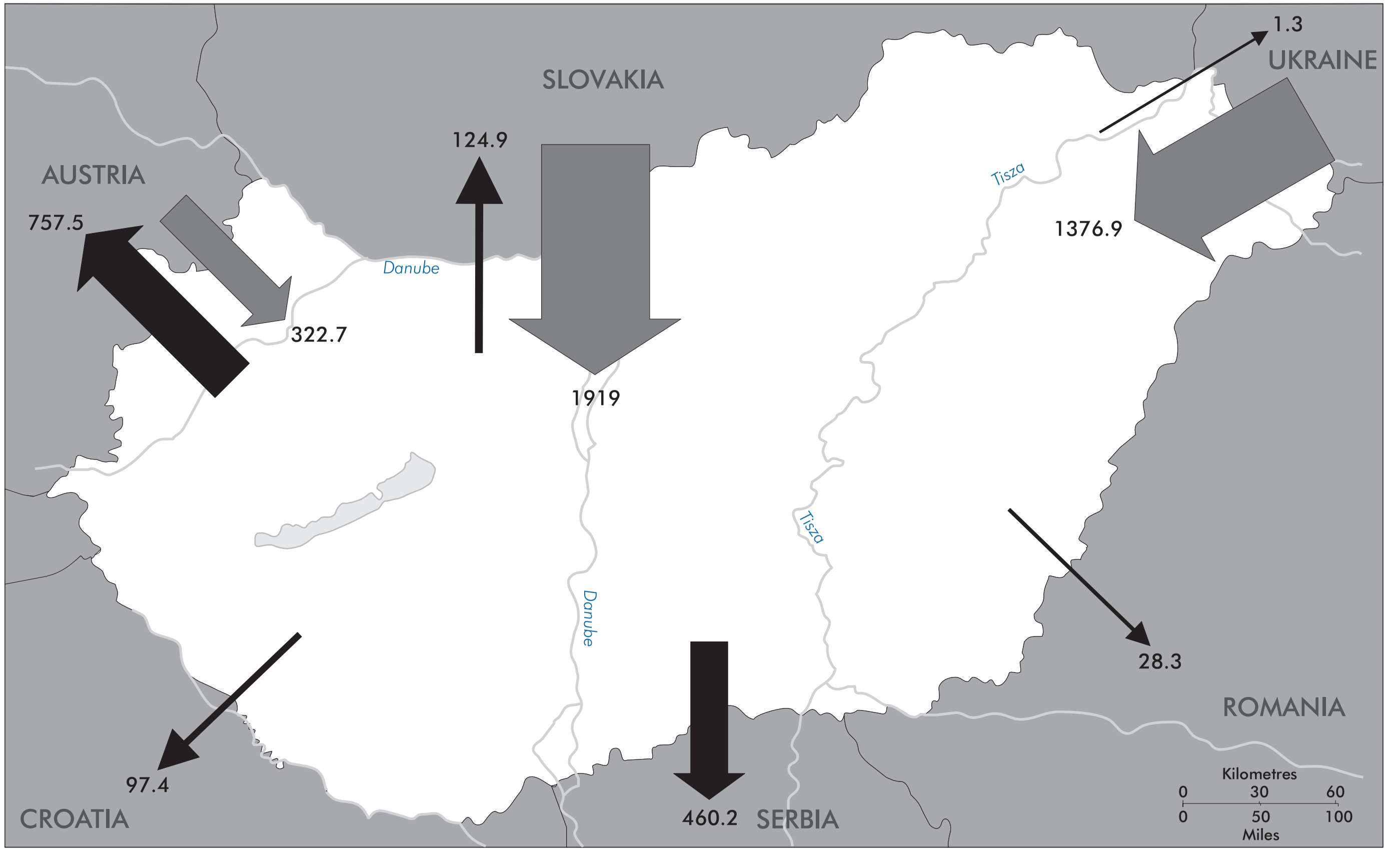
Aside from the 750 kV line, the Hungarian transmission network consists of a 400 kV network, begun in 1967, which connects most of the large power plants. Some power plants such as one block of the Dunamenti plant feed into a 220 kV network, begun in 1960 but not added to since 1970. Some power plants, including Pécs and Borsod, are connected to the 120 kV network. This network is almost twice as long as the 400 and 220 kV grid, but most of it is used for distribution and was transferred from MVM (OVIT) to the distributors in 1992. MVM continues to operate the

Figure 39
Hungary's International Interconnections

Source: MVM.

Figure 40

Hungary's Transboundary Electricity Trade, 1997



Source: MVM.

segments that are linked to power plants and function as low-voltage transmission lines.

This grid layout reflects the gradual development of the generation and distribution system and Hungary's past as a country largely dependent on electricity imports whose main concern was to distribute the imported electricity. The grid is not adapted to present and future requirements. In addition, large parts of the grid, especially the 220 kV grid, are old and in need of overhaul.

Distribution and Supply

All but a small part of the 120 kV network is united in the hands of the six distribution and supply companies. Hungary is fully electrified, with only 0.7% of homes and holiday houses not connected to the public grid.

Figure 41 shows the sectoral shares of power consumption in the regions in 1997. It illustrates the high share of industrial electricity demand in the northeast and northwest of Hungary and its comparatively low share in the south.

Figure 42 shows the development of electricity consumption per inhabitant in the six supply regions between 1980 and 1997. It illustrates to what degree power consumption in the regions has caught up with power demand in Budapest over the last 17 years. This has happened in a somewhat peculiar way. The smaller the town or village, the higher the share of electricity consumption metered according to time of day (night vs. day). Whereas only 11.3% of electricity consumption was metered with a day-night meter in Budapest, the share for towns was 30.9% and the share for villages was 43%. These figures relate to 1997 but they confirm a long-established trend. The reason for this is that electricity used to be more expensive in remote villages than in Budapest or major cities, and making use of day-night tariffs enabled customers to make use of cheaper rates.

There is no competition in electricity supply in Hungary at present. Therefore, the distributors/retailers operate under an obligation to supply. They are also responsible – on the basis of the contracts signed with the local municipalities – for street lighting.

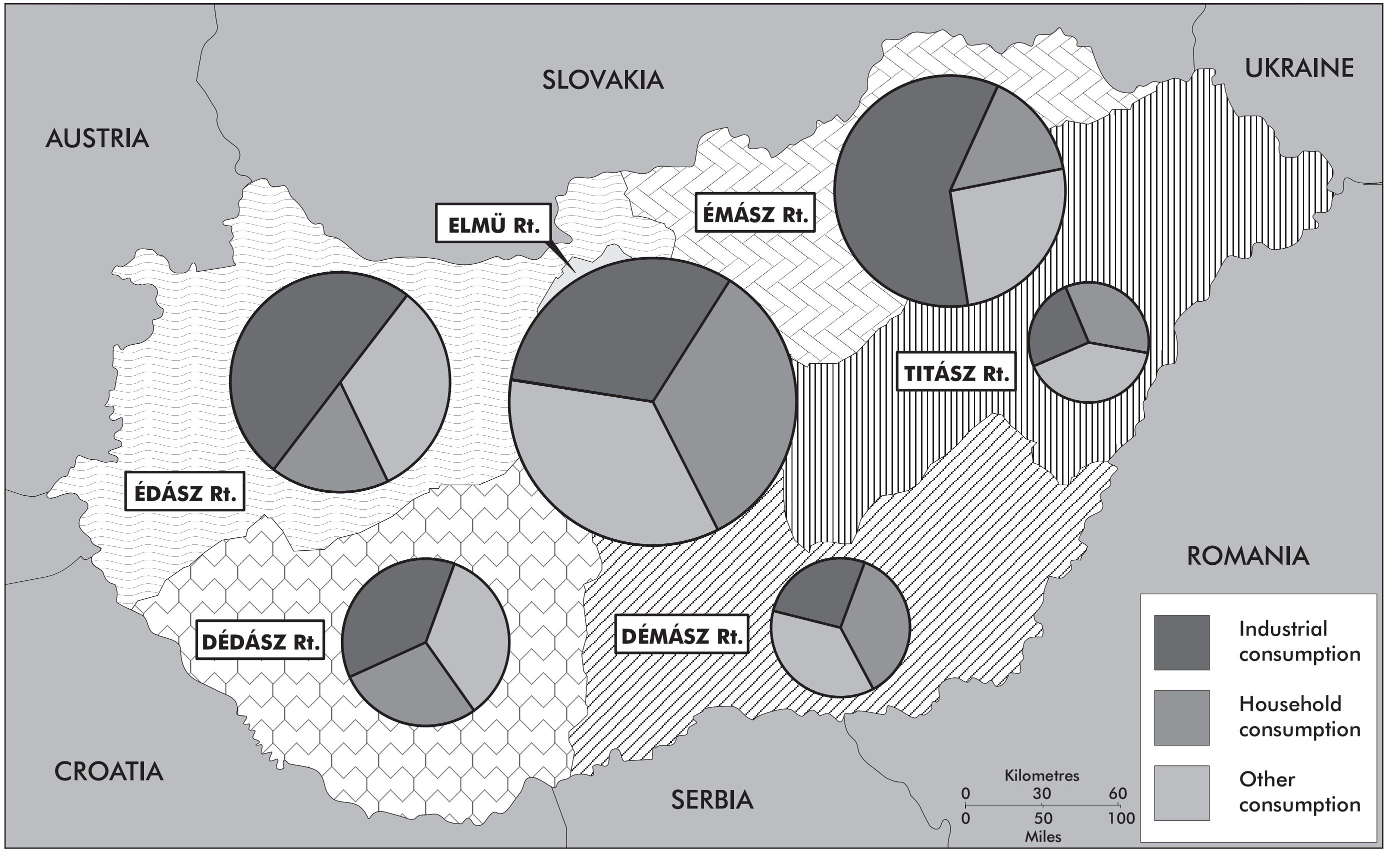
THE PATH OF REFORM

Restructuring and Privatisation

Since early 1992, ownership of MVM has undergone some dramatic shifts. Initially, nearly all shares of MVM (99.82%) were held by ÁVÜ, the Hungarian State Property Agency, which was responsible for managing state-owned assets in the early 1990s. MVM held 50% of the shares in the distribution companies and the grid company

Figure 41

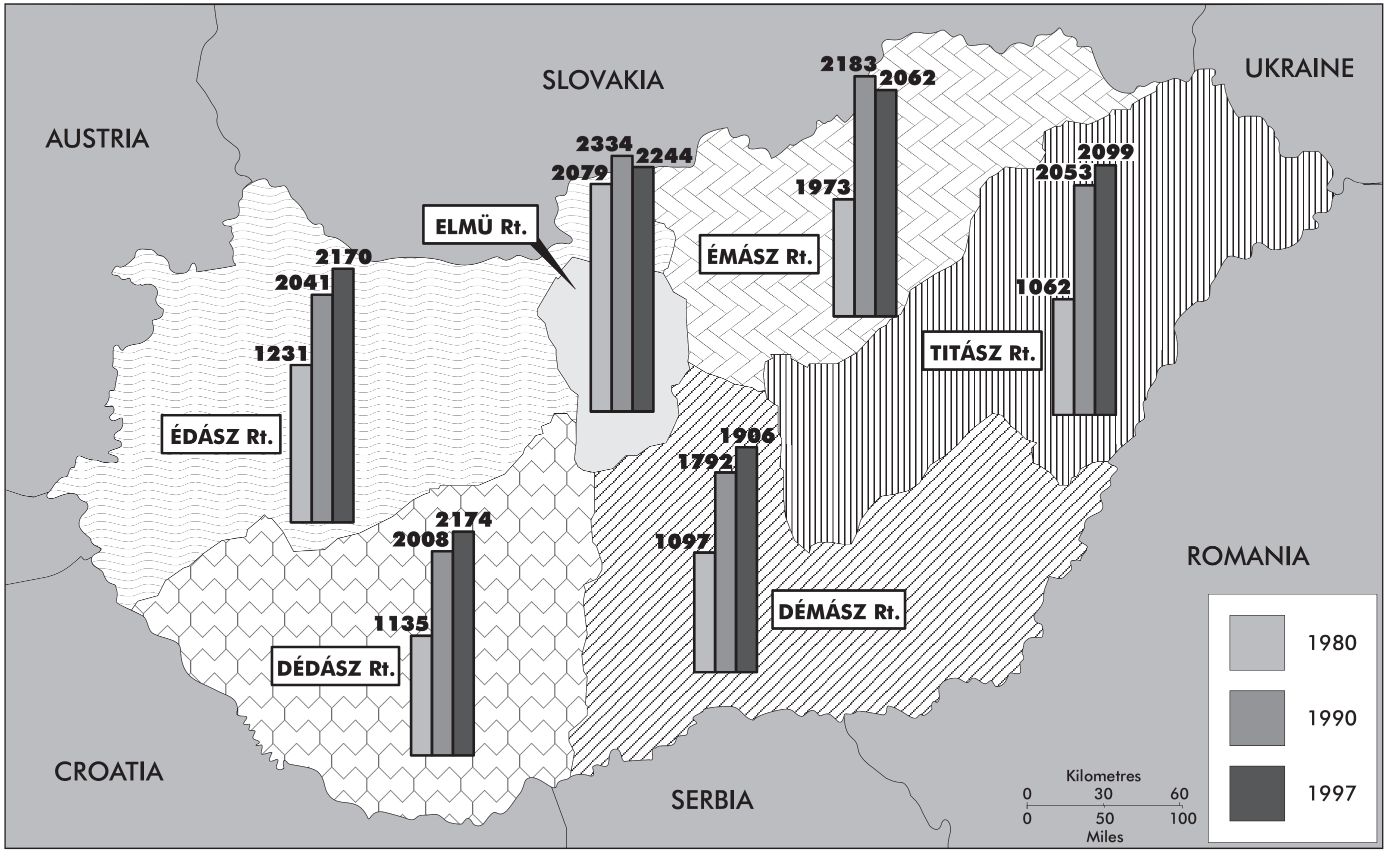
Sectoral Shares of Electricity Consumption in the Supply Regions, 1997



Source: MVM

Figure 42

Electricity Consumption per Inhabitant in the Supply Regions, 1980, 1990 and 1997



Source: MVM

OVIT. The remainder was, in turn, owned by ÁVÜ; some small stakes in the distributors and in OVIT were also owned by municipalities.

In 1992, the Government created a state privatisation agency, ÁV Rt. (State Asset Management Company). In August of the same year, the shares of MVM were transferred from ÁVÜ to ÁV Rt., but ÁVÜ kept its shares in the subsidiary companies. In 1993, after the integration of economically viable coal mines with power plants (described above in Chapter 6 on Coal, and below), ÁVÜ proceeded to sell its stakes in the regional distributors, 46%-48%, depending on the individual company. ÁVÜ issued a call for tender for 15% stakes in these companies in September 1993. This sale was opposed by ÁV Rt. on the grounds that the conditions for realising the full value of the companies were not given, because the Government had not yet taken a decision regarding the future structure of the power industry. Subsequently, the shares held by ÁVÜ were transferred to ÁV Rt.

In order to facilitate the economic survival and privatisation of some of the Hungarian coal mines, the Government decided to combine collieries with power stations that could use their coal production. Thus, Mátra Power Co. was combined with the Visonta and Bükkábrány opencast lignite mines in 1993, Bakony Power Co. with the Padrag, Ármin, Jókai and Balinka coal mines in 1994, and Pécs Power Co. with the Külfejtés and Komló mines. All three mines were considered economically viable. These transactions were carried out as share swaps whereby SZÉSZEK, the Hungarian Coal Mining Restructuring Centre, received shares in the integrated companies in exchange for the transferred assets. SZÉSZEK received about one-quarter of the shares of the integrated companies, about half of this out of MVM's shareholding in the firms, and the other half directly from ÁV Rt. The process continued throughout the following years. In 1994/95, Vértes Power Co. was integrated with the Oroszlány and Mány mines, and Tisza Power Co.'s Borsod coal plant with the Lyukóbánya mine.

MVM believes that the share swap caused financial losses, and in the ensuing privatisation process, bidders were somewhat reluctant to buy the integrated companies. Eventually, auctioning off of the integrated plants failed. Two of them, Pécs and Bakony, were nevertheless privatised – the privatisation agreements were eventually signed on 23 December 1997 – but only after protracted direct negotiations. In addition, the Borsod coal-fired power plant, owned by Tisza Power Co., and the user of coal from the Lyukóbánya mine, was privatised separately from its mother company, although to the same foreign investor, AES. This enabled AES to buy a stake of 95.77% in Tisza but only 67.92% in the Borsod plant. The 171 MW Borsod plant consists of nine individual boilers of 4 MW to 30 MW nameplate capacity. Tisza Power Co. has two other plants, an 860 MW oil- and gas-fired plant consisting of four individual units of 215 MW each (Tisza II) and an old coal-fired plant (Tiszapalkonya).

In 1995, ÁVÜ, ÁV Rt. and the Treasury Property Management Organisation (KVSZ), another government asset management agency, were merged into one organisation called ÁPV Rt. (Állami Privatizációs és Vagyonkezelő Rt., State Privatisation and Holding Company). This organisation is responsible for carrying out privatisations and managing residual state ownership. ÁPV Rt. became the new state shareholder in MVM and the second tier of the electricity supply industry, based on the

Privatisation Act of 1995 (Act XXXIX of 1995 on the Sale of Entrepreneurial Property Owned by the State).

The 1994 Electricity Act does not mention any specific objective for privatisation of the electricity supply industry, but in December 1994 the Government decided to offer 50% plus one share of the six distribution and supply companies to strategic – preferably foreign – investors. Another 15% were to be sold to small domestic investors and institutional investors. The regional distribution companies were to be fully listed on the stock exchange by 1 January 1997.

The same privatisation strategy was to be applied to the eight generating companies, except for Paks. Here also, 50% plus one share were to be sold to strategic investors. Remaining shares were to be offered to domestic and institutional investors, and the generators were also to be fully listed on the stock exchange at the beginning of 1997. The Government in office in 1994/95 had plans to privatise a minority stake in MVM, including Paks and OVIT, and the Privatisation Act of 1995 effectively states that MVM could be privatised down to a 50% plus one vote majority shareholding for the State.

Two of the initially eight generators (Mátrai Erőmű Rt. and Dunamenti Erőmű Rt.) were partly privatised in 1995, and two more in 1996 (Tiszai Erőmű Rt. and Budapesti Erőmű Rt.). As mentioned above, Pécsi Erőmű Rt. and Bakonyi Erőmű Rt. were privatised in 1997. Paks remained in MVM's ownership as planned, and Vértes was not sold because no suitable sales agreement could be concluded. However, the intention persists to sell the plant.

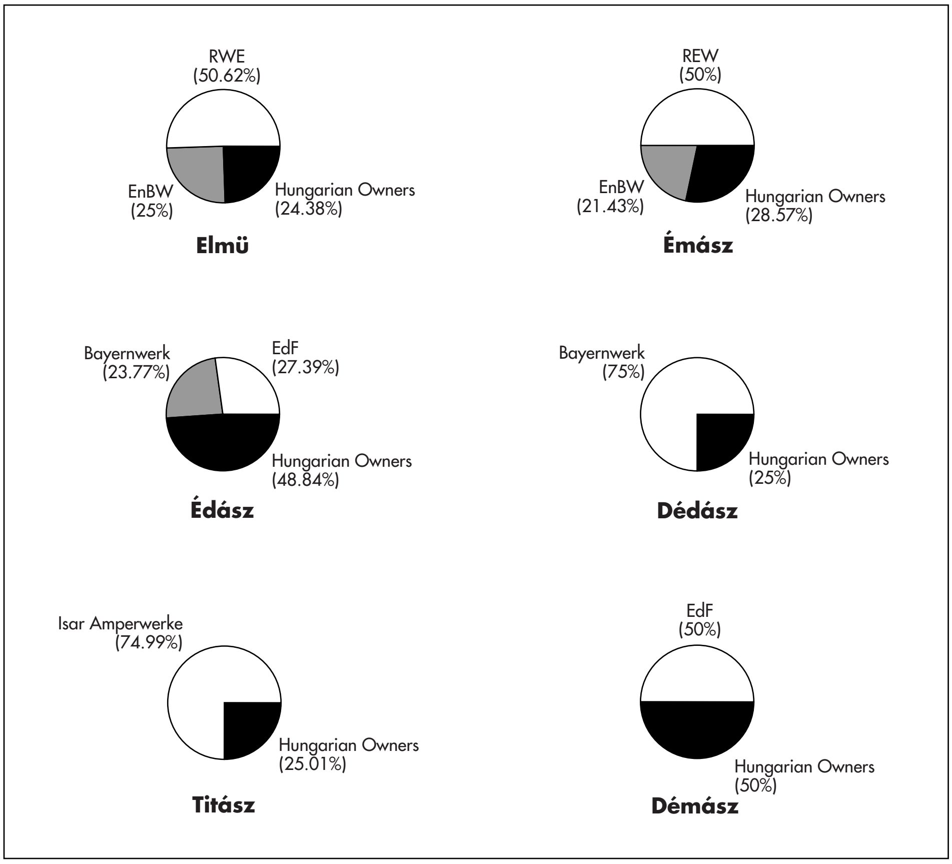
In the process, several power plants were spun off as independent companies. As mentioned above, this was the case for the Borsod plant (Borsodi Energetikai Kft.), which used to be part of Tisza Power Co., but there were also other cases, e.g. the Csepeli Power Plant Co. (Csepeli Erőmű Rt.) near Budapest, 100% owned by PowerGen. This plant had been used for autogeneration by the industrial company Csepel Industry Works Co. Today, there are 11 independent public electricity generating plants, including the two hydro-electric generators Hernádvíz Hydro Power Ltd. (one plant) and Tiszavíz Hydro Power Ltd. (two plants).

At the end of 1996, all six distribution and supply companies were privatised, and all have majority share ownership by foreign companies. The Government, through ÁPV Rt., retained a golden share in all of them, which, among other things, gives it control over mergers and acquisitions. Figure 43 shows the participation of new investors in the Hungarian electricity supply industry in 1997 before the sales agreements regarding Pécs and Bakony were concluded.

Modus Operandi of the Industry

The structural features of the reformed Hungarian electricity supply industry are a result of the complex reallocation and sale of shares in the power companies. At present, the industry operates in a co-operative mode. Electricity generation is

Figure 43
Privatisation in the Hungarian Electricity Supply Industry, 1998



Source: Hungarian Energy Office (MEH).

hardly competitive: MVM manages the economic as well as the technical aspects of dispatch. MVM does operate under a requirement to buy the power it subsequently transmits and sells to the distributors at minimum cost. But dispatch is not governed by competitive short-term price bids. It is based on the long-term power purchase agreements concluded with generators, which specify MVM's purchase prices. The contracts contain capacity, energy and mining capacity price elements, but the prices are regulated and set by the Minister of Economic Affairs on the basis of published price-setting formulas. Competition occurs only for new units, and for some power generation – some of the generators are ready to offer electricity below the regulated prices. Generators are under a legal obligation to maintain their power plants available for generation.

Nor is there competition in supply: the six distributors/retailers enjoy exclusive supply licences. Only in exceptional cases will the Hungarian Energy Office issue direct supply licences to a generator, who may then directly generate and supply a customer. This is the case for the Csepeli plant now fully owned by PowerGen. Also, a holder of an exclusive supply licence may waive his right partly or fully to the benefit of other supply licence holders and upon approval by the MEH.

MVM is at the core of the industry and has wide-ranging responsibilities. First, it manages the wholesale electricity market. This means that it monitors final demand trends and develops demand estimates. These are used for system planning at different time horizons. Based on these estimates, MVM purchases electricity from the generators under long-term contracts, established over the last years. In this function, MVM can also conclude import contracts with foreign generators, or sell excess generation abroad. Moreover, it initiates the process of capacity expansion if new capacity is needed. These duties are to be carried out at least cost. The power purchase prices stipulated in the contracts with generators vary according to the characteristics of the plants. Some plants are old and have very low thermal efficiencies, so they produce at considerably higher cost, and there is no unique market price. The long-term power purchase agreements are subject to price control by the Hungarian Energy Office.

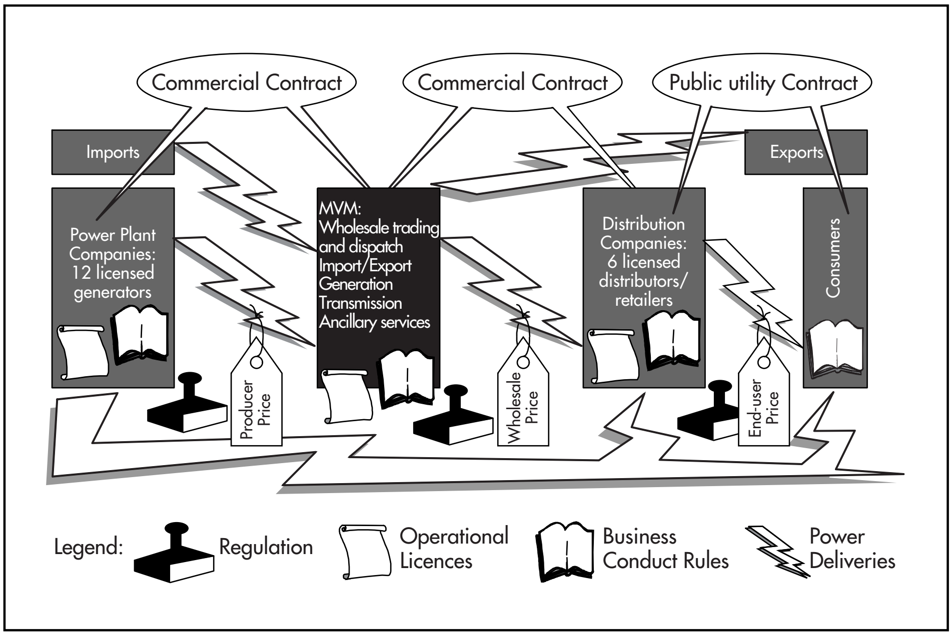
MVM and OVIT are also responsible for the technical side of system operation, i.e. dispatch, system control and operation, maintaining adequate reserve capacity, operation, maintenance and expansion of the transmission grid and international interconnectors, provision of ancillary services, etc. Operation and maintenance work of the transmission grid is carried out by OVIT on the basis of contracts signed by MVM.

On the downstream side, MVM also has long-term power delivery contracts with the six distribution and supply companies. All power must be purchased from MVM, except in rare cases of autoproduction and direct supply. There is one single sales price for wholesale electricity, regulated and published by the Minister of Economic Affairs. Finally, the distributors/retailers sell the electricity to final customers at prices which are under MEH surveillance. Figure 44 shows a simplified operational model of the Hungarian power supply system.

Lastly, the distribution and supply companies conclude so-called public utility contracts with the customers. According to the 1994 Electricity Act, these would normally be general public utility contacts between the retailers and the large number of individual small customers. These contracts are unlimited in time, and subject to the price-setting authority of the MEH and the Minister of Economic Affairs. So-called individual public utility contracts are concluded between retailers and large customers. They are freely negotiated, without price control by MEH or the Minister, and are valid for a limited time period. If customers eligible for an individual public utility contract fail to reach agreement in their negotiations, the general public utility contract applies – i.e. the supply is based on the regulated prices for a comparable customer group.

In the course of preparation for EU accession, Hungary is in the process of considering how the system can be adapted to the EU Directive on the Internal Electricity Market. It is the Government's intention to open up the market for retail competition to the required extent upon accession.

Figure 44
Functional Model of the Hungarian Electricity Supply Industry



Source: Hungarian Energy Office (MEH).

REGULATION

The Electricity Act (Act XLVIII of 6 April 1994 On the Production, Transportation and Distribution of Electric Power) defines the general regulatory framework for generation, transmission, distribution and supply of electricity. According to this general framework, the Hungarian power system is supposed to fulfil the following criteria:

- Its ownership is impartial. This is supposed to promote non-discriminatory behaviour towards all types of customers and other suppliers. It takes into account and helps represent customers' interests.
- It is controlled through legislation and regulation by public authorities.
- It serves consumers safely and at minimal cost.
- It covers its production costs, including the cost of necessary and warranted investment and efficient operation. Its prices include a rate of profit that is sustainable in the long term and allows sufficient investment.
- Operation and decommissioning of its plants are environmentally benign.

- It gives preference to renewable energies via a compulsory purchasing scheme for renewables.

The two main instruments of regulatory oversight provided for in the Electricity Act are, first, licences for power plant construction, generation, supply, etc., and secondly, ongoing regulation in the form of price regulation and regulatory resolutions. Both lie in the responsibility of the Minister of Economic Affairs and the Hungarian Energy Office (MEH), and are described below.

Licensing and Tendering

In the Hungarian electricity supply industry, activities subject to a licensing requirement are:

- Establishment and construction of a power plant of 20 MW capacity or above;
- Capacity extension or change of input fuel;
- Shutdown and decommissioning;
- Generation of electricity;
- Transmission and distribution of electricity;
- Supply of electricity to ultimate consumers.

The licences are designed to ensure a minimum level of performance by the licence holder, and are the most important basis of industry regulation other than price regulation. They are issued by the Hungarian Energy Office, and can also be modified – or, in extreme cases, revoked – by the MEH. Following the entry into force of the Electricity Act, the Hungarian Energy Office began to develop these licences in 1995. All of the licensed activities require that the entity seeking the licence must be based in Hungary.

Application for the establishment of a new power plant must be made to MVM and the MEH, and must be based on a feasibility study that contains detailed descriptions of the technical and economic viability of the project, its financing, its staffing with qualified operating personnel, proof of the applicant's past performance and management expertise, and identification of the future customers of the power plant.

Approval is based on the MEH's opinion, but according to Section 4 of the 1994 Electricity Act, requires much broader consensus than that: for new power plants between 20 and 200 MW, approval from the MEH and the Minister of Economic Affairs is required, especially regarding fuel choice. Above 200 MW, the Minister of Economic Affairs must agree but must also seek approval of the entire Government (Cabinet). For power plant projects of 600 MW or more, the Hungarian Parliament has to approve. In addition to this, the Minister of Economic Affairs determines minimum levels of fuel to be held in stock on the site of each power plant and, jointly with the Minister of International Economic Relations, decides how much electricity Hungary can import and export, and how much has to be produced domestically.

Based on the demand forecasts and system development plan prepared by MVM, and any possible modifications made to it by the Hungarian Energy Office, the Minister of Economic Affairs submits a power plant establishment plan to the Government and to Parliament every two years. If there are applicants who propose power plants in accordance with this plan, the MEH can grant a preliminary licence for power plant establishment.

If there are no suitable applications, MVM issues a call for tender in close co-operation with both the MEH and the Minister. The winner of the bidding process is to be determined by MVM on a competitive basis in order to ensure that the new capacity is created at least cost. Aside from the relevant economic criteria, the selection criteria also encompass items such as fuel diversity, the use of domestic energy resources and renewables, environmental externalities and social considerations, especially employment. The bidder is free to choose the site for the plant. MVM's decision is subject to review by the Hungarian Energy Office and by an independent consultant.

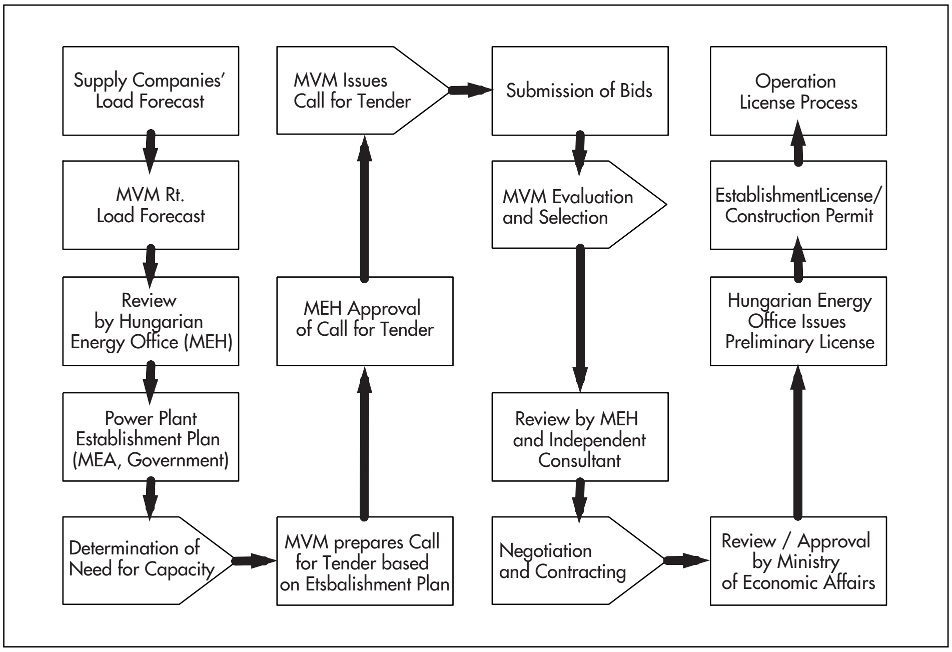
Figure 45 shows the steps of the process to be followed for new capacity investment. The tendering procedure depicted applies to new contracts and generating plants of 50 MW or above, but also to new capacity in the form of major refurbishment, contract and plant lifetime extensions, and plant upgrades of 20 MW and above. The call for tenders specifies the total amount of capacity required, the time lines for capacity establishment, the fuel options as defined in the Government's power plant establishment plan, the type of plant (base load, load following, peaking capacity), possible transmission constraints that have to be taken into account, and in certain cases a price cap, i.e. maximum average price that the new plant can be expected to earn throughout its economic life.

In 1997, two parallel calls for tender were issued by MVM. The first one invited investors to submits bids for a total of 800 MW of smaller plants (between 20 and 200 MW), to come on stream between 2002 and 2004. The second call for tender concerns a total of 1 100 MW of plant above 200 MW, to start service between 2004 and 2006. In January 1998, the tender was modified, lowering the sought-for capacity to 500 MW of small plant and 600 MW of large plant. The new deadline was set to October 1998. Both rounds of tendering were largely oversubscribed.

Ongoing Regulation

The legislation relating to the Hungarian electricity market, and notably the 1994 Electricity Act, stipulates that electricity price regulation must allow reliable electricity supply at "reasonable" prices. These prices must ensure recovery of

Figure 45
Establishment Procedure for New Generating Capacity



Source: MEH.

"reasonable" investment by the enterprises active in the market. The Electricity Act provides the main basis for price regulation but there are numerous decrees that set out the details of price regulation.

In accordance with the Electricity Act, the Hungarian Energy Office can become active and review or revise the level of electricity prices upon the initiative of any of the interested parties, customers and suppliers alike. Based on the 1990 Pricing Act (Act LXXXVII of 1990 on the Definition of Prices), in force until 31 December 1996, regular price adjustments were carried out annually. Following a decision taken by the Minister of Economic Affairs in December 1996, a quarterly price review mechanism was put in place in January 1997.

In every round of price determination, the companies in the market have to disclose all relevant information to the MEH. The MEH then prepares the new prices according to the methodology set out below. The Hungarian Energy Office is the pricing authority at the intermediate levels of price regulation, i.e. at power plant company level for the purchase prices of MVM, and at the level of MVM for the wholesale prices to the retailers. Price regulation is based on the principle that pricing for companies at each level of the industry should cover both capital and operating costs, and that the cost of purchasing electricity is to be passed through each tier of the industry. Companies submit applications for price increases, and the MEH prepares and adopts price resolutions, which are directly applicable. If companies disagree with the outcome, they can appeal directly to the Minister of Economic Affairs. If they disagree with the Minister's decision, they can appeal to the courts. For end-user prices, the final approval must be given by the Minister of Economic Affairs, and the new prices come into effect upon publication as a Ministerial Decree.

Figure 46 shows the current mechanism for end-user price regulation used by the Hungarian Energy Office. This mechanism applies to prices for heat and electricity. The price prevailing on 1 January 1997 – the so-called starting price – is used as the basis for price escalation. This starting price was determined based on a cost survey of all concerned energy companies, carried out in 1995 and 1996 by external experts on behalf of the MEH. It contains justified operational costs, including all capital investment required for power production, as determined by the MEH in 1995/96. The MEH is, of course, aware of the fact that cost data concerning the past can be little more than rough cost estimates, due to the complete absence of market evaluation. In order to fulfil its function as price regulator, the Energy Office monitors electric utilities' costs on an ongoing basis, and attempts to put downward pressure on costs through its powers to disallow certain costs or cost elements.

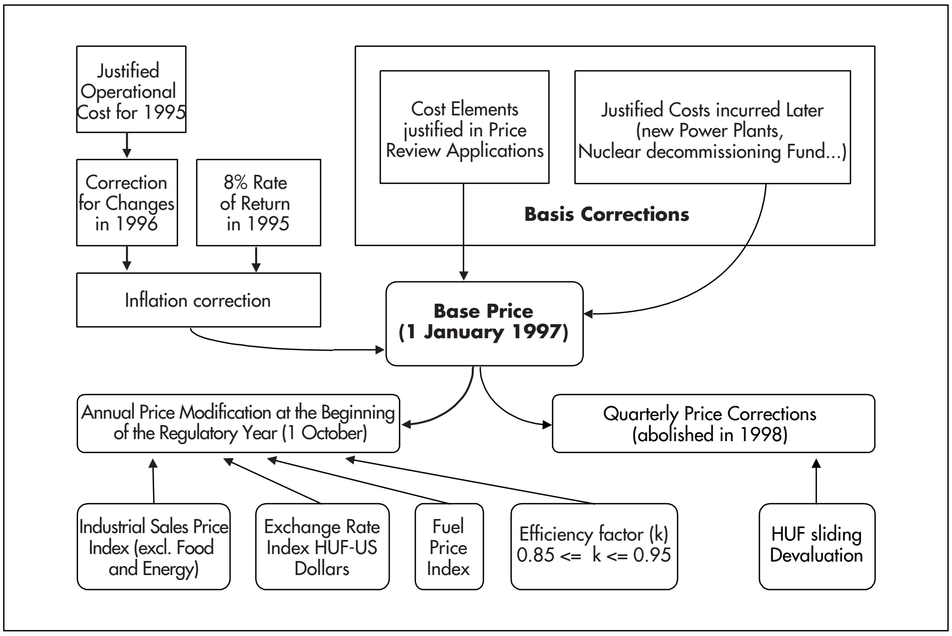
Once the cost of electricity supply is determined, an 8% rate of return on investment, also fixed in 1995, is applied. After adjustment for inflation, this yields the price basis for 1997. After incorporating further corrections to the price basis, i.e. justified costs incurred or identified after 1 January 1997, the corrected price basis is used to determine the new regulated price at the beginning of the regulatory year, which starts on 1 October each calendar year.

The corrected price basis is reviewed with regard to three indicators thought to be beyond the control of the utilities, i.e. the domestic industrial sales price index (excluding the energy and food sectors), the exchange rate of Hungarian forints versus US dollars, and an index expressing fuel price movements. In addition, Hungarian utilities are expected to make efficiency improvements and reduce costs, so an efficiency factor ***k***, reducing prices by 5% to 15%, is included. The quarterly adjusted prices are determined taking into account the sliding devaluation of the forint.

Within this legislative and regulatory framework, a difficult transition had to be made between the very beginning of the reforms in 1991, and today. In the 1980s, prices were far from cost-covering, and they were much lower for residential than for industrial customers, which indicates vast cross-subsidies. Based on a commitment made by the Hungarian Government to the World Bank and the International Monetary Fund, prices had to cover costs by 1996, and as of 1989, electricity prices did indeed rise noticeably. Cost-covering prices meant that prices had to rise 50% to 80% above their 1994 levels, according to the customer category. The prices that came into effect in 1995 were, for the first time, higher for residential consumers than for industrial/commercial consumers. Figure 47 shows the development of end-user prices since 1980.

Figure 46

Pricing Mechanism for Electricity and Heat Prices

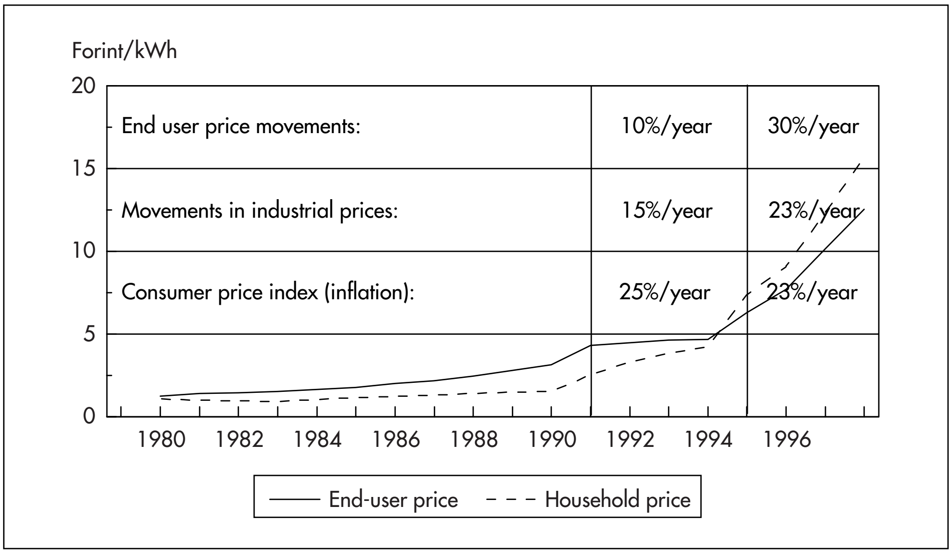


Source: MEH.

Figure 47

End-User Prices for Electricity, 1980 to 1998

Hungarian Forints



Source: MEH.

The graph shows that the rate of price increase accelerated noticeably after the Electricity Act came into force and the Hungarian Energy Office was established. Today, Hungary's end-user prices for electricity are cost-covering, and the cross-subsidies between residential and industrial consumers have been greatly reduced.

However, this process did not develop without disturbances. In 1997, the Hungarian Energy Office received 12 applications for price increases from power generators, and 6 additional applications from the electricity retailers. The MEH approved only a very small amount, some 16% on average, of the requested price increases. All electricity retailers and Vértes Power Plant Co. lodged complaints against these price resolutions. Following the complaints of the retailers, MEH had to carry out new proceedings, against which the supply companies also appealed in both instances. After their appeals were rejected, the suppliers began litigation procedures.

This dispute was not an isolated event. Throughout recent years, there were several disputes between the privatised energy companies on the one hand, and the Government and the Hungarian Energy Office on the other hand. These disputes concerned matters of principle as much as the detailed handling of regulation. A long-running dispute on principles concerned the cost elements that were to be included in the price base for regulated prices. Similar disputes in the gas industry had led investors to threaten litigation. Controversies linked to excessive regulatory discretion arose when the Minister of Economic Affairs chose not to follow the MEH's price proposals and revised electricity prices downward in the final decrees. Also, the quarterly price adjustment was deferred twice in 1997, due to social considerations and Parliamentary elections. The quarterly price adjustment mechanism was abolished at end 1998.

Eventually, all controversies were settled out of court, leading on each occasion to increased prices and the consideration of further cost elements. The last settlements were concluded between December 1998 and mid-June 1999. Following this, both the Government and electricity companies stated that the electricity and gas prices coming into effect in July 1999 are now fully cost-covering and ensure an appropriate rate of return. However, the process of adjusting allowable cost in the rate base is bound to continue in the near future; for example, more stringent environmental regulation will cause additional costs that have to be considered.

Apart from outright price regulation, the Hungarian Energy Office engages in other types of regulation. Under the 1994 Electricity Act, it is responsible for developing so-called restriction lists. These lists determine which customers are cut off first, and to what degree, in the case of a power shortage. Together with the interested parties in the electricity sector and other parts of Government, the Hungarian Energy Office developed the grid code, the dispatch code and the distribution code and monitors and enforces compliance with their provisions.

The MEH collects and deals with customer complaints and acts in cases where a real violation of the legislative and regulatory framework is recorded. At present, the vast majority of customer complaints, especially the complaints by residential customers, does not give rise to further proceedings because the consumers are still ill-informed about their rights and duties under the new law. Moreover, the MEH has the duty to monitor all important variables concerning the industry, and to provide information on it. Aside from data immediately relevant for conducting its core business, e.g. cost data, the MEH has started developing measures for quality of service and customer satisfaction. In 1995, it issued guidelines for the measurement of customer satisfaction. It also monitors the number and duration of outages and supply interruptions per year for each supplier.

CRITIQUE

Restructuring and Privatisation

The efforts Hungary has made to restructure its electricity supply industry, especially the divestiture of generation and distribution assets from MVM, are to be commended. The progress Hungary has made is impressive, given the very difficult starting position. In 1990/91, MVM was a fully vertically integrated state monopoly that imported record amounts of electricity from the former Soviet Union. It was burdened with a large amount of outdated, economically and technically obsolete generating capacity. Distorted prices were far below cost and showed extreme internal subsidies in favour of residential customers and Hungary was unable to face the inevitable re-investment cycle, necessary to maintain reliability, on its own.

Still worse, the cost of generating, transmitting, distributing and supplying electricity was not even known and had to be estimated through painstaking work carried out under the MEH's initiative and supervision years later. In addition, the cross-subsidies from industry favouring households had created a need for an internal compensation scheme involving the regional distributors. Since industrial customers were concentrated in the north and northwest, these regions had to finance the low-price but high-cost south.

Seen against this background, the progress that Hungary has made, first in unbundling the accounts of MVM, then in creating viable power and distribution companies, and eventually successfully privatising most of them, is substantial. Hungary has achieved an industry structure that can provide a starting point more suitable for competition than some long-standing IEA Member countries.[31] All this

31. In general, and in practice, government policy, including energy policy, is based on a multitude of goals. These encompass, to name but a few, economic prosperity and efficiency, stability and security of supply of all vital inputs to the economy, a clean environment, and an "equitable" distribution of wealth. While competitive markets may be an objective in their own right, their main merit lies in the fact that they appear to bring about economic prosperity better than any other type of market or economic system. Their effect on security of supply, the environment, and distribution is not uniform. These objectives are, and ought to be, promoted through specialised government policies. These policies should be compatible with competitive markets, because experience shows that prosperity often makes it easier to enhance security, environmental quality, and distributional "equity".

was achieved in a much more precarious macro-economic situation than most IEA Member countries have known: the painful transition in all sectors of the economy from a centrally-planned, command-and-control system towards a market economy meant that the necessary price increases created much more social hardship than in most IEA Member countries. Although the progress towards liberalisation did not occur in a linear way, and although at times progress appeared to stall on certain issues, such as the necessary re-balancing of prices between the various consumer groups, the progress made in the last eight years deserves praise.

Yet from the outset, the Hungarian Government struggled with the same issues as any IEA Member government intent on privatising and liberalising its power industry, only perhaps in a more intense form. In many countries, privatisation is one of the main drivers of reform, often to relieve a burden from the government's budget or to obtain funds for it, or to obtain private investment when the incumbent utility is unable to provide the necessary investment. There is some tension between this objective and the other important functions of the government as (indirect) share owner, as legislator/regulator, and as re-distributor, responsible for social cohesion.

The process surrounding the privatisation of power plants and their prior combination with coal mines illustrates the difficult path that had to be negotiated in Hungary in this respect. Integration with the coal mines proved a burden on the sell-off of the power plants, and the Vértes plant is still not sold. On the other hand, the conflict between ÁVU and ÁV Rt. regarding the timing of privatisation illustrates the conflict of interest which existed within the Government between the necessity to raise funds quickly to be able to pay off international debt, the desire of the Government as an indirect shareholder to realise the maximum value from the sale, and the necessity for the Government as legislator/regulator to take enough time to design a viable and effective structure for the new market.

There is a need to disentangle these conflicting roles some more in future. Advanced as it is, the Hungarian electricity market needs to undergo some more structural change if effective competition is to be introduced, and if EU rules for the internal market for electricity are to be fulfilled. The minimum in this respect must be the separation of the system operation function from MVM and the distribution companies. MVM and most of the big European utilities that now own the distribution and supply companies in Hungary also hold stakes in generation. MVM still owns and will continue to own the Paks nuclear plant, which, after all, accounts for no less than one-quarter of electricity generation in Hungary. Also, MVM has long-term contracts for more than 70% of the installed capacity in the Hungarian power industry.

Unless system operation is organised in the hands of an Independent System Operator (ISO), the playing field for competition will be so heavily biased in favour of MVM and the distribution-owning utilities that effective competition is very unlikely to arise. Creating an ISO is, in any case, a requirement under the EU Directive creating the Internal Market for Electricity. With an ISO in place, the Hungarian electricity market would have already made a lot of progress towards effective competition.

An even better solution would be to have MVM divest all its interests in generation and distribution/supply and become a pure transmission grid company. Divestiture would not necessarily have to mean privatisation of the remaining stakes in generation and distribution. The Paks plant could remain in government ownership – it might not be easy to sell anyway.

Currently, problems can arise from the fact that MVM as the system and market operator is not independent from generation interests and day-to-day government policy. Independence of the system operator from any particular interest, be it commercial interest or government intervention, is crucial. Maintaining a neutral role for the system operator and a level playing field for competition might require maintaining the system operator in public ownership. If the Government were to decide in favour of a competitive model with full vertical separation, Hungary could quickly become one of the most competitive power markets in the region. The Government might wish to study the example of Argentina, which introduced a very competitive market model in the face of the need for major investment, relatively low per-capita GDP, and the need for a rapid transition.

Whichever path is chosen, MVM cannot maintain its current position, which still contains elements of a vertically integrated monopoly, in its structure and even more in the behavioural rules that apply.

The Introduction of Competition

Since one of Hungary's most important policy objectives is to join the European Union in the first wave of new entries, the country has implicitly chosen the EU path towards reform of the electricity supply industry. The main question that needs clarification concerns the speed at which reforms will be introduced and the concrete model of competition that will be chosen. In any case, the far-reaching restructuring and privatisation have gone a long way towards a market structure which could allow effective competition – provided the appropriate rules for company behaviour are in place, and the structural changes suggested in the preceding section are introduced.

Once this is accomplished, the *modus operandi* of the industry will have to be changed. Supply to eligible customers will have to be opened up to competition, preferably through mandatory, regulated Third Party Access rules allowing eligible customers to conclude contracts freely with suppliers of their choice. These rules must be non-discriminatory and transparent. They should avoid conflicts of interest among the Government's different roles and should be implemented in a credible way.

The Government is at present looking into ways to implement the EU provisions within the Hungarian system. The Hungarian Energy Office is already exploring ways to use the existing framework to move towards more competition. One way in which it might attempt to accelerate the process is by issuing more licences for direct supply, i.e. licences that convey the right for a generator to supply an ultimate consumer. Another way might be to license generators as self-generators, thereby circumventing the requirement for power plants above 20 MW to submit proof that MVM buys their power, required under the normal licensing procedure. Laudable as these initiatives are, they can only provide an interim solution. Rules for grid access are an indispensable ingredient for competition and should be developed as soon as possible. In order to prepare for market opening, a number of issues will have to be addressed in detail, including how emergency back-up and top-up deliveries to eligible consumers should be organised and priced.

One of the issues under discussion in Hungary regards the specific timetable of market opening under the EU Directive. Taking the formula used to determine the degree of market opening under the Directive, the degree of opening in Hungary will fall short of the EU average. This is due to the fact that the size distribution of electricity-intensive companies is different from the EU average.

As of February 1999, end users in the EU with an annual electricity consumption of 40 GWh and above became eligible for competition. Whereas this represents some 25.4% of power demand throughout the EU, it only concerns 43 large customers in Hungary, representing 18.9% of total consumption. The next step, due in the year 2000 and concerning users with electricity consumption of 20 GWh and above, concerns 95 end users with a market share of 24.3% in Hungary but 28% throughout the EU. The last step of market opening (9 GWh and above) concerns 200 end users or 29.2% of the market in Hungary but 34% throughout the EU. The Hungarian Government is considering at the moment whether it would have to seek a derogation upon entry into the EU, depending on when entry occurs.

However, as far as the EU Directive is concerned, the percentage shares of market opening overrule the GWh thresholds – their function is only to provide an objective measure of the share of the market which must be opened at the moment when the threshold becomes active. This means that in the year 2000, all EU power markets must be opened to the community-wide market share of all customers using 20 GWh and above – whatever that share may be. On the assumption that electricity use will continue to grow slowly, it is likely that the share of market opening will diverge upward from 28%, if it does divert. For Hungary this means that full compliance with the Directive will amount to opening the market for customers below 20 GWh annual demand – unless a derogation is sought and granted.

Another issue that requires attention is the cost of transition, often referred to as stranded cost – not because the cost of transition is expected to be very high in Hungary, but rather because it depends on the behaviour of the Government and market participants today whether or not “new”, unnecessary stranded cost is created. A large number of obsolete power plants in Hungary must be replaced soon, not least because of their very low thermal efficiencies and poor environmental performance. Since market participants already know that competition is likely to be introduced soon, they have an opportunity to avoid stranded cost by refraining from building above-market, expensive capacity or concluding contracts at excessive costs now.

Moreover, despite the fact that electricity prices in Hungary are now by and large cost-covering, they are still low in comparison with Western Europe and the EU. Participation in the EU electricity market means, of course, competition in the domestic market but also cross-boundary competition. Given the comparatively low electricity prices in Hungary, it is unlikely that foreign competitors will out compete Hungarian suppliers, at least based on price – unless the market is opened to Ukraine and Romania. This is not very likely in the near future, partly because it would involve re-connecting the disconnected systems via DC links. It is much more likely that Hungarian power companies will find lucrative export opportunities to neighbouring EU countries. The consequence of this would not be stranded cost but rather a quick adaptation of Hungarian electricity prices to the price levels which will then prevail in Italy, Austria, or Germany. Therefore, it is better to act quickly now to adapt to the EU requirements, in order to give clear signals.

There may be additional benefits to be reaped since Hungary has played a very positive role in strengthening the links between the CENTREL and UCPTE systems. The country should assess the further opportunities for transboundary electricity trade to improve security of supply, increase efficiency and generate savings by combining hydro power, situated in Hungary's neighbouring countries (e.g. Austria), and fossil generation in Hungary. These developments might lead to a future regional power market in which Hungary could be a significant player.

Regulation

At present, regulation occupies an important place in the Hungarian power market. This is an important achievement compared with the recent past. The methods of regulation appear to be based on generally accepted regulatory principles, but the Minister of Economic Affairs enjoys excessive regulatory discretion.

The scope of regulation in the Hungarian electricity market will certainly shrink once competition is phased in and has reached a certain minimum number of consumers. When this happens, regulation will, by and large, apply only to transmission and distribution grid services and to those groups of consumers who will remain captive for the foreseeable future.

However, in order to reach this point, and to make the transition in an orderly way, the current regulatory procedures should be thoroughly reviewed and amended. The most important issue in this respect is the autonomy of the Hungarian Energy Office and its mandate to exert definitive, independent control over regulated prices.

It is important that the Hungarian Energy Office be made the country's main regulatory body for electricity and gas, and that its autonomy be strengthened. The fact that the Minister of Economic Affairs exerts the right of employer towards the President and Vice President of the Energy Office may already open possibilities for undue pressure on this crucial regulatory agency, despite the fact that outright removal from office appears to be difficult. The Government may wish to consider creating a governing board, impartially representing all important interests in the industry, which could be responsible for appointing the President of the Energy Office and his deputy.

Most important would be to eliminate the Minister's final authority over end-user prices, which opens the door to price distortions motivated by all kinds of concerns relating to macro-economic developments, social policy objectives and regional policy considerations, to name just a few. IEA Member countries which have had this type of institutional set-up have not had encouraging experiences with it, especially in times of high inflation or distributional conflicts, when the temptation to tamper with energy prices as a "quick fix" for deeper, structural problems can become overwhelming. In the same vein, the Minister should be replaced by the judicial system as the first instance of appeal. At present, the courts are the second instance of appeal, after the Minister. The competition authorities could also in future be consulted in cases where market participants appeal MEH's decisions.

It is of vital importance to separate the task of price control and responsibility for overall economic policy, situated with the Minister of Economic Affairs. The responsibility for price control should be attributed to the MEH, even though this move will create a certain amount of friction. The reason for this is that the regulator's task is to emulate as closely as possible the outcome of a competitive market where full competition is not possible, e.g. due to natural monopoly. Any failure to do this inevitably leads to inefficiencies. Although such inefficiencies may appear small in the short term, they may be very costly to society in the longer term. The reason for this is the pivotal role of the price mechanism in steering demand as well as future investment, technology use and development, and even research.

In contrast, the Minister's role is much wider and comprises objectives such as macro-economic stability and a certain degree of redistribution of wealth. These objectives are often in conflict with the goal of efficiency. The shorter-term imperatives of reducing inflation, for example, may lead to a strong temptation to reduce those prices that the Government can control below their optimal level, sometimes even below cost. This leads to delayed adaptation in the concerned sector, excess demand, and reduced or deferred investment, and can ultimately lead to poor service quality and environmental strain. This situation was experienced by some long-standing IEA Member countries after the oil crises.

It is also important to establish the regulator as a strong institution, appropriately staffed, and endowed with sufficient resources and far-reaching rights for company data disclosure. The task of emulating prices that would emerge in a competitive market is tremendous and requires considerable specialised knowledge and frequent use of computer-based economic modelling, or at least the capability to outsource modelling work to appropriate organisations. This task could not be carried out by any institution other than a specialised regulatory body. A Parliamentary committee, for example, would be overwhelmed by such a task and deliver inadequate work, possibly leading to much greater inefficiencies than unregulated monopoly.

Price regulation, especially if it is to persist in parts of a competitive market, must not favour any particular interest. This applies in particular to the prices for transmission and distribution grid services as well as grid access conditions, because they can determine whether the competitive playing field is level or not. Therefore, the Hungarian Energy Office should be given the mandate and resources to develop efficient, non-discriminatory and transparent transmission and distribution tariffs, based on international experience, as soon as possible. The same applies for grid access conditions.

RECOMMENDATIONS

The Government should:

- Establish clear, regulated transmission distribution prices and non-discriminatory grid access rules as a precondition for competition in the power industry. Open the retail market to competition.

- Unbundle generation, transmission, distribution and supply to end users. At the very least, system operation and wholesale trading should be fully unbundled from these functions by establishing an Independent System Operator. Independence of this System Operator from any particular interest, be it commercial interests or government intervention, is crucial.

- Consider maintaining the System Operator in public ownership, as this may be necessary to ensure neutrality of the System Operator and a level playing field for competition in a small country like Hungary.

- Strengthen the MEH's independence from short-term political interests, and, especially, give it full pricing authority as soon as possible. Establish Hungary's judicial system as the instance of appeal.

- In light of the country's anticipated EU membership, carefully choose a competitive model compatible with EU rules and suited to the structure of the unbundled Hungarian power market.

10

NUCLEAR

NUCLEAR POWER PLANTS

Hungary has only one nuclear power plant, the Paks plant run by the Paks Nuclear Power Plant Company (Paksi Atomerőmű Rt.). However, this plant consists of four reactor units of 460 MW each, amounting to a total of 1 840 MW, and accounts for some 40% of electricity generation in Hungary. More than 99% of the Paks Nuclear Power Plant Company is owned by MVM Rt.; the remaining less than 1% is held by local authorities.

The units are pressurised-water units of the Soviet-style VVER-440/V-213 type, which belong to the second generation of VVER-440 reactors. They use light water as moderator and coolant. As with all other types of VVER reactors, their safety philosophy is not based on concrete containment vessels around the reactor core but on so-called localising (bubbling) towers, which make up the pressure containment system in case of accidents caused by pipe ruptures.

The construction of the plants was based on an agreement between the governments of Hungary and the USSR, concluded in 1966. The Soviet Union supplied the reactor design, the equipment, and co-operation in completing the technical side of construction. The Hungarian side made a number of modifications to the original design to improve safety features, and manned the plant.

Following some initial delays, work proceeded continuously after 1971, and the design for the first two units was completed by 1974. The four units went on stream in December 1982, September 1984, September 1986 and August 1987, respectively.

Both the technical as well as the economic experience with the Paks plant have so far been very satisfactory. The plant runs in base load and sells electricity to MVM under a long-term contract at 4.44 forints/kWh. This compares to an average sales price of 9.45 forints for most other thermal plants, whose individual prices range between 6.99 and 20.30 forints/kWh. In 1997, the four units achieved load factors ranging between 81.2% and 91.5%, slightly down from 1996 values.

The future of nuclear power in Hungary remains open. There has been no referendum, government or parliament decision against nuclear power. In fact, the Paks Power Plant Co. sees a future for nuclear power in Hungary and submitted a bid in MVM's capacity tendering round in autumn 1998.[32] The bid proposed three alternatives for a new nuclear power plant of around 700 MW to come into operation by 2006. The alternatives were a Westinghouse pressurised water reactor (AP-600), a Canadian Candu-6 reactor, and a VVER-640 supplied by Atomstroiexport of Russia with Siemens participation.

32. See section on Licensing and Tendering in Chapter 9.

None of the three bids was accepted by MVM. This was partly because they were all submitted after the 9 October 1998 deadline. In all three cases, the environmental impact assessment (EIA) of the projects, which forms an integral part of the bids, could not be finalised in time. However, the projects which were selected, two combined-cycle gas turbines (CCGTs), were also cheaper and smaller units. It was MVM's explicit intention to avoid contracting for large increments in capacity in the light of very slow electricity demand growth and imminent electricity liberalisation in the context of EU accession. Paks Power Plant Co. and its foreign co-bidders, on the other hand, remain convinced that nuclear power could be economic in future, especially once the centralised bidding procedures are dismantled and investors can build merchant plants.

THE REGULATORY FRAMEWORK

The most important piece of legislation for Hungary's nuclear industry is the 1994 Electricity Act and the decrees based on it, which form the legal framework for the operation of the power industry as a whole. Some further pieces of legislation focus particularly on the nuclear industry and on safety. The most important among these is the Nuclear Energy Act (Act CXVI of 1996 on Nuclear Energy), which came into force on 1 July 1997, and was followed by a number of decrees defining the rights and duties of the Hungarian Atomic Energy Authority (HAEA). The 1996 Nuclear Energy Act replaces the 1980 Atomic Energy Act (Act I of 1980 on Atomic Energy). Previously, no specific legal framework had existed for the peaceful use of nuclear power.

Among the provisions of the Nuclear Energy Act, the following are the most important:

- Exclusive state ownership of nuclear installations was abolished;
- The licensing authority, formerly entrusted to each individual facility (including several research reactors, in addition to the Paks plant), was entrusted to the Hungarian Atomic Energy Authority;
- Nuclear safety was declared the highest priority;
- The HAEA was declared independent in both organisational and financial terms;
- Nuclear operators were made liable for all damages they caused, and indemnities were fixed in accordance with Hungary's obligations under the Vienna Convention in this respect;
- The HAEA was entitled to impose fines in cases of breach of the regulations;
- The allocation of tasks regarding licensing and surveillance among government ministries, national authorities and other competent bodies was clarified;

- A Central Nuclear Financing Fund was created for the financing of interim storage, final disposal and decommissioning. Nuclear operators are obliged to pay into this fund;

- An emergency preparedness and accident prevention plan was introduced.

Several decrees further clarified that the HAEA has the authority to issue regulatory guidelines in the following areas:

- Licensing for nuclear power plants;

- Ensuring quality standards for nuclear power plants;

- General requirements for nuclear reactor design;

- Operational safety requirements for nuclear power plants; and

- Safety standards for research reactors.

All construction of new nuclear power plants or reactor blocks requires the consent of the Hungarian Parliament, and ownership transfers require the consent of the Government. This agreement must be sought at the early stages of the process. Once this is done, and once the investor has applied for an installation licence, the HAEA prepares a preliminary safety analysis report. This report considers technical issues such as the plant site's geological characteristics and the plant's suggested water management system. Proof of the availability of an interim storage or final disposal site, conforming to international standards, must be shown at this stage. Also at this stage, the public must be informed and a public hearing must be held. A final safety analysis report is prepared prior to issuance of an operating license. The HAEA has six months to evaluate the licence application.

The Nuclear Energy Act contains provisions regarding nuclear liability based on the Vienna Convention, which was adopted by Hungary in 1990. According to the Convention, nuclear operators are obliged to accept responsibility for damages caused to third parties by nuclear accidents, and to seek insurance or other financial cover accordingly. The financial cover for damages from operation must be sufficient for damage up to 100 million SDR,[33] for damage caused from transport of nuclear fuel up to 5 million SDR.

In order to comply with these requirements, Paks Nuclear Power Plant Co. and Hungarian insurers established an insurance pool with the intention of seeking re-insurance in international pools. This occurred shortly before the entry into force of the Nuclear Energy Law. Subsequently, an extensive international review of the

33. SDR = Special Drawing Rights, an international accounting unit defined by the International Monetary Fund.

Paks plant's safety features was undertaken on behalf of the national and international insurers, and damage liability insurance contracts were concluded.

This was not the first time the safety of the Paks plant was reviewed by international experts. In addition to the domestic Periodic Safety Reviews carried out as of 1992, more than 20 international reviews took place since 1984, involving organisations such as the International Atomic Energy Agency (IAEA) and the World Association of Nuclear Operators (WANO). Following the reviews, a large number of technical adjustments were made, especially as of 1997. These included major works such as the complete separation of the auxiliary emergency feed-water system from the operational feed-water system.

FUEL CYCLE AND WASTE MANAGEMENT

Hungary had a uranium mine in the vicinity of Pécs, from which uranium was mined and then shipped to the USSR for fuel element fabrication. The cost of this uranium is very high, corresponding to about three times the world market price. The mine has now been closed, after having operated at half its capacity for three years.

Hungary was also tied to the Soviet Union for storage and final disposal of spent fuel. High-level spent fuel was reprocessed and retained in the USSR. However, as of the early 1990s, the fees for these services were due in hard currency, and were higher if the radioactive waste was to stay in Russia for permanent disposal. In 1995, spent fuel reshipment to Russia was brought to a sudden halt, leading to problems in Hungary. By the end of the refuelling of the Paks plant in 1995, the capacity of storage ponds was nearly exhausted.

For these reasons, a new entity called Puram (Public Agency for Radioactive Waste Management) was created in 1998. This entity is responsible for running the Radioactive Waste Treatment and Disposal facility for low and intermediate level wastes at Püspökszilágy, 30 km north of Budapest. Another repository for the same type of waste is currently being sought. Initial exploration activities covering all Hungarian territory yielded a possible site in the vicinity of Üveghuta. Puram is to pursue this option. Also in reaction to the waning possibility of sending radioactive waste to Russia for storage or disposal, new nuclear facilities must prove they have access to storage or disposal sites.

Faced with the problem of declining storage pond facility, the Paks Nuclear Power Plant Company had a modular vault dry storage system for interim storage of high-level radioactive waste and spent fuel built at the plant site. The first unit was commissioned in 1997; another one is due for commissioning in 1999. Together, the two modules will be sufficient for Paks' nuclear waste production for the rest of the plant's lifetime.

Puram and the Hungarian Government are currently considering what long-term strategy to adopt regarding high-level radioactive waste and spent fuel: final disposal or reprocessing? At present, final disposal without reprocessing appears to be the preferred strategy. The Boda claystone formation underlying the Pécs uranium mine is considered a promising site. Closer investigations regarding this site are under way.

The Central Nuclear Financing Fund, mentioned in the preceding section and based on the Atomic Energy Act, became operational on 1 January 1998. It is funded from payments by parties using nuclear energy. The goal of this fund is to provide financing for the storage of radioactive waste, interim storage and final disposal of spent fuel, as well as decommissioning (dismantling) of nuclear facilities. The amount of payments by nuclear facilities, primarily the Paks plant, is set forth in the annual Act on the State Budget, based on cost projections prepared by the Hungarian Atomic Energy Authority (HAEA) and the Hungarian Energy Office.

CRITIQUE

Hungary's experience with its Paks nuclear power plant has been successful, especially when compared to some other reactors of Soviet design and origin operating in Central and Eastern Europe. The basic safety features of the plant had to undergo some major adaptation to international standards, but this adaptation seems to have occurred without major delays or crises. Hungary's adherence to the Vienna Convention signals that the country takes the concerns of surrounding countries as seriously as it takes the safety of its own citizens.

Not only does the Paks plant have a good safety record, it also appears to generate at low cost. These cost figures appear to include most or all of the relevant cost components, including back-end costs. This is particularly important as Hungary had to build up storage capacity on its territory very quickly after the previous arrangements with Russia collapsed. The planning and construction of the required facilities occurred swiftly, and, even more importantly, in accordance with international standards. All this suggests that Hungary is on the right track with respect to its nuclear policy.

The outlook for nuclear is not clear. Public acceptance of existing nuclear capacity is rather high in Hungary: opinion polls regularly show 70% approval of the Paks plant. This is no doubt due to the positive experience of the past. It may also be due to the fact that Hungarians have direct experience with the entire supply chain of fossil fuels, including their environmental impact, since the country also produces coal, oil and gas. There is no major political commitment against nuclear in the country, and in the future competitive power market, market forces can decide freely for or against nuclear.

It is noteworthy, though, that in contrast to the approval of the majority of the population for existing nuclear, approval rates of new nuclear power lie around 30-40%. The results of the 1998 bidding round for new nuclear capacity do not indicate a high probability of new nuclear in a more competitive electricity market in Hungary.

RECOMMENDATIONS

The Government should:

- Continue ensuring high performance and safety of operation by securing sound management practices and appropriate levels of maintenance resources and R&D.
- Continue to follow international safety standards.
- Ensure continued progress by defining comprehensive waste management and decommissioning programmes.
- Ensure that the cost of waste management continues to be covered by revenues from nuclear generation.
- Weigh the economic, environmental and security of supply effects of nuclear power against those of all other power generating options and thus determine the role that nuclear can play in improving the environment, security and diversity of supply, and at what cost.

11

TECHNOLOGY, RESEARCH AND DEVELOPMENT

TECHNOLOGY AND R&D POLICY

Energy-related research and technology development in Hungary are very closely embedded in international research efforts. As with much of Hungary's energy policy, accession to the EU and adaptation of the country's policies to EU rules have the largest influence. For example, Hungary is already integrated in the European Union's 5^{th} framework programme on research, and prior to that has participated in the 3^{rd} and 4^{th} EU framework programmes. The objectives of the policy of integration closely mirror the country's general energy policy objectives, notably the elimination of Hungary's import dependence, greater energy efficiency and environmentally beneficial development, in order to further the overarching goals of economic recovery and development, reduction of unemployment, improved quality of life, and sustainable development.

One major nexus of issues in technology development and R&D is obviously climate change. Hungary is committed under the Kyoto Protocol to reduce its carbon dioxide emissions by 6% by 2008 to 2012. Under the umbrella of the 5^{th} EU framework programme, Hungary has started to determine areas of special interest which could help the country meet its commitments. These areas are general R&D regarding renewables, more specific research efforts focusing on the development of geothermal energy, and improvement of energy efficiency.

In the context of earlier framework programmes, Hungary's participation in the Joule-2 programme is particularly noteworthy. The Joule-2 programme focuses on the use of biomass, including the mapping and assessment of biomass sources, study and research of conversion technologies, and the optimisation of energy extraction as well as study of environmental performance of such technologies. In particular, Hungary participated in the so-called beacon programme for the use of energy crops within the regions where such crops are grown.

In addition to these initiatives, Hungary participates in numerous other international research efforts, such as the INCO-Copernicus programme for Central and Eastern European countries, the Cost and Eureka programmes, aimed at scientific and industrial research partnerships in the EU context, the UN Sacha project, and the NATO co-sponsored "Science for Peace" programme. Hungary has also been a member of CERN since 1992, participating in major international experiments in areas ranging from theoretical and nuclear physics to computer engineering. There is ample co-operation in international nuclear research efforts within the INCO-Copernicus programme, which aims at technology transfer and new technology development for Central and Eastern European countries, focusing on those countries' specific starting points and needs regarding nuclear technology. Last but not least, Hungary has shown a lot of interest in playing an active role in the IEA's

Implementing Agreements for technology research and development since joining the Organisation in 1997.

Almost all decisions regarding government-funded research are made by The National Board for Technological Development (OMFB, Országos Műszaki Fejlesztési Bizottság). This organisation is responsible for international research mechanisms in Hungary, channels funds towards eligible projects, and provides domestic government funds from the central technology development budget. This budget is part of the general government budget and was created by decree in 1996 as a decisive tool in the Government's technology development policy. The funds are in principle open to any project developed or suggested by research institutions as well as by the general public. The OMFB allocates the monies according to the selection made on its behalf by a committee of independent experts. The OMFB prepares an annual report that has to be submitted to and adopted by the Parliament in preparation of the following year's R&D budget. The technology development budgets of the last seven years amounted to only 0.74% of GDP, a comparatively low figure, but the most recent figures show a slightly increasing trend: in 1998, the figure was 0.78%.

CRITIQUE

Hungary participates in numerous international R&D programmes and projects, and the efforts made so far appear to have been fruitful at least in terms of the number of research publications that resulted from them. This is a commendable strategy because international knowledge development and exchange helps the country share its experiences and prevents it from having to re-invent what is already available.[34] Opening up research activities to the international community is a beneficial strategy, especially for a small country.

Yet, in such a situation it is very tempting to participate in as many international research efforts as possible, and, by the same token, to maximise the use of international research funding, regardless of the usefulness of such research to the country, or the country's comparative advantage in R&D. This could ultimately lead to sub-optimal use of resources and could jeopardise in-depth research or delay results in the areas of core expertise or greatest need.

Although there are at present no concrete signs that this phenomenon occurs in Hungary in a major way, great care should be taken to keep R&D policy aligned with the country's general mid- to long-term policy objectives and its comparative advantages. Presently, Hungary focuses a lot of its energy research efforts on energy efficiency, the continuous improvement of the safety of the Paks nuclear reactor and

34. Duplication of research is a phenomenon that was not unknown in the former Eastern Bloc, e.g. when the former German Democratic Republic in isolation developed the computer chip at great cost to its economy, decades after the chip had been invented and used in the West.

issues related to decommissioning and radioactive waste storage and disposal, and the use of renewable energy. These are the lines along which the country's R&D efforts should be oriented. As the country becomes more prosperous, it should continue to adhere to these principles.

RECOMMENDATIONS

The Government should:

- ☐ Continue to develop the existing R&D strategy and make it more transparent. In particular, address the issues most pressing to Hungary.

- ☐ Maintain the development of energy efficiency, nuclear safety and renewables at the core of the R&D strategy.

A

ANNEX

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit: Mtoe

SUPPLY		1973	1990	1996	1997	2000	2005	2010
TOTAL PRODUCTION		**12.71**	**14.20**	**12.88**	**12.75**	**11.95**	**12.01**	**10.11**
Coal[1]		6.05	4.14	3.21	3.30	3.11	3.13	2.38
Oil		2.02	2.29	2.14	1.99	1.47	1.47	1.07
Gas		4.02	3.81	3.60	3.36	2.71	2.71	1.91
Comb. Renewables & Wastes[2]		0.61	0.37	0.22	0.44	0.99	1.03	1.08
Nuclear		–	3.58	3.70	3.64	3.65	3.65	3.65
Hydro		0.01	0.02	0.02	0.02	0.02	0.02	0.02
Geothermal		–	–	–	–	–	–	–
Solar/Wind/Other[3]		–	–	–	–	–	–	–
TOTAL NET IMPORTS[4]		**8.69**	**14.19**	**13.58**	**13.12**	**14.14**	**15.27**	**18.29**
Coal[1]	Exports	0.11	–	0.46	0.51	–	–	–
	Imports	1.77	1.63	1.86	1.61	0.90	1.50	3.00
	Net Imports	1.66	1.63	1.39	1.09	0.90	1.50	3.00
Oil	Exports	0.92	1.52	1.96	1.90	2.00	2.00	2.00
	Imports	7.39	7.96	6.71	7.20	7.69	8.05	8.68
	Bunkers	–	–	–	–	–	–	–
	Net Imports	6.48	6.44	4.75	5.30	5.69	6.05	6.68
Gas	Exports	0.01	0.02	–	–	–	–	–
	Imports	0.17	5.18	7.26	6.54	7.35	7.52	8.41
	Net Imports	0.15	5.16	7.26	6.54	7.35	7.52	8.41
Electricity	Exports	0.09	0.19	0.11	0.19	0.08	0.08	0.08
	Imports	0.49	1.14	0.30	0.38	0.28	0.28	0.28
	Net Imports	0.40	0.96	0.19	0.19	0.20	0.20	0.20
TOTAL STOCK CHANGES		**–0.09**	**0.08**	**–0.67**	**–0.56**	**–**	**–**	**–**
TOTAL SUPPLY (TPES)		**21.31**	**28.46**	**25.80**	**25.31**	**26.09**	**27.28**	**28.40**
Coal[1]		7.92	6.12	4.60	4.35	4.01	4.63	5.38
Oil		8.21	8.52	6.85	6.98	7.16	7.52	7.75
Gas		4.17	8.90	10.22	9.70	10.06	10.23	10.32
Comb. Renewables & Wastes[2]		0.61	0.37	0.22	0.44	0.99	1.03	1.08
Nuclear		–	3.58	3.70	3.64	3.65	3.65	3.65
Hydro		0.01	0.02	0.02	0.02	0.02	0.02	0.02
Geothermal		–	–	–	–	–	–	–
Solar/Wind/Other[3]		–	–	–	–	–	–	–
Electricity Trade[5]		0.40	0.96	0.19	0.19	0.20	0.20	0.20
Shares (%)								
Coal		*37.1*	*21.5*	*17.8*	*17.2*	*15.4*	*17.0*	*18.9*
Oil		*38.5*	*29.9*	*26.5*	*27.6*	*27.4*	*27.6*	*27.3*
Gas		*19.6*	*31.3*	*39.6*	*38.3*	*38.6*	*37.5*	*36.3*
Comb. Renewables & Wastes		*2.9*	*1.3*	*0.9*	*1.8*	*3.8*	*3.8*	*3.8*
Nuclear		–	*12.6*	*14.3*	*14.4*	*14.0*	*13.4*	*12.9*
Hydro		–	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*
Geothermal		–	–	–	–	–	–	–
Solar/Wind/Other		–	–	–	–	–	–	–
Electricity Trade		*0.9*	*3.4*	*0.7*	*0.7*	*0.8*	*0.7*	*0.7*

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

Unit: Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	1996	1997	2000	2005	2010
TFC	**17.59**	**21.17**	**17.73**	**17.30**	**18.00**	**18.80**	**19.23**
Coal[1]	4.16	2.50	0.86	0.61	1.12	1.23	1.20
Oil	6.71	7.41	5.22	5.17	5.15	5.51	5.74
Gas	3.07	5.90	7.20	7.05	6.97	7.15	7.26
Comb. Renewables & Wastes[2]	0.61	0.36	0.22	0.44	0.87	0.91	0.94
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
Electricity	1.51	2.72	2.47	2.48	2.47	2.60	2.71
Heat	1.53	2.29	1.77	1.55	1.42	1.40	1.38
Shares (%)							
Coal	*23.6*	*11.8*	*4.9*	*3.5*	*6.2*	*6.5*	*6.2*
Oil	*38.1*	*35.0*	*29.4*	*29.9*	*28.6*	*29.3*	*29.8*
Gas	*17.5*	*27.9*	*40.6*	*40.8*	*38.7*	*38.0*	*37.8*
Comb. Renewables & Wastes	*3.5*	*1.7*	*1.2*	*2.5*	*4.8*	*4.8*	*4.9*
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
Electricity	*8.6*	*12.8*	*13.9*	*14.3*	*13.7*	*13.8*	*14.1*
Heat	*8.7*	*10.8*	*10.0*	*8.9*	*7.9*	*7.4*	*7.2*
TOTAL INDUSTRY[6]	**8.32**	**8.03**	**5.49**	**5.40**	**4.68**	**4.89**	**4.98**
Coal[1]	0.90	0.62	0.42	0.27	0.30	0.38	0.35
Oil	2.34	2.11	1.58	1.57	1.45	1.55	1.65
Gas	2.29	3.46	2.26	2.26	1.90	1.90	1.90
Comb. Renewables & Wastes[2]	0.14	–	–	0.09	–	–	–
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
Electricity	0.92	1.18	0.73	0.79	0.70	0.73	0.75
Heat	0.74	0.65	0.49	0.42	0.33	0.33	0.33
Shares (%)							
Coal	*22.8*	*7.8*	*7.7*	*5.0*	*6.4*	*7.8*	*7.0*
Oil	*28.1*	*26.3*	*28.8*	*29.1*	*31.0*	*31.7*	*33.1*
Gas	*27.5*	*43.1*	*41.2*	*41.8*	*40.6*	*38.9*	*38.2*
Comb. Renewables & Wastes	*1.7*	–	–	*1.7*	–	–	–
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
Electricity	*11.1*	*14.7*	*13.3*	*14.7*	*15.0*	*14.9*	*15.1*
Heat	*8.8*	*8.1*	*9.0*	*7.7*	*7.1*	*6.7*	*6.6*
TRANSPORT[7]	**2.37**	**3.15**	**2.72**	**2.85**	**2.73**	**2.94**	**3.07**
TOTAL OTHER SECTORS[8]	**6.90**	**9.99**	**9.53**	**9.05**	**10.59**	**10.97**	**11.18**
Coal[1]	1.88	1.88	0.44	0.34	0.82	0.85	0.85
Oil	2.45	2.25	1.01	0.85	1.05	1.10	1.10
Gas	0.78	2.44	4.94	4.79	5.07	5.25	5.36
Comb. Renewables & Wastes[2]	0.47	0.36	0.22	0.34	0.87	0.91	0.94
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
Electricity	0.42	1.43	1.65	1.60	1.69	1.79	1.88
Heat	0.80	1.63	1.27	1.13	1.09	1.07	1.05
Shares (%)							
Coal	*27.3*	*18.8*	*4.6*	*3.8*	*7.7*	*7.7*	*7.6*
Oil	*35.5*	*22.5*	*10.6*	*9.4*	*9.9*	*10.0*	*9.8*
Gas	*11.3*	*24.4*	*51.9*	*52.9*	*47.9*	*47.9*	*47.9*
Comb. Renewables & Wastes	*6.8*	*3.6*	*2.3*	*3.8*	*8.2*	*8.3*	*8.4*
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
Electricity	*7.5*	*14.3*	*17.3*	*17.7*	*16.0*	*16.3*	*16.8*
Heat	*11.5*	*16.3*	*13.4*	*12.5*	*10.3*	*9.8*	*9.4*

Unit: Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	1996	1997	2000	2005	2010
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**6.41**	**10.54**	**10.56**	**10.21**	**10.68**	**11.18**	**11.96**
OUTPUT (Mtoe)	**1.52**	**2.45**	**3.02**	**3.04**	**3.12**	**3.29**	**3.47**
(TWh gross)	17.64	28.44	35.09	35.40	36.30	38.30	40.33
Output Shares (%)							
Coal	*69.9*	*32.4*	*29.0*	*29.8*	*25.9*	*29.8*	*32.7*
Oil	*15.0*	*4.5*	*12.8*	*15.3*	*16.3*	*15.4*	*14.6*
Gas	*14.5*	*14.1*	*17.1*	*14.8*	*18.4*	*17.4*	*17.1*
Comb. Renewables & Wastes	–	–	–	–	*0.3*	*0.4*	*0.3*
Nuclear	–	*18.3*	*40.4*	*39.5*	*38.6*	*36.6*	*34.7*
Hydro	*0.6*	*0.6*	*0.6*	*0.6*	*0.6*	*0.5*	*0.5*
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
TOTAL LOSSES	**4.32**	**7.73**	**7.75**	**7.57**	**8.09**	**8.48**	**9.17**
of which:							
Electricity and Heat Generation[10]	3.36	5.81	5.77	5.62	5.97	6.32	6.94
Other Transformation	0.11	0.12	0.08	0.05	0.15	0.15	0.15
Own Use and Losses[11]	0.86	1.80	1.90	1.90	1.97	2.01	2.08
Statistical Differences	**–0.60**	**-0.44**	**0.32**	**0.44**	**–**	**–**	**–**

INDICATORS

	1973	1990	1996	1997	2000	2005	2010
GDP (billion 1990 US$)	24.18	35.78	32.16	33.64	36.75	42.61	49.39
Population (millions)	10.43	10.37	10.19	10.16	10.00	9.70	9.50
TPES/GDP[12]	0.88	0.80	0.80	0.75	0.71	0.64	0.57
Energy Production/TPES	0.60	0.50	0.50	0.50	0.46	0.44	0.36
Per Capita TPES[13]	2.04	2.75	2.53	2.49	2.61	2.81	2.99
Oil Supply/GDP[12]	0.34	0.24	0.21	0.21	0.19	0.18	0.16
TFC/GDP[12]	0.73	0.59	0.55	0.51	0.49	0.44	0.39
Per Capita TFC[13]	0.69	2.04	1.74	1.70	1.80	1.94	2.02
Energy-related CO_2 Emissions (Mt CO_2)[14]	64.2	68.1	60.3	58.2	58.6	62.5	66.5
CO_2 Emissions from Bunkers (Mt CO_2)	–	–	–	–	–	–	–

GROWTH RATES (% per year)

	73–79	79–90	90–96	96–97	97–00	00–05	05–10
TPES	4.9	0.0	–1.6	–1.9	1.0	0.9	0.8
Coal	1.2	–3.0	–4.7	–5.3	–2.7	2.9	3.0
Oil	5.7	–2.6	–3.6	1.9	0.9	1.0	0.6
Gas	10.0	1.7	2.3	–5.2	1.2	0.3	0.2
Comb. Renewables & Wastes	–0.3	–4.4	–7.8	97.8	30.7	0.8	0.1
Nuclear	–	–	0.5	–1.5	0.1	–	–
Hydro	6.3	1.3	3.1	5.6	1.7	–	–
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
TFC	4.1	–0.5	–2.9	–2.4	1.3	0.9	0.5
Electricity Consumption	6.0	2.2	–1.6	0.5	–0.1	1.0	0.8
Energy Production	2.5	–0.3	–1.6	–1.0	–2.1	0.1	–3.4
Net Oil Imports	7.1	–3.8	–4.9	11.7	2.4	1.2	2.0
GDP	4.3	1.3	–1.8	4.6	3.0	3.0	3.0
Growth in the TPES/GDP Ratio	0.6	–1.3	0.1	–6.2	–1.9	–2.0	–2.1
Growth in the TFC/GDP Ratio	–0.1	–1.8	–1.2	–6.7	–1.6	–2.1	–2.5

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, except for Finland, Ireland and Sweden. In these three cases, peat is shown separately.
2. Comprises solid biomass and animal products, gas/liquids from biomass, industrial waste and municipal waste. Data are often based on partial surveys and may not be comparable between countries.
3. Other includes tide, wave and ambient heat used in heat pumps.
4. Total net imports include combustible renewables and waste.
5. Total supply of electricity represents net trade. A negative number indicates that exports are greater than imports.
6. Includes non-energy use.
7. Includes less than 1% non-oil fuels.
8. Includes residential, commercial, public service and agricultural sectors.
9. Inputs to electricity generation include inputs to electricity, CHP and heat plants. Output refers only to electricity generation.
10. Losses arising in the production of electricity and heat at public utilities and autoproducers. For non-fossil-fuel electricity generation, theoretical losses are shown based on plant efficiencies of 33% for nuclear, 10% for geothermal and 100% for hydro.
11. 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.
12. Toe per thousand US dollars at 1990 prices and exchange rates.
13. Toe per person.
14. "Energy-related CO_2 emissions" specifically means CO_2 from the combustion of the fossil fuel components of TPES (i.e. coal and coal products, peat, crude oil and derived products and natural gas), while CO_2 emissions from the remaining components of TPES (i.e. electricity from hydro, other renewables and nuclear) are zero. Emissions from the combustion of biomass-derived fuels are not included, in accordance with the IPCC greenhouse gas inventory methodology. TPES, by definition, excludes international marine bunkers. INC-IX decided in February 1994 that emissions from international marine and aviation bunkers should not be included in national totals but should be reported separately, as far as possible. CO_2 emissions from bunkers are those quantities of fuels delivered for international *marine* bunkers and the emissions arising from their use. Data for deliveries of fuel to international *aviation* bunkers are not generally available to the IEA and as a result, these emissions have not been deducted from the national totals. Projected emissions for oil and gas are derived by calculating the ratio of emissions to energy use for 1997 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.

B

ANNEX

INTERNATIONAL ENERGY AGENCY "SHARED GOALS"

The Member countries* of the International Energy Agency (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

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

IEA Members wish to retain and improve the nuclear option for the future, at the highest available safety standards, because nuclear energy does not emit carbon dioxide. Renewable sources will also have an increasingly important contribution to make.

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.)

C

ANNEX

GLOSSARY AND LIST OF ABBREVIATIONS

In this report, abbreviations are substituted for a number of terms used within the International Energy Agency. While these terms generally have been written out on first mention and abbreviated subsequently, this glossary provides a quick and central reference for many of the abbreviations used.

AC	alternating current.
ÁPV Rt.	Hungarian State Privatisation and Holding Company.
ÁV Rt.	Hungarian State Asset Management Company.
ÁVÜ Rt.	Hungarian Sate Property Agency.
bcm	billion cubic metres.
b/d	barrels per day.
cal	calorie.
CCGT	combined-cycle gas turbine.
CENTREL	the association for the co-ordination of Polish, Czech, Slovak and Hungarian electric power companies.
CERT	Committee on Energy Research and Technology of the IEA.
CFCs	chlorofluorocarbons.
CHP	combined production of heat and power; sometimes, when referring to industrial CHP, the term "co-generation" is used.
CIS	Council of Independent States, an association of the successor nations to the Soviet Union.
CO	carbon monoxide.
COMECON	Council of Mutual Economic Assistance.
CO_2	carbon dioxide
DC	direct current.
DH	district heating.
DSO	distribution system operator.
ECU	European Currency Unit.
EFTA	Europe Free Trade Association: Iceland, Norway, Switzerland and Liechtenstein.
EIA	environmental impact assessment.

ESCP	Energy Savings Credit Programme.
EU	The European Union, whose members are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom.
Euro	European currency (€).
FCCC	Framework Convention on Climate Change.
Forint	Hungarian currency (HUF). One Hungarian forint corresponded to US$ 0.005 and to Euro (€) 0.004 in 1998.
FSU	former Soviet Union.
GCARF	German Coal Aid Revolving Fund.
GDP	gross domestic product.
GEF	Global Environmental Facility.
GJ	gigajoule, or 1 joule × 10^9.
GW	gigawatt, or 1 watt × 10^9.
HAEA	the Hungarian Atomic Energy Authority.
HAG	the Hungary-Austria gas pipeline, linking Győr in Hungary and Baumgarten in Austria.
HEECP	Hungarian Energy Efficiency Co-financing Programme.
HUF	Hungarian forint. See Forint.
IAEA	International Atomic Energy Agency.
IEA	International Energy Agency whose Members are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, the United States.
IPCC	International Panel on Climate Change.
IPS/UPS	United Power System/Integrated Power System, the integrated electricity transmission grid of the former Soviet Union.
ISO	independent system operator.
J	joule; a joule is the work done when the point of application of a force of one newton is displaced through a distance of one metre in the direction of the force (a newton is defined as the force needed to accelerate a kilogram by one metre per second). In electrical units, it is the energy dissipated by one watt in a second.
kV	kilovolt, or one volt × 10^3.

kWh	kilowatt-hour, or one kilowatt × one hour, or one watt × one hour × 10^3.
LDC	local distribution companies.
LNG	liquefied natural gas.
LPG	liquefied petroleum gas; refers to propane, butane and their isomers, which are gases at atmospheric pressure and normal temperature.
mcm	million cubic metres.
MEH	Magyar Energia Hivatal, the Hungarian Energy Office.
MOL Rt.	Magyar Olaj- és Gázipari Részvénytársaság, Hungarian Oil and Gas Company.
Mt	million tonnes.
Mtoe	million tonnes of oil equivalent; see toe.
MVM Rt.	Magyar Villamos Művek Részvénytársaság, Hungarian Electricity Companies Ltd.
MW	megawatt of electricity, or 1 Watt × 10^6.
MWh	megawatt-hour = one megawatt × one hour, or one watt × one hour × 10^6.
NATO	the North Atlantic Treaty Organisation.
NEA	the Nuclear Energy Agency of the OECD.
NO_x	nitrogen oxides.
OECD	Organisation for Economic Co-operation and Development.
OKGT	Országos Kőolaj- és Gázipari Tröszt, the Hungarian Oil and Gas Board.
OMFB	Országos Műszaki Fejlesztési Bizottság, the National Board for Technological Development.
PJ	petajoule, or 1 Joule × 10^{15}.
ppm	parts per million.
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.
PPP	Pilot Panel Programme, a soft loan system for reconstruction of panel-built housing.
PRF	Phare Revolving Fund.
Puram	Public Agency for Radioactive Waste Management.
R&D	research and development, especially in energy technology; may include the demonstration and dissemination phases as well.

SB	Single Buyer
SLT	Standing Group on Long-Term Co-operation of the IEA.
SO_2	sulphur dioxide.
SZÉSZEK	the Hungarian Coal Mining Restructuring Centre.
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.
TOP	take-or-pay contract.
TPA	third party access.
TPES	total primary energy supply.
TSO	transmission system operator.
TW	terawatt, or 1 watt $\times 10^{12}$.
TWh	terawatt $\times$ one hour, or one watt $\times$ one hour $\times 10^{12}$.
UCPTE	Union pour la coordination de la production et de la transmission de l'énergie électrique.
UN	the United Nations.
VAT	value-added tax.
VOCs	volatile organic compounds.
VVER	Vodiano Vodianoi Energuyeticheski Reaktor, Russian-design PWR.
WANO	World Association of Nuclear Operators.
WTO	World Trade Organisation.