INTERNATIONAL ENERGY AGENCY

Energy Policies of IEA Countries

HUNGARY

2003 Review

OECD

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9, rue de la Fédération,
75739 Paris, cedex 15, France

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

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

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

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

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

Pursuant to Article 1 of the Convention signed in Paris on 14th December 1960, and which came into force on 30th September 1961, the Organisation for Economic Co-operation and Development (OECD) shall promote policies designed:

- to achieve the highest sustainable economic growth and employment and a rising standard of living in member countries, while maintaining financial stability, and thus to contribute to the development of the world economy;
- to contribute to sound economic expansion in member as well as non-member countries in the process of economic development; and
- to contribute to the expansion of world trade on a multilateral, non-discriminatory basis in accordance with international obligations.

The original member countries of the OECD are Austria, Belgium, Canada, Denmark, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The following countries became members subsequently through accession at the dates indicated hereafter: Japan (28th April 1964), Finland (28th January 1969), Australia (7th June 1971), New Zealand (29th May 1973), Mexico (18th May 1994), the Czech Republic (21st December 1995), Hungary (7th May 1996), Poland (22nd November 1996), the Republic of Korea (12th December 1996) and Slovakia (28th September 2000). The Commission of the European Communities takes part in the work of the OECD (Article 13 of the OECD Convention).

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SUMMARY

The aim of Hungary's energy policy is to strike a balance between energy security, economic efficiency and environmental protection, in line with the IEA Shared Goals. In 1999, the "Hungarian Energy Policy Principles and the Business Model of the Energy Sector" (Resolution 2199/1999 VIII. 6) was published. This document promoted the following policy principles and objectives:

- Creation of an efficient domestic energy market functioning as an integral part of the single European energy market, but respecting national particularities, serving both economic competition and consumer protection.
- Preservation and augmentation of the security of energy supply.
- Enforcement of environmental protection requirements on both future developments and existing generating and energy-consuming plants.
- Improvement of public scrutiny and information, democratic control and, for the remaining monopolies, transparent price regulation.

Hungary continued its remarkable progress in energy market liberalisation since the last In-depth Review, creating the conditions for an electricity market to develop on similar grounds as in other European countries, and paving the way for a natural gas market. A new Electric Power Act was passed in December 2001, introducing competition into the restructured power industry and making Hungarian legislation in this area compatible with EU directives. In 2003, the Hungarian electricity retail market will be partially opened to competition and then gradually fully opened by the time Hungary is admitted to the European Union (EU). A new gas law is being discussed and will probably be approved in 2003. This law will pursue the liberalisation of the gas sector, with an initial opening of the gas market to 25% of gas consumption, creating a new gas pricing mechanism and discontinuing the practice of setting prices for gas produced in Hungary. The government deserves full credit for its determination to pursue reforms. While the strong driving force in energy policy has clearly been the need to conform to the *acquis communautaire*[1] given the prospect of EU accession, it is also a step towards a more efficient energy system.

1. The *acquis communautaire* is a term used to designate the current state of EU legislation and procedures.

Despite these positive developments, Hungary faces a number of challenges. In the electricity sector, it needs to ensure that the state electricity generation and grid company (MVM) does not cause market distortions given its importance in the market. In particular, existing long-term contracts of MVM should be monitored, since the company has access to low-cost nuclear facilities, influencing effective competition. The independent system operator (MAVIR) was established in 2002, but the ownership of transmission lines remains with MVM. MAVIR's responsibilities need to be further strengthened. Capacity and transmission constraints are also causes of concern. Hungary is likely to encounter capacity constraints around 2005 when some of the old coal-fired plants will be closed in line with EU environmental directives. There could also be severe congestion in the interconnection between the Slovak Republic and Hungary. The government will need to monitor generation, transmission and interconnection capacities.

Security of natural gas supply is vital for Hungary given the high share of natural gas in the energy mix. It is therefore commendable to strive to open the Hungarian upstream market to increase indigenous gas production and facilitate competition. Domestic production prospects could be limited, because of uncertainties concerning the regulation of the natural gas market given the delayed implementation of the proposed Gas Act. The act should be adopted and implemented as quickly as possible. Limited gas-to-gas competition due to the strong dominance of Russian gas, uncertain future gas demand given uncertain electricity demand and the oligopolistic structure of gas distribution companies are fundamental constraints to the development of strong and healthy competition in the Hungarian natural gas market. The appropriate authorities, including the Hungarian Energy Office (MEH), should monitor the development of the gas market, in particular the implication of existing take-or-pay (TOP) contracts, limited sources of supply and interaction with stranded costs as market conditions develop.

While the new legislation has increased MEH's independence, key pricing decisions for non-eligible consumers are still a government responsibility. Despite recent efforts for prices better to reflect costs, a policy to keep energy prices low for certain categories of consumers for social reasons still exists. This policy has various harmful effects, such as discouraging energy saving and distorting fuel choices. Furthermore, low prices have discouraged investment by domestic energy firms such as MVM and the Hungarian oil and gas company (MOL) because the policy has caused financial losses and rendered economic viability of new investment uncertain. This could have serious implications for energy security. The government should provide a clear timetable with milestones for price increases to market levels for gas and electricity. To avoid possible conflicts of interest, it should give full responsibility to the MEH, not only to calculate prices, but also to set them.

As in many other transition countries, Hungary's energy policy has for a long time focused on the expansion of energy supply, while paying little attention to costs and economic efficiency. During the past decade, the government increased its emphasis on the demand side, but its primary focus remains largely on the supply side, *i.e.* securing supply, introducing competition in the energy markets and diversifying energy sources. Weak emphasis on the energy demand side could be problematic in the future. Final energy consumption has been quite stagnant in past years, largely because of economic restructuring, during which several energy-intensive industries shrunk and less energy-intensive industries emerged and grew. Economic restructuring is likely to slow down, which will lead to growth in final energy consumption, following a gradual increase of GDP per capita. In the future, some specific sectors of the Hungarian economy will require more focus on increased energy efficiency, in particular the building sector, small and medium-sized enterprises and the transport sector.

Renewable energy potential, though limited, largely remains to be developed in Hungary. Significant near-term potential lies in bioenergy resources and renewable municipal wastes for electricity and heat production, and in geothermal energy for heat. However, current grants and funds without clear technology or market priority may eventually support technologies that have little economic relevance in Hungary. Similarly, the use of a single feed-in tariff for electricity generated from renewable sources may end up supporting relatively high-cost renewable energy options while generating rents for lower-cost options. The current policy framework for renewables will need to be improved to better reflect cost-effectiveness.

RECOMMENDATIONS

The government of Hungary should:

General Energy Policy

- *Establish an indicative timetable for price increases to market levels for gas and electricity for non-eligible consumers.*
- *Address social hardship through social policy measures, not through energy prices.*
- *Establish a timetable for handing price control responsibilities to the MEH.*
- *Ensure that the Directorate-General for Energy is adequately staffed and has sufficient resources to administer the energy market liberalisation process.*

- *Organise, in a transparent fashion, the contributions of the different representative bodies of consumers of the network industries (electricity, gas, district heating) to avoid any risk that certain groups of consumers would have a favoured position in influencing government policy.*

- *Define a timetable to improve energy quality and reduce technical and non-technical losses.*

- *Devise indicators for monitoring the quality of energy supply (electricity, gas), in co-operation with all the energy stakeholders.*

- *Design and implement a system of improved measures (detection and sanctions or penalties) against electricity pilferage.*

Energy Efficiency

- *Continue to strengthen the close co-ordination among all energy efficiency plans involving national, European and international institutions to make optimal use of such expertise and funding.*

- *Provide the Energy Centre with an adequate budget, staff and executive powers to allow it to fulfil its tasks at both national and international levels.*

- *Investigate through the MEH and the Hungarian Competition Office whether heat prices are being set on a reasonable cost-reflective basis and, if not, devise and implement an appropriate solution to avoid price distortions between heat and power that would negatively affect investment in and modernisation of combined heat and power (CHP) and district heating systems.*

- *Give priority to strengthening energy efficiency in the building sector through the implementation of EU regulations on energy-efficiency standards in the household sector, improve and enforce the mandatory thermal insulation standards and strengthen the programme for retrofitting the energy-inefficient housing stock.*

- *Strengthen energy audits in industry (including small and medium-sized enterprises), and measures to encourage the audited enterprises to implement recommended cost-effective measures.*

- *Establish and implement a comprehensive long-term energy efficiency Transport Plan with clear objectives supported by adequate cost-effective measures and investments funded over the long term to limit the growth of road transport. Include measures to stimulate investment in public transport, on driver behaviour (car labelling for example) and on the diffusion of cleaner fuels and low-emission vehicles.*

- *Strengthen the appropriate measures and capacities to carefully monitor and assess all the energy efficiency programmes and measures, and adjust them according to the changing economic context.*

Energy and the Environment

- *Establish a clear institutional framework for Joint Implementation (JI) projects to facilitate access of foreign investors and minimise transaction costs. Consider whether to use the existing emissions trading surplus under the Kyoto Protocol to encourage early investment in JI projects.*
- *Consider broader participation in international emissions trading under the Kyoto Protocol and how the government can improve Hungary's environmental performance,* e.g. *through financing additional projects to reduce greenhouse gas emissions.*
- *Define a timetable for joining an emissions trading regime.*
- *Maximise transparency on environmental issues to encourage public acceptance.*
- *Continue to seek improvements in local pollutant emissions levels.*

Renewable Energy

- *Create a roadmap for renewable energy resource development, highlighting economic potential in priority technologies.*
- *Evaluate the added value of expanding technology co-operation through the IEA Implementing Agreements.*
- *Anticipate that the future level of support will gradually decline as viable technologies are identified and sustainable markets are developed.*
- *Work towards the introduction and development of market-oriented policy instruments as the mainstream for cost-effective exploitation of renewables.*

Fossil Fuels

Oil

- *Make sure that the relevant competition authorities continue to monitor whether oligopoly is developing in the regional market and if there is a need for regulatory action.*
- *Consider reducing the price distortion created by the relatively high excise duty on light fuel oil in order to diversify energy supplies for heating.*

- *Ensure the implementation of the law requiring that MOL submit the necessary data for the reporting requirement under international commitments.*

Gas

- *Adopt the proposed Gas Act as soon as possible to implement a stable regulatory tax and pricing regime as a means to reduce uncertainties for all market participants, including domestic gas producers.*

- *Price all gas in the wholesale market on a market-related basis.*

- *If the government decides to impose an "excess profits tax" to capture, for the public benefit, excess profits derived from gas production at facilities that have been fully written down, ensure that such a tax only captures genuine "excess" profits.*

- *Continue to monitor the effects on competition of existing TOP contracts, limited sources of supply and interaction with stranded costs.*

- *Set up the conditions to facilitate the decision by MOL (or others) to install additional gas storage facilities, keep this option under review in consultation with the MEH and allow tariffs to reflect storage costs.*

- *Address the social consequences of bringing gas prices to market-related levels through targeted social policy measures.*

- *Develop a contingency plan for possible supply disruption, to ensure that appropriate co-ordinated emergency arrangements are put in place to avoid gas supply shortfalls, and for the safe reconnection of consumers in the event of a gas supply shortfall.*

Electricity and Nuclear

Electricity

- *Give MAVIR more extensive responsibilities in the management and operation of the network and strengthen MAVIR's responsibilities as an independent system operator.*

- *Ensure that balancing services provided by MAVIR are priced on a competitive basis.*

- *Ensure that appropriate arrangements are made for MAVIR to monitor the adequacy of the transmission network cross-border interconnection capacity.*

- *Monitor the development of competition to avoid excess market power exerted by companies through long-term contracts.*

- *Address the problem of electricity pilferage.*
- *Review the arrangements for price caps as a means of price regulation, ensuring that social objectives are pursued through means other than energy prices.*
- *Strengthen the MEH's autonomy in regulating electricity.*

Nuclear

- *Take decisions on the nuclear waste disposal framework as soon as possible, consistent with a full safety assessment.*
- *Continue to ensure a high level of safety and maintain public confidence in nuclear plant operations, by securing the independent position of the Hungarian Atomic Energy Authority (HAEA) to regulate nuclear safety.*
- *Take the necessary steps to separate the management of the Public Agency for Radioactive Waste Management (PURAM) from HAEA in order to clarify the relationship between the safety regulator and the licensee.*

Research, Development and Demonstration

- *Design and implement a comprehensive energy RD&D strategy integrating the existing fragmented programmes and clearly setting priorities.*
- *Consider joining IEA Implementing Agreements.*

ORGANISATION OF THE REVIEW

REVIEW TEAM

An IEA review team visited Hungary in October 2002 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 official Hungarian government's response to the IEA 2002 policy questionnaire, and the views expressed by various parties during the visit. Pierre Audinet managed the review process and is the main author of this report. The team greatly appreciated the openness and co-operation shown by everyone it met.

The members of the team were:

Mr. John Havard
(Team Leader)
Assistant Director
Energy Markets Unit
Department of Trade and Industry
United Kingdom

Mrs. Helen Gratsia
Head of Energy Statistics Section
Energy Policy Directorate
Ministry of Development
Greece

Mrs. Karina Veum
Adviser, Energy Section
Ministry of Petroleum and Energy
Norway

Mr. Timo Haapalehto
Administrator
OECD Nuclear Energy Agency

Mr. Olivier Appert
Director, Long-Term Co-operation
and Policy Analysis Office
International Energy Agency

Mr. Alain Bilot
Administrator, Energy Efficiency
Policy Analysis Division
International Energy Agency

Mr. Pierre Audinet
(Hungary Desk Officer)
Administrator
Country Studies Division
International Energy Agency

ORGANISATIONS VISITED

The team held discussions with representatives of the following organisations:

Association for the Protection of Consumers (OFE), www.ofe.hu

Association of Gas Distribution Companies (GE), www.hungas.hu

Association of Hungarian Energy Consumers (MESZ)

Budapest Electricity (ELMÜ), www.elmu.hu
Clean Air Group (Levegö Munkacsoport), www.levego.hu
Coal Mining Restructuring Centre (SZÉSZEK), www.szeszek.hu
E.ON Hungária, www.eon-hungaria.hu
El Paso Hungary (EL-PASO)
Energy Centre (Energia Központ), www.energycentre.hu
Energy Club (Energia Klub), www.energiaklub.hu
Hungarian Association of Electricity Distributors (MÁE)
Hungarian Atomic Energy Authority (HAEA), www.haea.gov.hu
Hungarian Competition Office (GVH), www.gvh.hu
Hungarian District Heating Association (MATA'SZSZ)
Hungarian Energy Office (MEH), www.eh.gov.hu
Hungarian Petroleum Association, www.petroleum.hu
Industrial Energy Consumers' Forum (IEF), www.ief.hu
Institute for Electric Power Research (VEIKI), www.veiki.hu
MAVIR, www.mavir.hu
Ministry of Agriculture, www.fvm.hu
Ministry of Economy and Transport, www.gkm.hu
Ministry of Education, www.om.hu
Ministry of Environment and Water, www.kvvm.hu
MOL, www.mol.hu
MVM, www.mvm.hu
North-Transdanubian Gas Supply Corporation (ÉGÁZ)
Paks Nuclear Power Plant, www.npp.hu
Public Agency for Radioactive Waste Management (PURAM), www.rhk.hu
World Wide Fund Hungary, www.wwf.hu

GENERAL ENERGY SCENE AND ENERGY POLICY

OVERVIEW

Hungary is a landlocked country in the centre of Europe. It borders on Austria, Croatia, Romania, Serbia and Montenegro, the Slovak Republic, Slovenia and Ukraine and has a surface area of 93 000 km^2. The country has a temperate climate.

Hungary transitioned from a communist state to a democracy relatively smoothly and held its first free, multi-party parliamentary election in March 1990. Prior to this important change, Hungary had already led significant market reforms that provided a competitive edge to its economy. Hungary's infrastructure, particularly that of the energy sector, has features that date back to the time it was a communist state within the Council of Mutual Economic Assistance (COMECON), when the focus was on developing large collective energy delivery systems to facilitate energy access rather than on efficiency or cost. The first post-communist government encountered problems in the transition to a market-based economy. Real gross domestic product (GDP) fell by about 18% from 1990 to 1993 and industrial output also shrank, while foreign debt, current account deficit and budget deficit rose to high levels. Inflation increased and consequently price controls became a major focus of the government's macroeconomic policy. In 1995, the government instituted an austerity and privatisation programme and a new export-promoting foreign exchange regime to reduce the debt and deficit levels. By 1997, the country's finances were solid; Hungary had repaid all of its debts to the International Monetary Fund (IMF) and no longer required its assistance. Hungary had also developed close political and economic ties to the rest of Europe. It joined NATO in 1999. Breaking away from the COMECON signified a re-direction of Hungary's external trade flows, clearly noticeable in the shift in export shares, declining towards Russia and growing towards western European countries.

Hungary is part of the Visegrád Group formed in 1991 to facilitate co-operation among a few central European countries on issues pertaining to European integration[2]. Hungary has been a front runner in the future expansion of the EU. The talks preceding EU accession have been progressing in line with

2. The name of this group was chosen by Václav Havel, President of the then Czechoslovakia, József Antall, Prime Minister of Hungary, and Lech Walesa, President of Poland, during a meeting that took place in Visegrád, Hungary on 15 February 1991. During the meeting the leaders signed a declaration on close co-operation of the three (today four) countries that were on their way to European integration. After the collapse of the communist regime, their co-operation was important for the transition from a totalitarian regime to a free, pluralistic and democratic society.

Figure 1

Map of Hungary

the "road map" marked out by the European Commission for 2004 accession. Hungary has complied with the *acquis communautaire* including the section on energy.

Table 1

General Economic Features, 1997 to 2001

	1997	*1998*	*1999*	*2000*	*2001*
GDP at market prices (HUF billion)[3]	8 540.7	10 087.4	11 393.5	13 150.8	14 876.4
GDP (US$ billion using market exchange rate)	45.7	47	48	46.5	51.9
Real GDP growth (%)	4.6	4.9	4.2	5.2	3.8
Consumer price inflation (average; %)	18.3	14.1	10	9.8	9.2
Population (million)	10.2	10.2	10.1	10.0	10.0

Source: OECD, *National Accounts*.

While GDP declined substantially between 1990 and 1993, it grew substantially thereafter. In the OECD *Economic Survey of Hungary 2002,* Hungary is referred to as one of the fastest growing OECD economies, with GDP having expanded at an average annual rate of 4.5% between 1997 and 2001 while unemployment fell from 8.9% to 5.8% during the same period. Despite rapid output growth, consumer price inflation decelerated between 1997 and 2001 from 18% to 9% and the current account deficit was reduced. From the second half of 2001, the economy faced its first endogenous slow-down of the post-transition period, made more severe by the slow-down in world economic growth, while a new exchange rate regime tightened monetary conditions in order to attain a more ambitious price reduction objective. Real annual GDP growth slowed to 2.9% in the first quarter of 2002 and inflation continued to decrease[4].

In 2001, Hungary's per capita GDP reached 52% of the OECD average. Hungary has modernised the supply side of its economy and improved its structural performance through successive macroeconomic reforms. Today, the principal policy challenge is to close as quickly as possible the large gap in living standards, as measured by GDP per capita, which separates Hungary from advanced OECD economies. The catch-up process was unleashed by bold structural reforms. Key factors of productivity advances included policies

3. Between 1999 and 2002, one Hungarian forint (HUF) averaged about US$ 0.004.
4. See OECD, *Economic Survey of Hungary 2002*, Paris.

that put strong pressure on firms to reduce costs, entailed a radical opening of the economy to foreign investment[5] and imports, and the establishment of a business-friendly environment with a reasonably flexible labour market. Productivity was subsequently enhanced by massive inflows of foreign direct investment that introduced best business practices, contributed significantly to capital formation in the private sector and upgraded labour skills.

In April 2002, a new government was elected. It rapidly drew up its macroeconomic strategy, emphasising a high degree of continuity with its predecessors' plans to reform the Hungarian economy. Having won the election against the background of a downturn in real GDP growth rates, the new administration set sustained growth of 5% to 6% as the long-term goal of its economic policy. Policies for industrial support, infrastructure development and public-sector reform are being designed to achieve this acceleration. The government also plans to implement measures to reduce the budget deficit. Its margins of manoeuvre to support economic growth through fiscal measures are limited by the need to virtually halve the yearly public deficit over the next four to five years if admission to the European Union (EU) Economic and Monetary Union (EMU) is to occur approximately two to three years after accession, in accordance with the government's stated goal. The new administration is pursuing the goal of harmonisation with EU law to improve the transparency and accuracy of public-sector accounting. By accelerating the adoption of EU (ESA-95) reporting rules, the main areas of expenditures that were previously concealed off-budget have been brought on-budget. For example, it is now transparent that MVM is currently demanding extra subsidies to cover losses resulting from state-imposed caps on wholesale power prices, and may require ongoing funding for its Paks nuclear power plant.

ECONOMY, ENERGY SUPPLY AND DEMAND

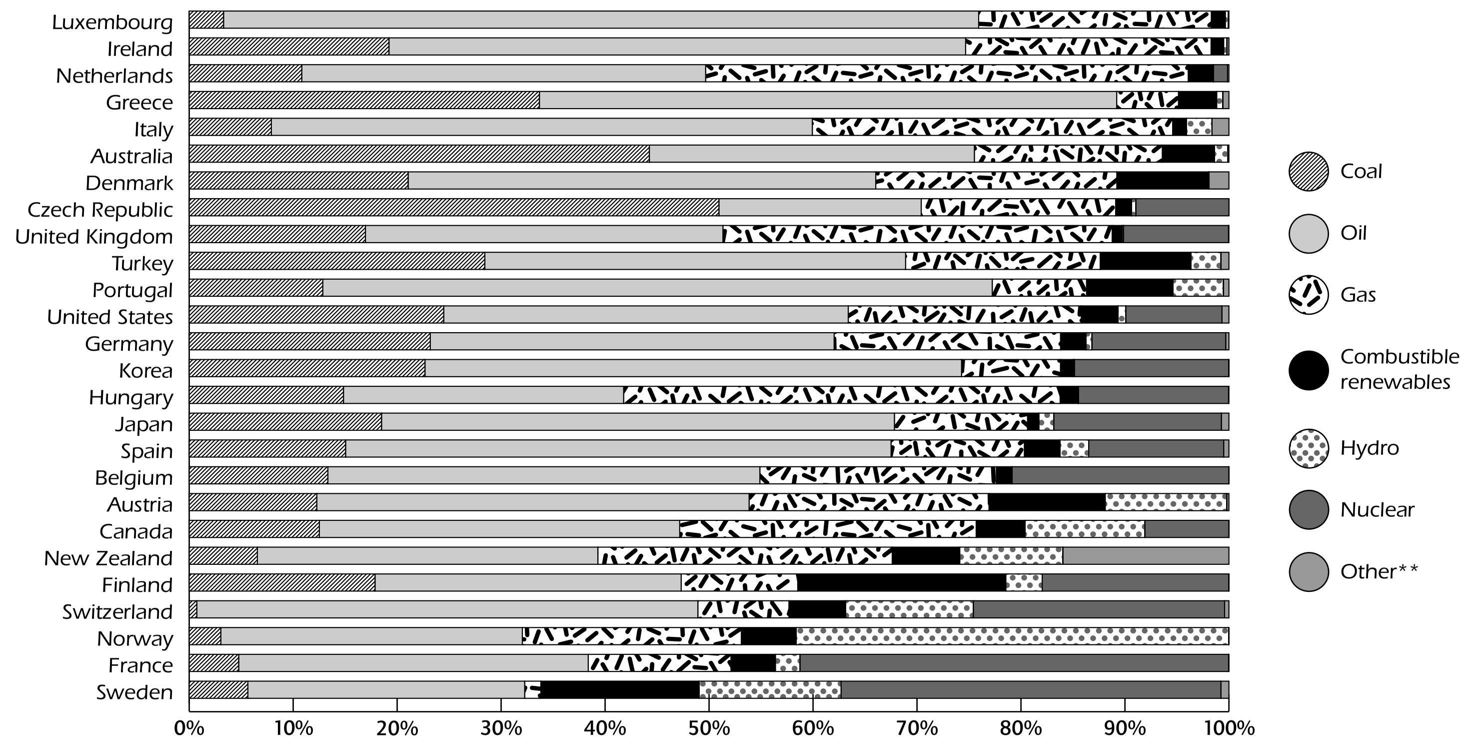
In 2000, Hungary's GDP measured by using constant 1995 purchasing power parities (PPPs) represented US$ 112.9 billion. It was a little smaller than Norway's (US$ 118 billion) and a bit larger than Ireland's (US$ 104 billion). Hungary is characterised by a slightly decreasing demographic trend. Its population reached 10 million inhabitants in 2000, similar to that of Portugal or Belgium. In 2001, GDP per capita grew to reach US$ 13 232 using PPP.

In 2000, the total primary energy supply (TPES) amounted to 24.8 Mtoe, equivalent to Portugal and a little below Norway. Hungary's TPES systematically decreased between 1990 and 2000, excepting the years 1995

5. At more than US$ 2 000 per capita in 2000, foreign direct investment inflow in Hungary is one of the highest in the region.

Figure 2

Total Primary Energy Supply in IEA Countries, 2001*



* preliminary data.

** includes solar, wind and ambient heat production

Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2002.

and 1996, at an average rate of –1.7% per annum. Between 1999 and 2000, TPES reduced by 1.6%, after two years of stagnation. The energy sector contributed 6.5% of the GDP in 2000.

Though energy supply in Hungary is fairly diversified, almost all of Hungary's TPES is derived from fossil fuels. In 2000, coal and oil represent large but gradually decreasing shares, equivalent to 16% and 28% respectively. Gas confirms its leading role with almost 40% of TPES in 2000. Nuclear remains important, accounting for 15% of the energy supply in 2000 and maintaining a large role in electricity supply. Combustible renewables and wastes (1.5% in 2000 against 1.2% in 1990) and hydro (stable at 0.1%) are negligible. Since 1990, almost all primary energies have decreased, the main change being a fall in coal use by more than 4% between 1990 and 2000.

In a scenario implementing policies to mitigate CO_2 emissions and promote energy diversification, the government projects primary energy supply to grow at an annual rate of approximately 1% between 2000 and 2020 to reach 27 Mtoe in 2010 and 29 Mtoe in 2020. By 2020, the share of coal is expected to decrease to 11%, oil to remain roughly stable at 31% and gas to grow slightly to 41%, while nuclear is expected to decrease to 13%.

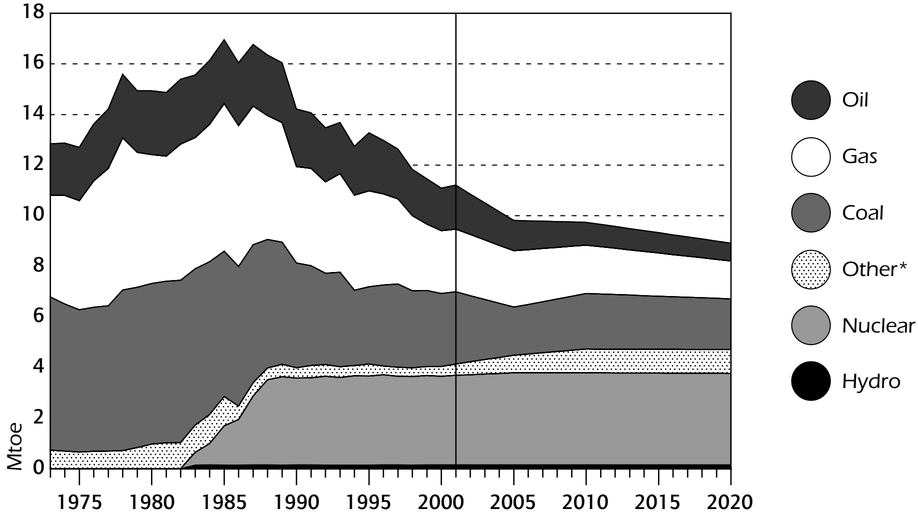
Hungary is a small producer of oil (34 kbd or 1.7 Mt in 2001 including condensate and natural gas liquids) and net dry gas (3.2 bcm in 2001, against 3.4 bcm in 1999). In 2000, Hungary imported 16 Mtoe, out of which 5.8 Mtoe was crude oil, 7.3 Mtoe was natural gas and 1.2 Mtoe was coal. During this period, Hungary exported a total of 2.4 Mtoe energy, of which 1.7 Mtoe of petroleum products and 0.5 Mtoe of electricity. In 2001, fuel and electricity represented 8.2% of imports and 1.9% of exports. Hungary's external energy dependency grew from 47% in 1994 to 56% in 2000[6].

The energy intensity of the Hungarian economy, measured as a ratio of TPES to GDP, improved between 1990 and 2000, from the tenth highest in OECD countries (lower than North America), at 0.27 toe per unit of GDP (in US$ 1995 PPP), to the thirteenth highest, at 0.22 toe per unit of GDP, roughly equivalent to the IEA average. In 2000, Hungary displayed one of the lowest energy supply per capita of OECD and IEA countries, with 2.5 toe versus the IEA average of 5.2 toe. With 0.13 toe of oil supply per thousand US dollars (1995) of GDP in 2000, Hungary had one of the highest oil intensity, largely above the IEA average of 0.08 toe and similar to Canada. However, oil supply measured per capita was among the lowest in IEA countries, with 0.7 toe in 2000. There are several reasons for these trends; the main one being an important change in GDP structure, with big investments made in light manufacturing industries (*e.g.* car assembling) substituting heavier industries, and efforts made to conserve energy and improve efficiency in the residential

6. Imports minus exports divided by TPES.

Figure 3

Energy Production by Source, 1973 to 2020

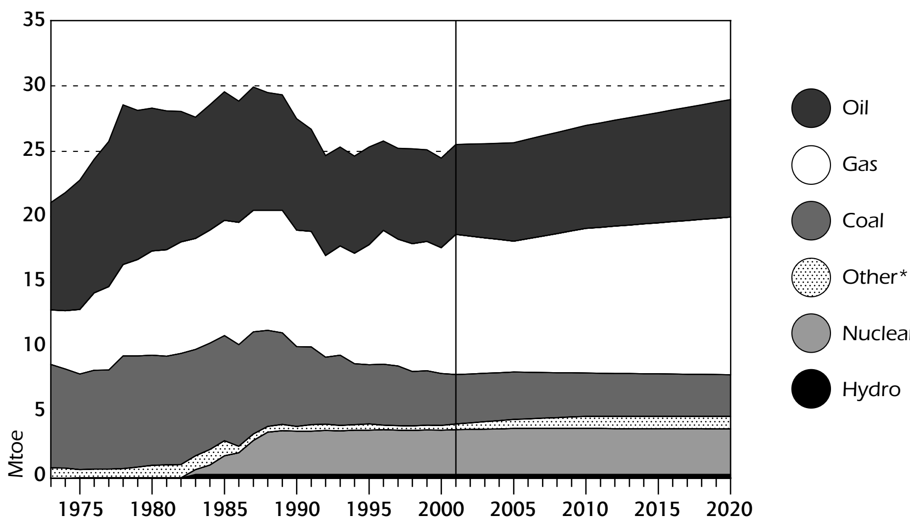


* includes geothermal, solar, wind, combustible renewables and wastes.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2002; and country submission.

Figure 4

Total Primary Energy Supply, 1973 to 2020



* includes geothermal, solar, wind, combustible renewables and wastes.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2002; and country submission.

and industry sectors. This resulted in an improvement in Hungary's ranking on an international scale of energy intensities measured as TPES per unit of GDP. However, since per capita energy consumption in Hungary is still relatively low, there is large scope for additional gains in actual energy efficiency.

Total final consumption (TFC), in line with TPES, displayed negative growth on average during the 1990s, at an annual rate of –2.2% (from 1990 to 2000). TFC decreased radically in the first half of the 1990s and almost stagnated during the second half. In 2000, TFC rebounded by 1.5%, reaching 17.4 Mtoe.

In 2000, transmission and distribution losses accounted for 17% of total final electricity consumption, against 7% on average for the IEA or the EU. These high losses affect the quality of electricity being delivered to final consumers.

ENERGY POLICY

Hungarian energy policy aims to maintain a balance between security of supply, cost-effective delivery of energy to the economy, energy efficiency and the environment. The Hungarian energy sector is still in transition and is expanding its energy markets with the perspective of becoming an EU member State.

The energy policy resolution adopted by the Hungarian Parliament in 1993 [21/1993(IV.9)OGY] outlines the following strategic objectives:

- Diversification of energy supplies and elimination of import dependence on the former Soviet Union (mainly Russia).
- Improved protection of the environment and pollution mitigation.
- Increased energy efficiency through the modernisation of supply structures and better management of electricity consumption.
- Improved public acceptance of new energy facilities through provision of better information to the general public.

The general aim of this resolution was to lay the foundations for an open energy economy, gradually being integrated in the EU. Between 1994 and 1996, three major pieces of legislation were adopted, which created the necessary conditions for privatisation of the incumbent energy public companies: (i) the Act on Gas Supply (1994), (ii) the Act on Producing, Transmitting and Distributing Electricity (1994), and (iii) the Act on Nuclear Energy (1996). The 1994 electricity and gas acts also established the Hungarian Energy Office (MEH) as the regulator of the energy sector (electricity and gas).

In 1999, a new set of policy principles was conceived and adopted by the government in consultation with private energy companies and energy consumers. The motivation was to outline the new medium-term objectives and to prepare a more detailed plan of action. The 1999 document entitled "Hungarian Energy Policy Principles and the Business Model of the Energy Sector" (Resolution 2199/1999 VIII.6) defined the following objectives:

- Creation of an efficient domestic energy market functioning as an integral part of the single European energy market, but respecting national particularities, serving both economic competition and consumer protection.
- Preservation and augmentation of the security of supply.
- Enforcement of environmental protection requirements on both future developments and existing generating and energy-consuming plants.
- Improvement of public scrutiny and information, democratic control and for the remaining monopolies, transparent price regulation.

The 1999 document defined a number of practical transitional measures to facilitate the emergence of a competitive energy market wherever competition remains to be developed (electricity and gas). Examples of these measures include the following:

- Bringing information to the market players on energy demand.
- Strengthening the regulatory authorities.
- Finding ways to solve possible conflicts arising from existing long-term power purchase contracts that are consistent with EU rules and consumer interests.
- Bringing energy prices in line with costs.

The 1999 document provided a detailed timetable for policy implementation of market liberalisation measures until 2002. Given that a detailed timetable of tasks related to EU accession could only be finalised once the precise date of accession to the EU was determined, the government only set general objectives for the period following 2002. Further steps and the full liberalisation of export-import rights were scheduled on the basis of competitive market experiences and the final date of accession. As a consequence of European integration, the 1999 document perceives that Hungary's energy supply security will be guaranteed beyond its national borders largely by the European energy market. For this reason the government places greater emphasis on nurturing the Hungarian energy sector's competitivity *vis-à-vis* Europe than on trying to reduce its external energy dependency through domestic production or conservation. However, specific measures to protect safety of supply are implemented sector-wise:

- For electricity, through Hungary's UCTE membership.

- For natural gas, through a relative diversification of supply origins, underground storage and a Winter Action Plan to handle domestic emergency disruptions in times of high demand.

- For crude oil, through diversification of supply and high oil stocks.

The 1999 document announced the establishment of a national programme for energy conservation and renewable energy sources that was adopted in 1999, the Energy Conservation and Energy Efficiency Improvement Action Programme (see below for more information on this programme).

The 1999 document stated as a central aspect of energy policy that "the internalisation of environment-related costs (...) must not exceed what the public can bear and must not threaten the international competitiveness of the economy". The government considers that environmental costs will principally be determined by new EU-harmonised legislation requirements.

The 1999 document and the need to conform with EU legislation and policy framework prior to accession brought about the following policy measures:

- A new Electric Power Act, passed in December 2001, introducing competition into the restructured power industry and making Hungarian legislation in this area compatible with EU law. The law was implemented from 2002. The Hungarian electricity retail market will be partially opened to competition in 2003 (see Chapter 8 on electricity and nuclear) and then gradually fully opened by the time Hungary is admitted to the EU.

- A new law on gas is being discussed and will probably be approved in 2003. This law will pursue the liberalisation of the gas sector, with an initial opening of the gas market to about 40% of gas consumption, creating a new gas pricing mechanism and discontinuing the practice of centrally setting prices for gas produced in Hungary. The new gas law could possibly come into effect by 1 January 2004.

- The oil emergency stockpiling law was amended in December 2001 to add an obligation to report information on oil and oil products to the IEA and EUROSTAT.

- Ratification of the Kyoto Protocol by the Hungarian Parliament on 16 July 2002.

The government elected in April 2002 committed itself to continue the reforms that were set out in the 1999 document. The principal institutions formulating and implementing energy policy have not changed from those found in the 1999 In-depth Review.

The Ministry of Economy and Transport, Directorate-General for Energy.

The three divisions of the Directorate-General for Energy that control the overall implementation and formulation of the energy policies are the following:

- *Supply:* oil, gas, coal, nuclear and mining.
- *Economy and regulation:* includes the legal office in charge of providing support to law design.
- *Energy co-ordination and efficiency:* international affairs, environment, efficiency and statistics.

The Directorate-General for Energy has a limited permanent staff of 18.

The Hungarian Energy Office (MEH).

It has become a large institution covering electricity, gas and also heat that is sold by power stations (with above 50 MW capacity) to district heating facilities. Regulation of district heating activities is otherwise the responsibility of the municipalities. The MEH has the following responsibilities:

- Licensing of companies operating on the gas and electricity markets.
- Calculating wholesale and end-user regulated gas and electricity prices and preparing the corresponding decrees that are signed by the Minister of Economy and Transport.
- Protecting consumers' interests.

The MEH is more independent than it used to be. It prepares an annual report to the Parliament, not the government. The president and vice-president have six-year mandates. They are chosen by the prime minister based on a proposal made by the Ministry of Economy and Transport. The current president of the MEH was chosen in February 2002. Decisions taken by the MEH can only be opposed by a court decision, except those related to energy prices, which can be opposed by the Ministry of Economy and Transport. Its financial independence is secured by a fee on energy prices decided by the Ministry of Economy and Transport and the Ministry of Finance. The MEH has an authorised staff of 88.

The Energy Centre covers energy efficiency and renewables (see details in Chapter 4 on energy efficiency).

Other public institutions with a role in energy and energy policy (see other chapters for more information on these institutions) include the following:

- Hungarian Atomic Energy Authority (HAEA) – regulates the use of the Paks nuclear power plant.
- Ministry of Environment and Water – manages the control and reduction of CO_2 and pollutants from the energy industry.
- Ministry of Education – controls the national committee that prepares all R&D decisions.
- Emergency Oil Stock Association – manages the development of strategic oil storage.
- Ministry of Agriculture – has a role in developing agro-industrial biofuels.
- Hungarian Competition Office (GVH) – monitors competition and mergers in the energy sector.
- Inter-Ministerial Committee on Energy Saving – allocates funds to energy-saving projects.

ENERGY SECURITY

Competitivity of the energy sector is a priority for the Hungarian government, but energy security is of particular interest given that for a long time the country was highly dependent on energy imports from only one country, Russia (previously the Soviet Union).

In 2000, Hungary imported 74% of its total supply of natural gas, the dominant fuel in its primary energy mix. This figure is expected to increase given that domestic production is unlikely to grow despite recent discoveries, while demand will probably continue to grow, although the pace of future growth is uncertain. All imported gas comes from Russia, although contracted supply companies have been diversified in recent years with around 8% of the imports being imported through contracts with German and French suppliers. Hungary has never experienced unexpected import cuts during several decades of purchasing gas from Russia (and previously the Soviet Union). The large volumes of Hungarian gas storage facilities, representing approximately 100 days of gas consumption, enhance natural gas security. This level of gas storage is relatively high by European standards; however, seasonality of demand imposes that gas stored is consumed – often entirely – in winter to satisfy peak demand.

The majority of Hungary's oil demand is met by imports. The percentage share of imports is expected to remain stable or climb as domestic production is stagnating and is not expected to grow, whereas demand could rise slightly, in particular to respond to the development of oil use in transport. Hungary imports crude oil only from Russia. However, its oil product imports are diversified, namely from the Czech Republic, Russia, the Slovak Republic and Ukraine. Hungary has never experienced unexpected cuts in its oil imports. Hungary's oil supply security is enhanced by its emergency preparedness measures, which are comprehensive and fully equipped to address short-term supply cuts. As of 1 October 2002, oil emergency stocks reached 200 days of 2001 net imports equivalent.

Today, Hungary has a substantial reserve margin of electricity generating capacity in excess of its peak demand for power. Hungary has substantial international transmission capacities that allow for imports or exports of power. The MEH, which oversees the liberalisation of the electricity market, anticipates no problems with the issue before 2005 when it will be necessary to retire some of the coal-fired plants. Hungary is highly dependent upon nuclear electricity (40%) that is produced in one plant. The possibility of having to stop this power plant for a period of time for unanticipated reasons may cause short-term problems in electricity supply, requiring substantial imports to compensate or pushing electricity prices up.

ENERGY PRICES

Gasoline and diesel prices are generally similar to those practised in Europe. However, electricity and gas prices for households are lower than in the rest of OECD Europe, principally because of government intervention to keep nominal prices relatively low for social reasons. Alternatively, prices of light fuel oil sold to industry are much higher than in the rest of Europe given that this product has long been taxed to avoid it being used illegally as a substitute for automotive diesel.

Since 1997, electricity and natural gas prices are calculated according to pricing principles and price formulas defined by the MEH. Pricing is established according to a cost-plus formula. On 1 July 1999, a new electricity tariff system came into force (Decrees 9/1999 and 10/1999), which aim to comply with EU requirements for the termination of cross-financing between consumer groups.

Cost-based tariffs were introduced in natural gas by 1 July 1999 (Decree 11/1999), thereby eliminating cross-financing between consumer groups. Given the low price level of gas sold to households, it appears that there are still some cross-subsidies between products sold by MOL.

The 1999 document calls for the development of a new price regulation system that takes into consideration import prices and a system of setting transmission tariffs in the competitive market. Regulated third party access (TPA) is the government's preferred option given Hungary's integration in the European Internal Gas Market.

Table 2

Energy End-use Prices

(US$/toe-converted using exchange rates; including taxes)

Fuel	*Hungary*	*OECD Europe*	*Ratio to OECD Europe*
High sulphur fuel oil for industry*	187.9	230	0.8
Heavy fuel oil for electricity generation**	138.5	172.2	0.8
Light fuel oil for industry**	685.4	368.9	1.9
Automotive diesel for commercial use**	818.2	730.9	1.1
Premium unleaded gasoline (95 RON)**	941.6	1 130.4	0.8
Natural gas for industry**	176.1	192.1	0.8
Natural gas for households**	203.6	391.5	0.5
Electricity for industry***	566.4	623.6	0.9
Electricity for households***	757.1	1 241	0.6

* 2002 (third quarter).

** 2001.

*** 2000.

Note: years of reference were chosen according to the availability of data at both the Hungarian and the European levels.

Source: *Energy Prices and Taxes*, IEA/OECD Paris, First Quarter 2002.

Regulated electricity prices are capped. The first four-year cycle of price regulation for electric and heat energy was completed at the end of 2000. Effective from 1 January 2001 under Ministerial Decree 45/2000(XII.21)GM, the main guidelines of the new electricity price mechanism correspond to the principles of the previous system. The wholesale prices were defined on the basis of justified costs. The price formulas are designed to maintain the average prices drafted on several levels of the marketing chain (power plants, wholesalers and distribution companies). These price formulas are published several years prior to implementation and contain parameters that are partly measured by statistics, partly calculated on public data produced by the MEH, and partly defined under a price authority decision by the Ministry of Economy and Transport (see Chapter 8 for a more detailed explanation of the price formulas).

The Ministerial Decree 59/1995(XI.14)IKIM describing the first natural gas price regulation system was effective until 31 December 2001. The MEH began to elaborate a new four-year price regulation system at the beginning of 2001. The new pricing system could be introduced during 2003. Meanwhile, the old system has been prolonged (see Chapter 7, p. 89).

Real electricity prices increased to the extent that they are now covering costs. The same is not true for gas prices. Even though real gas prices also grew in the past decade, they are yet to cover costs, and have generated losses for MOL and a number of distortions in the energy sector that are described further in the following chapters.

In 2002, the state-owned MVM group announced that the 5% growth cap on retail electricity prices imposed by the government in January 2002 will result in a loss of HUF 42 billion (approximately US$ 190 million), which represents 10% of MVM's annual revenues[7]. Similarly, MOL stated publicly that they lost US$ 800 million over the period 2000 to 2001 as a result of government caps on gas prices.

There are two levels of value-added tax (VAT) in Hungary:

- 12% on the price of household products (electricity, gas and heat supply, propane-butane for non-fuel purposes, firewood, charcoal, mineral fuels, solar energy collectors), which are considered prime necessities.
- 25% on liquid fuels[8].

Hungary also has two levels of mining taxes for domestic energy production:

- 12% for crude oil and natural gas.
- 2% for hard coal and lignite.

Excise duties on liquid fuels, which have recently been increased, are an important source of revenue for the State. The rates are as follows:

Table 3

Excise Duty Levels for Liquid Fuels

Fuel	*Excise duty from 1 January 2000 onward*	*Excise duty from 1 July 2002 onward*
Gasoline (95 octane)	HUF 93 / l	HUF 103.5 / l
Gas oil, fuel oil	HUF 80.2 / l	HUF 85.0 / l
Propane-butane	HUF 43 / kg	HUF 47.9 / kg

Generally speaking, apart from a few exceptions discussed later in this review, tax levels on energy products in Hungary are similar to those practised in many other European countries.

7. A loss of HUF 74 billion (approximately US$ 330 million) in 1999 to 2000.
8. Biodiesel is exempted from tax (VAT and excise duty).

CRITIQUE

The aim of Hungary's energy policy is to strike a balance between energy security, economic efficiency and environmental protection, in line with the IEA Shared Goals (see Annex B). Since the last In-depth Review, Hungary has continued its remarkable progress in energy market liberalisation. It set the conditions for an electricity market to emerge on similar grounds to those in other European countries, and paved the way for the emergence of a natural gas market. The government deserves full credit for its determination to pursue reforms.

A strong driving force in energy policy has clearly been the need to conform to the *acquis communautaire* with the perspective of EU accession. Compliance with this *acquis communautaire* is also a step towards a more efficient energy system. Even after full compliance, Hungary will need to address energy policy challenges to maintain supply security, cost-efficiency and environmental mitigation.

As in many other transition countries, Hungary's energy policy focused for a long time on the expansion of energy supply while paying little attention to costs and economic efficiency (see Chapter 4). However, during the past decade the government has increased its emphasis on the demand side. The effectiveness of its energy efficiency policies will be discussed in the next chapter. While the government is beginning to put more emphasis on market mechanisms as guiding principles in policy choices, its primary focus remains largely on the supply side, *i.e.* securing supply, introducing competition in the energy markets and diversifying energy sources. Continued emphasis on the energy demand side is indispensable. Final energy consumption has been quite stagnant in past years, largely owing to the economic restructuring in which several energy-intensive industries have shrunk and less energy-intensive industries have emerged and grown. However, economic restructuring is likely to slow down, which will lead to an increase in final energy consumption, following the gradual growth of GDP per capita. In order to reach its energy policy goals the government will need to pay more attention to energy demand-side measures.

Full and rapid liberalisation would entail a significant readjustment of prices. Although electricity and gas prices in the industrial sector are similar to those observed in other IEA member countries with relatively open markets, Hungarian households pay far less, which reveals possible price distortion, cross-subsidisation or direct price subsidy. The new legislation has increased the independence of the MEH but left the key pricing decisions for non-eligible consumers (*i.e.* those who do not have the right to choose their supplier) with the government. The Ministry of Economy and Transport continued to play a decisive role in the price-setting decisions that are dominated by social considerations. The authorities justified the artificially low prices in the household sector by the need to protect the real income of the population and to restrain the overall level of consumer price inflation. This is particularly true for natural gas prices. However, this policy has various harmful effects. First, it distorts fuel choice, and, for example, artificially boosts natural gas demand by household. Second, it undermines energy conservation by weakening incentives for the efficient use of energy, it encourages energy wasting and increases energy demand, with implications for energy security and environmental policies. Third, low prices discourage investment by domestic energy firms such as MVM and MOL (sometimes pushed to incur losses), thereby exacerbating a harmful impact on security of supply.

To avoid uncertainties the government must provide a clear timetable setting milestones for price increases to market levels for gas and electricity. To prevent possible conflicts of interest, since the government owns capital in energy firms and has a political interest in price levels, full responsibilities should be given to the MEH, not only to calculate prices but also to set them (when the government has set the milestones). Social hardship should be addressed through social policy measures, not through energy prices.

Since the last In-depth Review, progress on energy market reforms has been both significant and positive. Competition is gradually increasing. Major tasks should be carried out by the MEH and the Ministry of Economy and Transport to enable markets to function smoothly in the future. While the level of staffing of the MEH has increased to face the new regulatory challenges, the volume of staff of the Directorate-General for Energy has been reduced. This is logical since a number of the new tasks relate to the functioning of markets and are performed by regulatory authorities. However, the main task of elaborating an energy policy and implementing it remains largely unabated and the Directorate-General for Energy seems to be insufficiently staffed to deal with this issue.

The Hungarian economy and policy-making process benefits from strong independent bodies to represent consumer interests. These bodies have an important contribution to ensuring the continued development and success of the energy market liberalisation programme. However, it is important that they represent all consumers, not only specific groups such as energy-consuming industries.

Energy supply in Hungary suffers from recurring problems of quality and losses. The government acknowledges the problem, realising that a significant part of these losses are not technical but rather due to electricity pilferage. A number of measures need to be taken beyond prices to correct this trend. The government should envisage stronger measures against electricity pilferage (both detection and sanctions). Significant variations in pressure and composition of the natural gas being supplied to end-users are also a cause for concern. Price liberalisation will go a long way towards facilitating investments to improve quality. The government should also fix targets to improve quality and reduce losses, with clear indicators to monitor the progress and feed back into the policy and regulatory framework to take into account progress in energy prices and taxes.

RECOMMENDATIONS

The government of Hungary should:

- *Establish an indicative timetable for price increases to market levels for gas and electricity for non-eligible consumers.*
- *Address social hardship through social policy measures, not through energy prices.*
- *Establish a timetable for handing price control responsibilities to the MEH.*
- *Ensure that the Directorate-General for Energy is adequately staffed and has sufficient resources to administer the energy market liberalisation process.*
- *Organise, in a transparent fashion, the contributions of the different representative bodies of consumers of the network industries (electricity, gas, district heating) to avoid any risk that certain groups of consumers would have a favoured position in influencing government policy.*
- *Define a timetable to improve energy quality and reduce technical and non-technical losses.*
- *Devise indicators for monitoring the quality of energy supply (electricity, gas), in co-operation with all the energy stakeholders.*
- *Design and implement a system of improved measures (detection and sanctions or penalties) against electricity pilferage.*

ENERGY DEMAND

Aggregate energy demand remained unchanged since the 1999 In-depth Review. It grew at an average rate of 0.2% between 1995 and 2000. TFC increased only slightly in 2000, while GDP grew by around 3.6% per annum between 1995 and 2000. In 2001 and 2002, GDP growth is expected to be lower. Hungary's energy intensity, measured as TPES per unit of GDP, declined in the same order of magnitude, at a rate of 2% per annum between 1990 and 2000. The principal fuels in final consumption are natural gas (39% of TFC in 2000) and oil products (32% of TFC in 2000). The share of other fuels is lower, namely electricity (15%), heat (8%) and coal (4%).

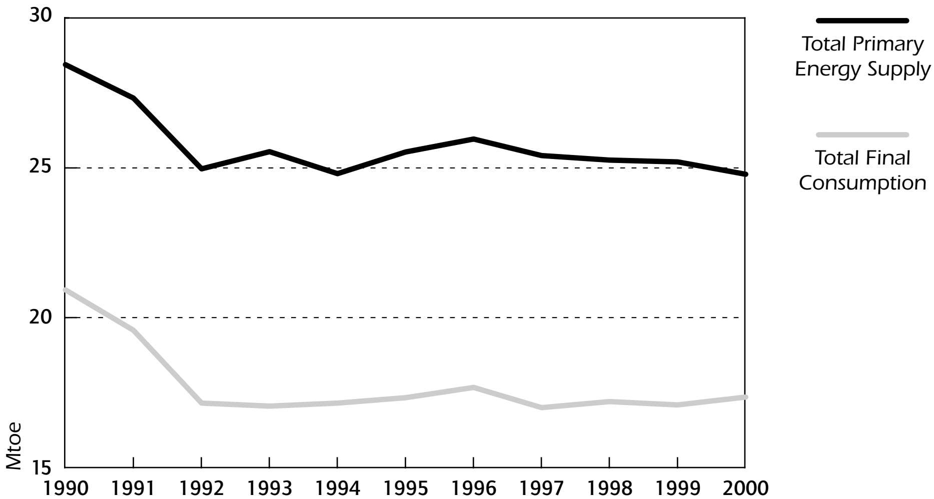
During the past decade, the accelerated replacement of capital stock, fuel switching and efficiency gains, especially in industry, facilitated a clear decoupling between energy supply and economic growth in Hungary. In the last two years the increase in TPES has been slower than that of TFC, probably because of the implementation of improved energy conversion equipment, with the use of gas for power generation and factors such as the gradual shift to electrical equipment in industrial processes[9].

The sectoral trends behind TFC changes explain the stagnation in TFC that has occurred in recent years. Industry energy consumption marginally decreased after 1995 (–0.5% per annum on average between 1995 and 2000). A similar trend is observed in residential energy consumption (–1.7%) where energy efficiency is improving in buildings and in district heating[10]. The sectors driving energy consumption are transport (3.9% annual growth between 1995 and 2000) and commercial (3.7%). Fuel switching has positively affected final electricity consumption (1.1% growth per annum on average between 1995 and 2000) and final natural gas consumption (2.4%). However, it has negatively affected the demand for petroleum products (–0.4%) and coal (–10.4%).

9. The shift towards electricity in final energy consumption facilitates the use and efficiency of electricity in industrial processes and air-conditioning. This affects specific sub-sectors, namely chemical and petrochemical (4.6% growth in final consumption of electricity between 1995 and 2000), non-metallic minerals (9.0%), commercial and public services (4.2%).
10. In Hungary, more than half of the building stock was built during the communist era, when the priority was to produce a large quantity of cheap buildings to accommodate households with no strong emphasis on energy efficiency. A similar remark applies to district heating systems.

Figure 5

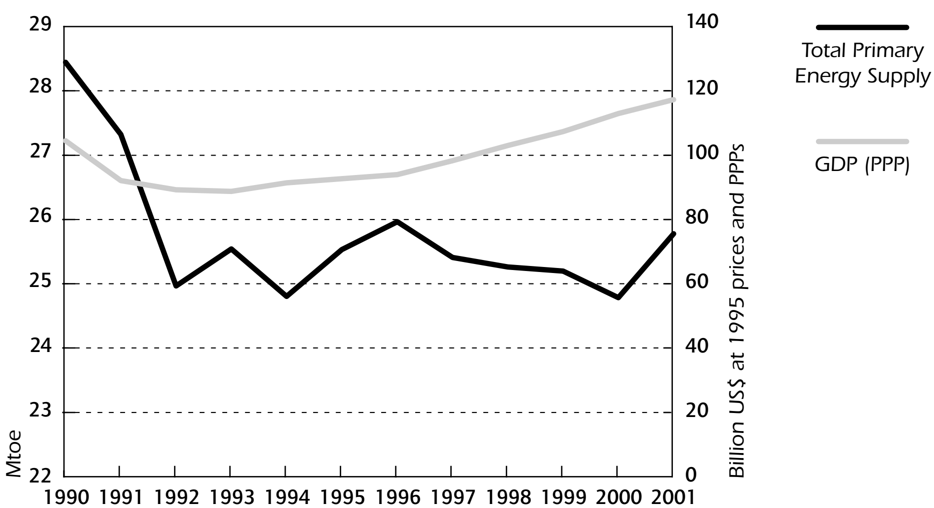
Total Primary Energy Supply and Total Final Consumption, 1990 to 2000



Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2002.

Figure 6

Total Primary Energy Supply and Gross Domestic Product, 1990 to 2001

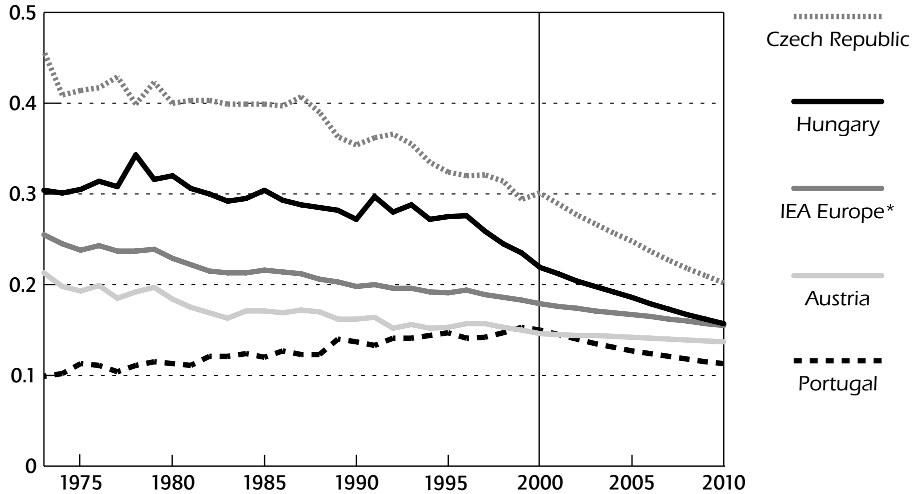


Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2002; and *National Accounts of OECD Countries*, OECD Paris, 2002.

Figure 7

Energy Intensity in Hungary and in Other Selected IEA Countries, 1973 to 2010

(toe per thousand US$ at 1995 prices and purchasing power parities)



* excluding Norway from 2001 to 2010.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2002; *National Accounts of OECD Countries*, OECD Paris, 2002; and country submissions.

ENERGY EFFICIENCY POLICIES

Hungary has a large energy efficiency potential. Domestic and external resources have been used to rapidly catch up with the best international practices and as a means to accelerate the acquisition of more energy-efficient equipment.

On the basis of the 1999 "Hungarian Energy Policy Principles and the Business Model of the Energy Sector" and related policy decisions, the government adopted the new Energy Conservation and Energy Efficiency Improvement Action Programme (Decision 1107/1999) that began in 2000 and is to run for ten years. The Action Programme is part of the Széchenyi Plan, a broad effort to fund modernisation of the Hungarian economy launched in 2000. It also includes initiatives related to renewables. The Action Programme lists 15 sectors and areas for financial support. It targets a 7% to 8% reduction in energy consumption per annum (approximately 1.8 Mtoe) until 2010 in these sectors and areas.

The Action Programme has an annual budget of HUF 1 billion (approximately US$ 4.5 million). In 2000, measured in terms of TFC savings, the programme was thought to be successful, and the government increased its annual budget to HUF 5 billion in 2001 (approximately US$ 22 million). To facilitate the administration of this programme, two pre-existing organisations, the Energy Centre and the Energy Information Agency, were merged. The Energy Centre[11] is a non-profit company, with a staff of approximately 50[12]. Its capital is owned by the founders as follow: Ministry of Economy and Transport 60%; Ministry for Environmental Protection 25%; Hungarian Energy Office 15%.

The Energy Centre has the following principal functions:

- To administer the implementation of the Action Programme by presenting a short list of applicants to an inter-ministerial committee on energy efficiency (established in 1999).
- To manage the implementation of international energy efficiency projects using multilateral or European funding (UNDP/GEF energy programme for municipalities, EU PHARE programme).
- To produce energy information and statistics.

It is estimated that HUF 200 billion (approximately US$ 820 million) is needed to finance the Energy Conservation and Energy Efficiency Improvement Action Programme, of which HUF 50 billion (approximately US$ 220 million) will come from the State. Support for the residential sector mainly involves grants of up to 30% on new and additional investments. Other sectors are offered a variety of measures ranging from loans with favourable interest rates to full grants.

Hungary is also implementing the following energy efficiency policies and programmes:

- The UNDP/GEF Public Sector Efficiency Programme to remove barriers to improved energy efficiency in the public sector.
- The IFC/GEF Efficient Lighting Initiative (ELI) to promote energy-efficient lighting.
- The German Coal Aid Revolving Fund (GCARF) to provide finance to the private sector to support energy efficiency investments and reduce environmental pollution.
- The EU PHARE Revolving Fund (PRF) to provide soft-loan credit facilities to municipalities, private and municipality-owned companies.

11. Also subtitled Energy Efficiency, Environment and Energy Information Agency.
12. The staff number is higher since some are working only part-time, being seconded.

Table 4

2001 Objectives and Results of Energy-saving Programmes within the Széchenyi Plan

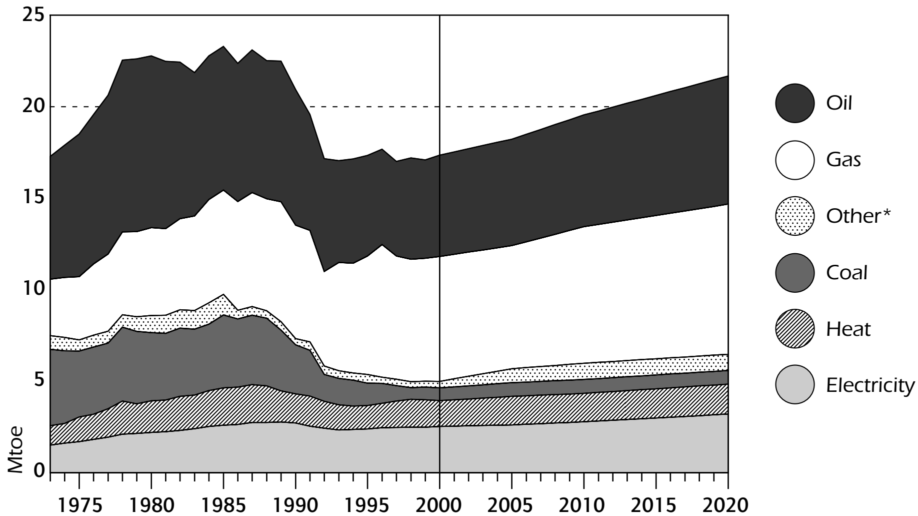
Programme code	*Name of programme*	*Total number of supported applications*	*Amount of support (million HUF)*	*Value of project (million HUF)*	*Expected energy saving TJ/annum*	*Saving in economy costs (million HUF/annum)**
SZT-EN-1	Communal	3 987	1 213.015	4 475.4	143.0	156
SZT-EN-2	Local government	97	344.709	1 180.5	97.0	138
SZT-EN-3	Public lighting	116	411.876	1 389.0	116.0	289
SZT-EN-4	District heating	38	1 047.669	4 135.1	999.0	1 121
SZT-EN-5	Renewable	231	390.860	1 863.8	226.0	214
SZT-EN-6	Approach	14	42.598	63.8	0.0	0
SZT-EN-7	Production company audit	34	128.810	200.5	0.0	0
SZT-EN-8	Local government audit	59	111.690	222.3	0.0	0
SZT-EN-9	Transport	4	11.975	16.9	0.0	0
SZT-EN-10	SMEs, energy-saving project	34	120.604	432.2	73.8	99
Total		**4 614**	**3 823.806**	**13 979.5**	**1 654.8**	**2 017**

* HUF 1 = US$ 0.004

- The Hungarian Pilot Panel Programme to provide grants for improving thermal insulation of buildings.
- The Hungarian Energy Saving Credit Programme (HESCP), now merged in the Széchenyi Plan, to provide non-refundable subsidies of up to 30% for the modernisation of energy use in municipality-owned institutions.
- The Hungarian Energy Efficiency Co-financing Programme (HEECP) funded by the International Finance Corporation to offer partial guarantee support for credits provided by financial institutions for energy efficiency projects.
- The Supporting the Co-operative Organisation of Rational Energy Use Programme (SCORE) funded by the Netherlands Agency for Energy and Environment to support the development of energy efficiency institutions and networks and demonstration projects.

Figure 8

Energy Intensity in Hungary and in Other Selected IEA Countries, 1973 to 2020

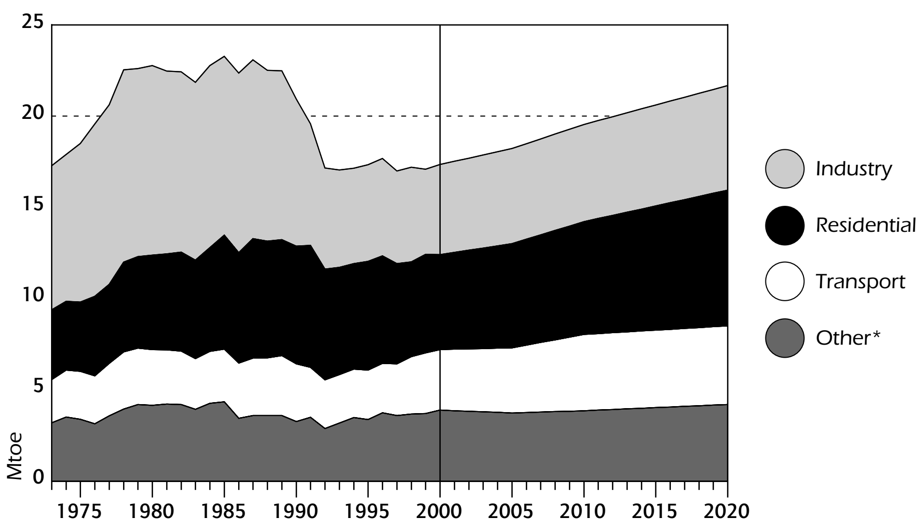


* includes geothermal and combustible renewables and wastes.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2002; and country submission.

Figure 9

Total Final Consumption by Sector, 1973 to 2020

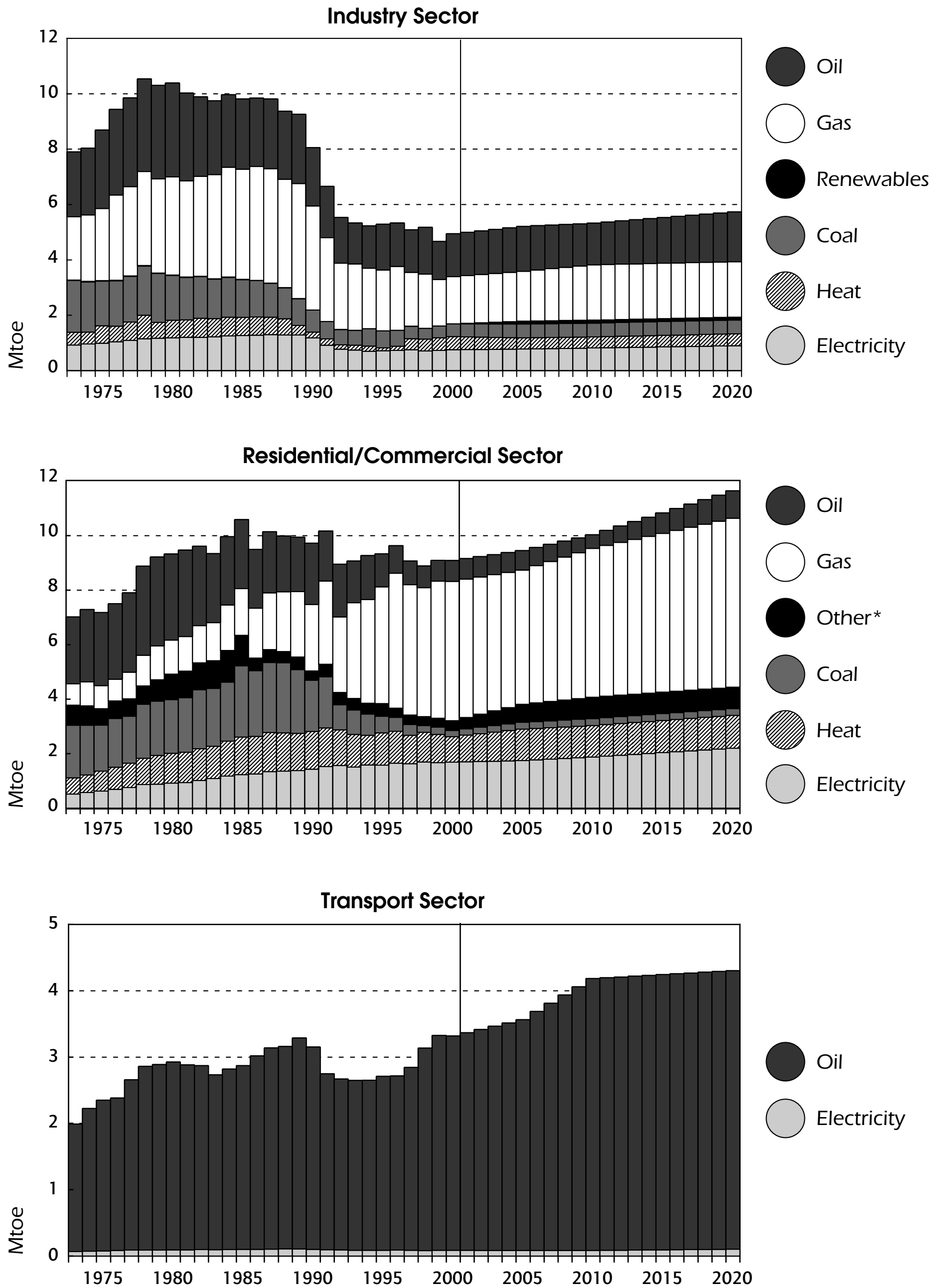


* includes commercial, public service and agricultural sectors.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2002; and country submission.

Figure 10

Total Final Consumption by Sector and by Source, 1973 to 2020



* includes geothermal, combustible renewables and wastes.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2002; and country submission.

RESIDENTIAL AND COMMERCIAL SECTOR

A large share of Hungary's building stock is old and badly insulated. Final energy consumption in the household sector considerably decreased as a consequence of important price increases between 1992 and 1998, and stabilised thereafter given smaller increases in real energy prices of electricity and gas.

The following energy efficiency measures have already been adopted:

Energy Efficiency Standards

Until 2002, most of Hungary's energy efficiency standards were obsolete. To comply with EU regulations, the Ministry of Economy and Transport issued three new Ministerial decrees in February 2002 on energy efficiency labelling of dish-washers, household combined washer-dryers and household electric refrigerators, freezers and their combinations.

Building Codes

The Hungarian Insulation Standard MSZ 04-110-2-191, which regulates the thermal insulation of new residential buildings, has been in force since 1992. Although it conforms to the strictest EU standards, enforcement and quality control in buildings are still lacking.

Retrofitting

To modernise the large number of poorly insulated housing blocks, Hungary launched a reconstruction programme (the SZT-EN-1 Programme), within the Széchenyi Plan. A non-reimbursable grant is provided for people wishing to make energy efficiency investments in their homes, such as heating reconstruction, additional insulation and replacement of windows and doors representing HUF 60 000 (approximately US$ 300) per apartment. In 2001, the Energy Centre supported 3 842 applications; the total grants amounted to HUF 1.15 billion (approximately US$ 5 million) and may reach about HUF 3 billion (approximately US$ 13 million) in 2002. The SZT-LA 2 Programme offers non-refundable grants to finance energy-efficient renovations in residential buildings made with prefabricated technology and retrofitting of company buildings with industrial technology (block houses). Total grants amounted to HUF 2 billion (approximately US$ 8.5 million) in 2001.

Information/Education/Public Awareness

During the 1990s, the awareness activities launched by the central administration diminished. The Energy Conservation and Energy Efficiency Improvement Action Programme stressed the need to strengthen information on energy savings in the education system, to support advisory networks and consumers offices and to increase publicity to encourage consumers to save energy. In 2002, in the framework of the Széchenyi Plan, a public awareness programme was implemented and directed mainly towards the education sector. Non-governmental organisations (NGOs) have played an important role in this area. The Energy Efficiency Advisory Network launched by environmental NGOs, the Enterprise Development Fund (MVA) and the Hungarian Alliance of Technical and Science Association (MTESZ) form a group of around twenty Regional Energy Advice Centres disseminated throughout Hungary. To develop these energy advice centres, Hungary benefited from funds channelled through the EU PHARE programme and the Dutch energy agency, NOVEM.

DISTRICT HEATING AND COMBINED HEAT AND POWER

DISTRICT HEATING

Hungary has a long experience in district heating[13], which was developed in a large and systematic fashion in the 1960s to coincide with major housing construction programmes. In 2000, the country had 142 district heating companies, which operated 240 systems in 109 towns and cities. These companies supplied some 644 000 dwellings or about 16% of the approximate four million households in Hungary. Natural gas accounts for 66% of the fuel used for district heating, while coal and oil account for 19% and 11% respectively and renewable energy sources, waste and other fuels represent 4%.

For a long time, district heating companies received significant amounts of financial support from the central government, through a 30% to 40% subsidy to end-user prices. These subsidies were abolished in 1991. The issue of strong regional price discrepancies and remaining amounts of cross-subsidies led to the institution of a uniform, national regulatory framework for district heating: the District Heating Law that was adopted by the Hungarian Parliament in March 1998[14]. Before that, the ownership of district heating companies was handed over to the municipalities through the Municipality Act. The 1998 District Heating Law and the Law on Concessions allows restricted privatisation of up to 49% of the capital, while maintaining the majority of the shares in the ownership of the municipality. A private concession for the operation of the district heating system is also permitted, if

13. In 1896, the Hungarian Parliament was the first building to be equipped with a heating system based on district heat.
14. The District Heating Law defined rules and responsibilities in district heating; however, it could not solve the problem of cross-financing.

100% of the capital remains in the hands of the municipalities. Responsibility for municipal district heating, including the setting and control of end-user prices, was also transferred to municipalities in 1998, through the District Heating Law. The Ministry of Economy and Transport exercises the power to set prices for heat supplied by power plants over 50 MW. Price determination and district heating licensing are the responsibility of the MEH insofar as it involves an electricity production capacity of 50 MW or more[15]. District heating companies operating under the authority of municipalities must purchase heat at artificially high official prices while their tariffs for selling heat to their customers are kept low for social and political considerations and in the context of strong competition from natural gas suppliers in the residential sector. Gas prices are official prices set by the Ministry of Economy and Transport, which have also been kept artificially low (see Chapter 7).

The 1993 resolution on energy policy and the 1999 document entitled "Hungarian Energy Policy Principles and the Business Model of the Energy Sector" state that it is necessary to improve the district heating system, to modernise it and to make it competitive. Despite the generally good technical condition of district heating systems in Hungary on the supplier side, there is still a need for a large refurbishment of the end-user district heating distribution networks. Complete reorganisation of the network involves various actions, which will pave the way for a more technically advanced and economical service, such as:

- Renovation and modernisation of heat generating plants.
- Reconstruction of district heating supply systems (pipelines and heat centres).
- Provision by local governments owning the systems to create competition between district heating operators and to remove the current monopolies.

The 1999 document indicates that the current environmental regulations must be modified to better exploit the environmental advantages of district heating systems.

The Energy Conservation and Energy Efficiency Improvement Action Programme's action No. 15 considers reconstruction of the district heating system a high priority; the objective being to save 10 PJ of energy per annum until 2010. In 2001, modernisation of the district heating systems benefited from a total US$ 19 million on the supplier and consumer sides in the form of non-reimbursable direct capital support, based on the government's Széchenyi Plan. The maximum subsidy represented 30% of the investment cost. The

15. The 2001 Electricity Act raised the limit from 20 MW to 50 MW.

government has now changed its support to preferential credits. Other funds for improving the existing district heating system include the Environment Protection Fund and the German Coal Aid Revolving Fund (GCARF).

COMBINED HEAT AND POWER (CHP)

Total CHP capacity in 1999 amounted to 873 MW. CHP produced 4.8 TWh of electricity and 46 PJ of heat in 2000[16].

According to Ministerial Decree 55/1996, both the then electricity transmission company (MVM), today MAVIR, and the electricity distribution companies are required to purchase electricity produced from renewable sources and small-scale CHP (from 0.5 MW up to 20 MW) at guaranteed prices. Under the 2001 Electricity Law (to enter into force in 2003), mandatory purchasing will be enforced with guaranteed prices from 0.5 MW up to 50 MW (up to only 5 MW for industrial CHP and hydropower), and with market prices above the given limits. Since 1 January 2001, electricity and heat purchase prices are very attractive (between HUF 14 and HUF 15/kWh). Future electricity and heat prices will be regulated by the MEH, unless heat is produced by power plants below 50 MW, in which case the municipalities set the prices (see Chapter 8, section on electricity prices).

INDUSTRY

A large part of the energy-intensive industries, namely iron and steel, aluminium metallurgy, heavy chemical industry, mining, etc., went bankrupt during the transition from a centrally planned to a market economy. After this period, the modernisation of these industries and the spectacular development of non-energy-intensive industries, such as the car industry, electronics, telecommunications, precision engineering, etc., resulted in a decrease in the final energy intensity of manufacturing.

The main energy efficiency measures for industry comprise the following:

Energy Audits

Within the framework of the Széchenyi Plan, non-refundable grants are provided for energy audits in companies with energy costs of HUF 30 million per annum or higher (approximately US$ 130 000). In 2001, 29 company audits received a total amount of HUF 110 million financial support (approximately

16. According to the Hungarian District Heating Association (MATÁSZSZ), cogeneration resulted in approximately 20 PJ (5.6 TWh) energy saving and the avoidance of 1 Mt of CO_2 emissions in 1999, out of which approximately 90% is district heating related.

US$ 450 000). In 2002, the support amounted to 50% of the total audit (maximum amount per application: HUF 5 million, or US$ 20 000).

Energy Services Companies (ESCOs)

Seven ESCOs are operating in Hungary; they focus on heating projects, in particular gas-fired boiler plants and, to a lesser extent, public lighting and thermal insulation. Hungary has been one of the leading countries to develop the scope of ESCOs in the 1990s, with the assistance of international funding agencies or international banks (European Bank for Reconstruction and Development, International Finance Corporation).

The Hungarian Energy Efficiency Co-financing Programme (HEECP) and the Global Environmental Facility (GEF) programmes facilitate the establishment of ESCOs and maintain the stable economic conditions for their development.

TRANSPORT

Although transport's share in TFC increased from 15.7% in 1990 to 19% in 2000 and is expected to reach 21% by 2010, it is still lower than the 2000 IEA average of 34%. However, transport's share in TFC is growing in Hungary at a rate that is three times higher than the IEA average.

A wide range of commendable measures has already been implemented to limit increased road traffic use by private passengers and freight, namely high excise taxes on fuels; differentiated taxation on the purchase, import and use of cars and trucks to encourage turnover in road vehicle stock; and investments in rail and public transport systems. However, the modal split of transport has shifted strongly towards passenger car road transport at the expense of the decreasing share of rail, inland waterways and public transport in the 1990s. This is due to the continued increase of per capita income, the expansion of the national motorways network and the renewal and maintenance of the state-owned road networks. In addition, income tax credits for commuting by passenger cars and corporate tax credits for company-owned vehicles have been encouraging unnecessary use of passenger cars.

The Energy Conservation and Energy Efficiency Improvement Action Programme includes several measures to fund energy-saving measures in the transport sector, offering in particular preferential credits to investors improving the infrastructure, or facilitating education programmes on energy saving.

MONITORING AND ASSESSMENT

Monitoring the efficiency of the programmes and measures requires the installation and operation of an appropriate measurement and control network. A biannual assessment report on the Energy Conservation and Energy Efficiency Improvement Action Programme is provided by the Energy Centre to the Ministry of Economy and Transport and reported to the government. A conceptual plan and the related action plan for developing a national measurement network have been prepared and will be elaborated in the framework of the EU SAVE Energy Efficiency Programme.

CRITIQUE

Hungary's experience in implementing energy efficiency measures is limited, given that the Hungarian authorities' interest in energy efficiency only began at the end of the communist regime. However, Hungary's impressive number of energy efficiency policies and programmes should enable it to rapidly catch up with best international practices. In this context, it is commendable that energy efficiency policies were regarded a high priority area in the 1999 document "Hungarian Energy Policy Principles and the Business Model of the Energy Sector" and in the new Energy Conservation and Energy Efficiency Improvement Action Programme.

The creation of a new Energy Centre, merging the former Energy Centre and the Energy Information Agency, is a positive step to implement the Energy Conservation and Energy Efficiency Improvement Action Programme in a most cost-effective manner.

In designing and implementing an overall energy efficiency policy, Hungary can greatly benefit from expertise and funding from neighbouring European countries, the European Commission and international financial institutions. Given the multitude of international collaboration programmes, some overlap and duplication of effort may occur. The government has a role in streamlining and co-ordinating all these programmes. The management of so many programmes with different targets is challenging, and must therefore be very efficiently and effectively co-ordinated in order to reach the desired outcome. The co-ordination that is carried out on an *ad hoc* basis would benefit from being strengthened and systematised.

It is commendable that Hungary is adopting energy efficiency standards for household appliances on the models stipulated in the EU regulations. This action must be vigorously pursued as it will impede low-priced energy-inefficient mass products to enter the consumer market. It is also commendable that Hungary has adopted thermal insulation standards in line with the strictest EU standards, but the problem is how to implement them. According to the Hungarian authorities, these standards have not been effectively implemented. It appears necessary to monitor their implementation through well-trained architects or specialised building engineers. The poor quality of building materials used in most of the housing blocks built during the centrally planned regime is the source of a considerable waste of energy and lack of comfort for thousands of people living in such conditions. There is an urgent need for the government to retrofit all its energy-inefficient buildings through a long-term and well-structured programme supported by sufficient investment.

Modernising district heating systems is a high priority under the Energy Conservation and Energy Efficiency Improvement Action Programme in order to save 10 PJ by 2010. District heating system owners' revenues from heat sales should be sufficient to allow renovation and investment in the networks. However, this is not the case where district heating systems owned by municipalities supply heat to their own municipalities and the prices for heat are set for social and political purposes rather than based on economic parameters.

While there are programmes to promote energy audits and sufficient audit companies with a reliable level of expertise, it appears that energy audits in industry are not adequately developed. They do not focus on small and medium-sized enterprises; more attention needs to be paid to these enterprises given their important number. It is also essential to promote ESCOs with a view to accelerating energy-saving measures, especially at a time when energy prices are likely to increase as a result of the gradual elimination of electricity and natural gas price subsidies.

Energy efficiency programmes in transport are funded on an annual basis, which prevents any long-term strategy. A change in this mechanism is a prerequisite for effective action. It is difficult to know the exact level of funding allocated for improving energy efficiency in this sector. There is an urgent need to adopt a comprehensive and long-term transport policy to streamline and eventually strengthen the various energy efficiency measures and plans already implemented. Solutions could involve refining the fuel duty differential to facilitate the diffusion of lower sulphur diesel fuels or less emitting alternative fuels. The vehicle tax regime could also be based on energy efficiency and emissions levels. Additionally, there is scope for following up more rapidly transport technology initiatives taken by the EU, in particular on the R&D side. More could also be done on the investment side to boost investments in urban public transport.

Most of the energy efficiency measures and programmes have only recently been implemented. It is too early to say whether all of them are well designed or adequately adapted to specific situations. Monitoring the cost-effectiveness of the programmes on a regular basis as well as evaluating their impact on energy and the environment are of paramount importance. It will allow the government to adopt additional measures where increased efforts should be made, notably in the residential, commercial and transport sectors.

RECOMMENDATIONS

The government of Hungary should:

- *Continue to strengthen the close co-ordination among all energy efficiency plans involving national, European and international institutions to make optimal use of such expertise and funding.*
- *Provide the Energy Centre with an adequate budget, staff and executive powers to allow it to fulfil its tasks at both national and international levels.*
- *Investigate through the MEH and the Hungarian Competition Office whether heat prices are being set on a reasonable cost-reflective basis and, if not, devise and implement an appropriate solution to avoid price distortions between heat and power that would negatively affect investment in and modernisation of CHP and district heating systems.*
- *Give priority to strengthening energy efficiency in the building sector through the implementation of EU regulations on energy efficiency standards in the household sector, improve and enforce the mandatory thermal insulation standards and strengthen the programme for retrofitting the energy-inefficient housing stock.*
- *Strengthen energy audits in industry (including small and medium-sized enterprises), and measures to encourage the audited enterprises to implement recommended cost-effective measures.*
- *Establish and implement a comprehensive long-term energy efficiency Transport Plan with clear objectives supported by adequate cost-effective measures and investments funded over the long term to limit the growth of road transport. Include measures to stimulate investment in public transport, on driver behaviour (car labelling for example) and on the diffusion of cleaner fuels and low-emission vehicles.*
- *Strengthen the appropriate measures and capacities to carefully monitor and assess all the energy efficiency programmes and measures, and adjust them according to the changing economic context.*

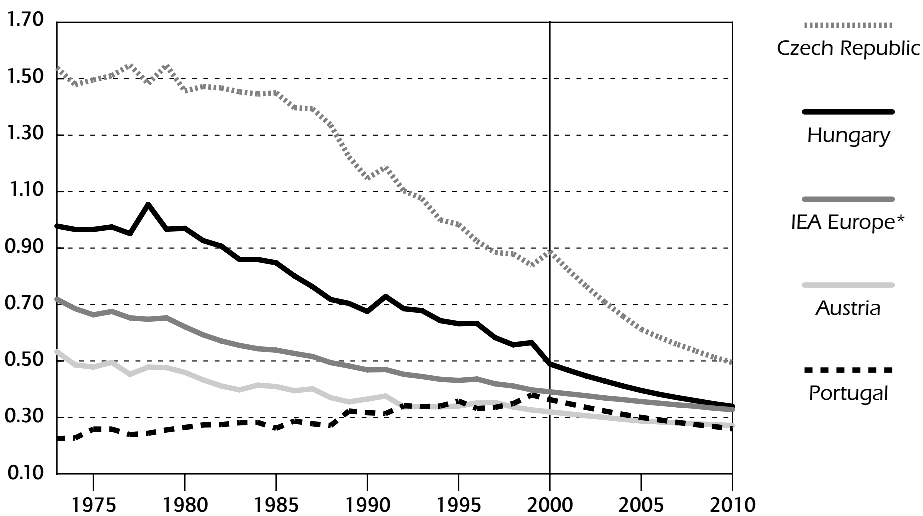
CLIMATE CHANGE

Hungary ratified to the Kyoto Protocol on 21 August 2002 and committed to reduce its emissions of all six GHGs by 6% between 2008 and 2012 from a 1985 to 1987 baseline. As an economy in transition, Hungary was free to choose that baseline, which marked the country's highest level of energy consumption. Following the decrease in GDP encountered during Hungary's transition to a market economy, Hungary's CO_2 emissions decreased at an annual rate of 2.2% between 1990 and 2000, to reach 55 Mt of CO_2 in 2000, against 71 Mt in 1990[17]. Compared to 1990, CO_2 emissions were 22% lower in 2000. The government projects CO_2 emissions to remain at the 2002 level in 2005, and reach 59 Mt in 2010 and 64 Mt by 2020. Accession to the EU has been a leading driver in Hungary's efforts to mitigate GHG emissions.

Figure 11

Energy-related CO_2 Emissions per GDP in Hungary and in Other Selected IEA Countries, 1973 to 2010

(CO_2 emissions/GDP using 1995 prices and purchasing power parities)



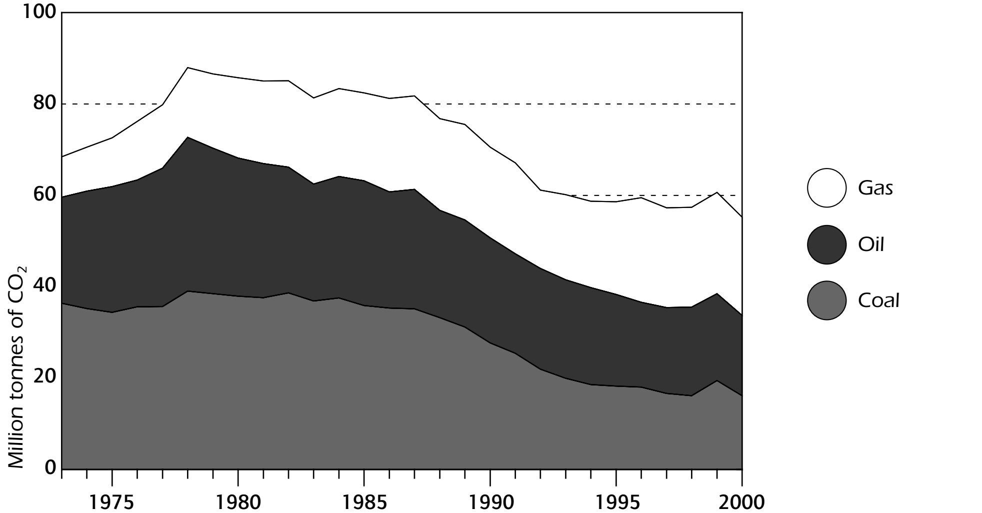
* excluding Norway from 2001 to 2010.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2002; *National Accounts of OECD Countries*, OECD Paris, 2002; and country submissions.

17. Assessed using the Intergovernmental Panel on Climate Change Tier 1 Sectoral Approach.

Figure 12

CO_2 Emissions by Fuel*, 1973 to 2000

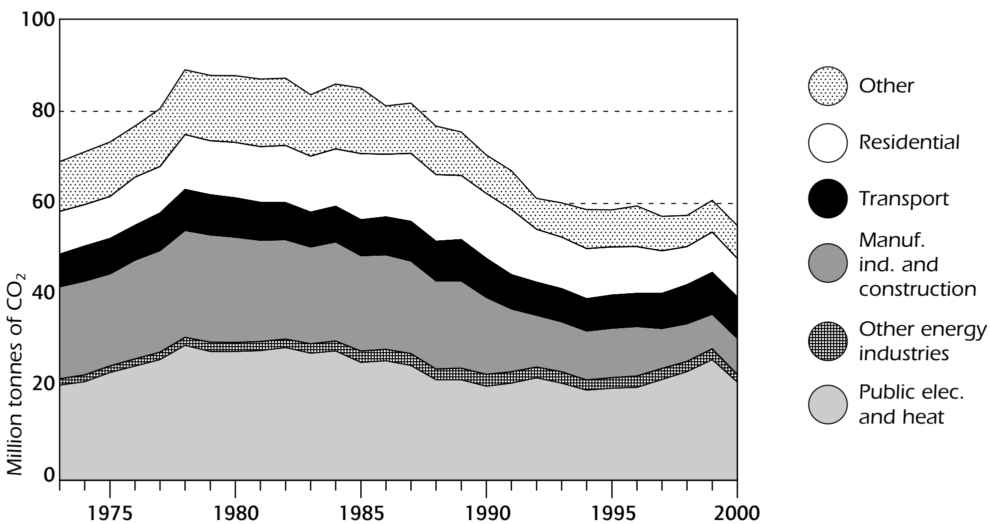


* estimated using the IPPC Sectoral Approach.

Source: *CO_2 Emissions from Fuel Combustion*, IEA/OECD Paris, 2002.

Figure 13

CO_2 Emissions by Sector*, 1973 to 2000



* estimated using the IPPC Sectoral Approach.

Source: *CO_2 Emissions from Fuel Combustion*, IEA/OECD Paris, 2002.

In 2000, the relevant government authorities developed a strategic dual objective approach to climate change mitigation policies (Government Decision No. 2206/2000). On the one hand it defines governmental and non-governmental tasks in light of preparations for accession to the EU, and on the other, it provides a general planning and conceptual framework until 2012. In particular, the strategy aims to achieve the following:

- Meet the Kyoto commitment entirely through domestic measures.
- Develop and select measures through dialogue with the country's different economic and social interest groups.
- Support the development of an efficient GHG emissions monitoring and reporting system as well as emissions reduction projects, to minimise administrative costs of Joint Implementation (JI).
- Use the flexibility mechanisms under the Kyoto Protocol only for additional emissions savings. A system for JI – the reduction of emissions through specific projects and the transfer of these reductions to other parties – and emissions trading is to be developed in the longer term. The government intends to carefully manage its surplus of emissions under the Kyoto Protocol to ensure the country's compliance with its goals.

Among the strategy's concrete goals, the government aims to increase the share of renewables in primary energy consumption to 5% to 6% in the next ten years. This target is part of the government's Energy Conservation and Energy Efficiency Improvement Action Programme, which is detailed in the chapters on renewable energy and energy efficiency.

Table 5

Activities Implemented Jointly in Hungary

Activity title	*Investor*	*Total GHG reductions (t CO_2 equivalent)*	*Lifetime (years)*
Energy efficiency improvement by Hungarian municipalities and utilities	Netherlands	240 000	20.0
Redesign of the energy process at Bácstej Kft	Netherlands	..	..
Fuel switching and co-generation in the Dorog Erőmű Kft power plant	France	71 420	15.0
RÁBA/IKARUS compressed natural gas engine bus project	Netherlands	148 000	20.0

Source: United Nations Framework Convention on Climate Change.

Under the EU directive approved on 9 December 2002 by the Council of Environment Ministers, governments must draft national plans detailing how many allowances will be distributed to plants covered by the directive (*inter alia* all thermal plants above 20 MW of capacity). Once this critical and politically difficult measure has been cleared and agreed by the European Commission, these plants will need to surrender allowances equivalent to their annual emissions for two periods, namely 2005 to 2007 and 2008 to 2012. Plants will be able to buy and sell allowances to other plants in the European emissions trading system. It is not clear how the directive will apply to new member States, *i.e.* whether they will be granted a transition phase, or how project-based activities may be taken into account.

Hungary complies with the requirements for reporting its GHG emissions to the Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC), by submitting periodical national inventory reports.

Hungary has used activities implemented jointly (AIJ), the precursor of JI, which were adopted in Kyoto, to develop four projects, two related to energy efficiency and two facilitating fuel switching. This experience could be used as capacity building to facilitate JI projects. Proposals have already been made for JI projects in Hungary, *e.g.* under the Netherlands international tender for JI projects.

AIR POLLUTION

According to the Ministry of Environment and Water, 3% of Hungarian territory is considered to be polluted, while 9% only slightly polluted, with 44% of the population living in these areas. The air pollutants emitted in large quantities include SO_2, NO_x, CO_2 and particulates that are essentially produced by the combustion of fossil fuels in power plants and transport. SO_2 and particulate emissions have been decreasing steadily and significantly over the past two decades. Most of the reductions occurred in the mid-1980s and much less after 1990. The improvement in NO_x emissions levels is less obvious given the increasing share of emissions from transport observed in recent years. The growth of private transport is also limiting potential for further reductions and is contributing to the stagnation of CO emissions. The drop in emissions levels was principally a consequence of fuel switching from coal to gas, the modernisation of combustion technology and general industry restructuring, with a significant number of energy-intensive industries closing down in the early 1990s following a change in political direction.

The widespread use of unleaded petrol, enforcement of stricter vehicle emissions standards and the growing proportion of more recent vehicle models have helped reduce the growth of transport emissions and significantly reduced lead emissions. Nevertheless, road traffic can still be blamed for a considerable share of air pollution. It is one of the factors that affects air quality in cities with significant levels of pollution such as Budapest, and significantly contributes, on a national scale, to total NO_x and CO_2 emissions.

Table 6

Air Pollutants in Hungary, 1992 to 1998

(thousand tonnes)

	1992	*1994*	*1996*	*1998*
SO_2	827.3	741.0	673.2	591.8
NO_x	183.2	187.5	195.8	202.6
Particulates	159.6	155.5	140.7	127.4
CO	835.9	774.3	726.9	736.9
Lead*	183.0	107.0	68.0	52.0
Non-methane volatile organic components	141.8	142.4	150.1	140.6

* tonnes.

Source: Hungarian Ministry of Environment and Water.

Compared to other OECD countries, the balance of pollutants in Hungary reflects the country's specific structural features. For example, SO_2 emissions per capita are much larger in Hungary than in other OECD countries, mainly because of the number of old coal, often lignite, fired power plants. NO_x emissions are lower per capita in Hungary than in the OECD on average, principally because car ownership is lower than in the rest of the OECD.

Hungary has already taken a number of measures to mitigate local pollutant emissions, including the 1998 Regulation 22/1998(VI.26) on emissions limit values for large combustion plants. It applies to plants with thermal inputs rated equal or greater than 50 MW, and transfers the requirements of the EU 88/609/EC standards on emissions limits from power plants into Hungarian law. All existing plants concerned are required to comply by 2005, after which Hungary expects to be an EU member State. This concerns six coal-fired and one oil-fired power plants. These standards are likely to impact on the energy mix, facilitate the development of natural gas use and reduce coal use in electricity production. Investments to upgrade the plants are expected to be made by the private players concerned. Investors can apply for loans or grants from the Central Environment Protection Fund. In 2002, the revenues of the Environment Protection Fund amounted to HUF 31 billion (approximately 60% from environmental product charges[18] and fines and

18. Environmental charges apply to water use, waste collection and disposal, mining (to fund landscape rehabilitation of mines being closed or environmental improvement of existing mines), changes in land use and products (batteries, tyres, etc.).

40% from loans reimbursement, budgetary aid and other sources, corresponding to US$ 130 million).

Hungary's first National Environmental Programme (NEP) was adopted by Parliament in 1997. The NEP covers a six-year period (1997 to 2002). Specific quantitative targets have been set for the protection of air, water and soil, the built environment (human settlements, human health), nature and landscape, as well as special environmental issues such as waste management, noise and vibration abatement and environmental safety. The NEP takes into account relevant international environmental policy action plans and programmes, such as the Environmental Action Programme for Central and Eastern Europe, the EU Fifth Action Programme and the Agenda 21.

Financial assistance from the EU has so far been granted through the PHARE programme for institution building and, to a lesser extent, investment projects. Co-financing through EU grants may cover up to 75%, even 85% in some cases, of investment costs. It is being introduced through two main schemes, namely the Large Scale Infrastructure Facility (LSIF), with assistance from international banking institutions, and the Instrument for Structural Policy for Pre-Accession (ISPA).

Since 1998, the NEP helped to phase out leaded gasoline, three years in advance of the 2001 target[19].

A second NEP (2003 to 2008) is currently being prepared.

CRITIQUE

Although Hungary has reasonable prospects of meeting its Kyoto commitments, the government is aware of the country's significant potential for additional energy efficiency and GHG emissions reductions. It seeks to exploit this potential, partly through funding from international and domestic institutions. Compliance is not an issue today, however this may not be the case if and when emissions levels begin to grow again.

A clear government position to encourage JI projects to accelerate investment in cleaner technologies and to introduce an emissions trading system would certainly help. If trends confirm Hungary's surplus under the Kyoto Protocol, the government should consider how to use flexibility mechanisms to exploit this resource and foster further emissions reductions in the country, *e.g.* by

19. The Hungarian government adopted a number of EU directives related to fuel quality, such as the Council Directive 98/70/EC related to the quality of petrol and diesel fuels.

financing projects that would not otherwise take place and put the country on a more sustainable energy path.

Accession to the EU will soon bring these issues onto the government's agenda, since the EU agreed on 9 December 2002 on a directive that imposes emissions caps on large industrial sources and establishes a tradable permit system for GHG emissions.

Almost half of the Hungarian population is considered to live in slightly polluted and polluted areas. Although progress has been made to design and implement solutions to improve air quality, there are still a number of environmental problems linked to this phenomenon, such as growing emissions from transport, or the large share of emissions associated with power production. The government is aware of the situation and, overall, the existing plans and measures taken to mitigate pollution are satisfactory. Hungary's environmental policy appears to be appropriate for the country.

Transition to an open market economy resulted in much hardship for the Hungarian population for a number of years, with current per capita incomes still low for a large proportion of the population. Transition also brought significant opportunities to leapfrog to new, more efficient and less polluting technologies. However, the end of transition may also see renewed growth in energy consumption and polluting emissions with higher levels of household equipment and the recovery of industrial output. Nevertheless, Hungary appears to be in a favourable situation to gain an environmental advantage, catching up with cleaner technologies and providing incentives to curb demand for polluting technologies and goods, but such changes will only take place with proper incentives and government decisions.

In order to maximise the environmental benefits of governmental policy, the government may consider improving the co-ordination between its existing emissions mitigation programmes and the different levels of their implementation, namely government, regions and municipalities. Financial support provided by the Central Environment Protection Fund is essential, but its priorities for a given set of sectors are unclear. A clearer set of priorities guiding the disbursement of the funds may be useful. Similarly, technical choices or options to improve power plants would benefit from a clear and transparent assessment of all the alternatives being offered within the context of a broad public consultation[20].

20. As an example, the legitimacy to qualify the biomass retrofit project at the Borsod power plant as a JI has been questioned by some NGOs. They question the sustainability of forest use to provide fuel to the project and the lack of efficiency in the electricity conversion process chosen.

RECOMMENDATIONS

The government of Hungary should:

- *Establish a clear institutional framework for JI projects to facilitate access of foreign investors and minimise transaction costs. Consider whether to use the existing emissions trading surplus under the Kyoto Protocol to encourage early investment in JI projects.*
- *Consider broader participation in international emissions trading under the Kyoto Protocol and how the government can improve Hungary's environmental performance,* e.g. *through financing additional projects to reduce GHG emissions.*
- *Define a timetable for joining an emissions trading regime.*
- *Maximise transparency on environmental issues to encourage public acceptance.*
- *Continue to seek improvements in local pollutant emissions levels.*

RENEWABLE ENERGY

OVERVIEW

Hungary has limited renewable energy potential, principally in the form of biomass and geothermal energy. In order to develop this potential, deployment mechanisms must be put in place and sufficient economic incentives made available to entrepreneurs. EU requirements and policies, including conformity with the EU renewable energy source directive, are the main drivers for renewable energy development in Hungary. The EU aims to increase renewables as a share of TPES to 12% and as share of total electricity to 22% by 2010. Individual EU countries have been allocated individual targets depending on national circumstances. Hungary, like other EU candidate countries, is in the process of agreeing a national indicative target. The fact that renewable energy may contribute to lower GHG emissions is of less interest to the Hungarian authorities than it is to other IEA countries because Hungary will have fewer difficulties in achieving its GHG emissions reduction target. The government is mainly interested in other potential benefits from renewable energy, such as:

- Reducing external energy dependency through the exploitation of locally available energy resources.
- Contributing to energy security through energy diversification.
- Generating employment.

Table 7

Renewable Energy in Hungary, 2000

(TJ)

	Primary Energy Supply
Geothermal direct use	67
Solar thermal direct use	4 138
Industrial waste	2 662
Solid biomass	39 547
Gas from biomass	59

Source: IEA.

In 2000, renewable energy represented 1.6% of TPES[21]. This share is very limited compared to other IEA countries, especially in Europe[22] where it reached 6.7% in 2000. This share grew a little faster, by 2.1% per annum since 1990, against 1.6% for OECD Europe. A large part of renewable energy – unaccounted here – is fuel wood consumed by the residential sector in small boilers.

By 2010, the government aims to increase its share of renewables in primary energy consumption to 5% to 6%. This target is part of the government's Energy Conservation and Energy Efficiency Improvement Action Programme, which is detailed in Chapter 4.

Areas of interest for the government include:

- *Biomass projects.* Energy from biomass is principally derived from wood processing. Its use will increase with investments in modern wood-fired boilers and small power plants. Wood waste combustion is also considered a complement to coal in power plants, partly to increase the lifetime of old coal-fuelled power plants, and to reduce their fuel cost. Hungary is experimenting a fuel switching project at the 137 MW Borsod power plant, to retrofit it using fuel wood. Fuel wood is also used in some district heating plants. Two biodiesel plants using rapeseed (four million litres per annum capacity) and sunflowers (12 million litres per annum capacity) as raw materials are currently being built. One bioethanol plant using corn and grain already produces 65 million litres per annum.

- *Geothermal energy*. Hungary has a large geothermal potential. Its water temperature gradient is sufficiently high for it to be used for heat applications. However, this has not yet been significantly developed. Around 20% of geothermal energy is currently used in agriculture for crop drying or greenhouse heating. The remainder is used elsewhere, such as spas for tourism. Geothermal heat utilisation by heat pump is also expanding in the residential sector.

- *Municipal waste.* Recently, investments in sewage treatment are increasing the production of sewage sludge gas.

- *Wind energy.* Two wind turbines of 600 kW and 250 kW were built in Hungary during the last five years.

The Széchenyi Plan managed by the Ministry of Economy and Transport provides support for renewable energy projects through application to a one-time grant

21. The definition of renewables does not include industrial waste, non-renewable municipal solid waste, pumped storage production or non-commercial energy sources (such as fuel wood).
22. OECD Europe.

aid. This plan can support 30% of investments in renewable energy; however, the upper limit differs depending on the type and purpose of the project. For the year 2000, HUF 350 million (approximately US$ 1.5 million) were available for competitive applications announced in order to increase the use of any renewable sources of energy. The support is a grant that cannot exceed HUF 35 million (approximately US$ 160 000), unless justified[23].

The Ministry of Environment and Water also provides a similar magnitude of support for renewable energy. To avoid duplication of public funding, the total amount of public financial support may not exceed 50% of the total costs of development, excluding any reclaimable VAT, or 65% in case of small and medium-sized undertakings. Applicants must have their own financial sources amounting to at least 25% of the total project cost. In addition to the evidence of their own financial sources, promissory notes confirming the availability of any other possible sources must be attached to the application for public support.

The 2001 Electricity Act (see Chapter 8) offers the possibility for independent electricity producers using renewables with a capacity above 100 kW to access a feed-in tariff[24]. This tariff is fixed up to 2010 and is the same for all renewable energy sources. It is adjusted annually with inflation. It is paid by the main electricity producer (MVM) where a power plant is connected to the transmission network, or by the local service provider if the independent producer is connected to the distribution network. Purchasing renewable electricity is mandatory. The tariff is regulated by the Ministry of Economy and Transport through a decree. Given the current cost of renewable energy projects, the tariff is not sufficient to make them fully independent of other support mechanisms.

The 2001 Electricity Act also includes a reference to an intent to move towards a portfolio-based system, met by a renewable energy obligation and tradable green certificates. The details remain to be finalised. The act stipulates that this system could provide "an effective and transparent system of support to renewables (...) in harmony with the principles of energy policy". The idea is to inform consumers of the potential environmental benefits of renewable energy and make them bear uniformly the operating costs of the support system. Renewable energy capacity would be certified by the MEH at the request of its owner or operator. In return, the latter would be allowed to issue and sell a green certificate for the quantity of electricity produced from renewable sources and waste.

23. This funding source was used for example to help finance two of Hungary's wind turbines in 2001 (at Inota and Kulcs, which began producing 1.5 TWh per annum from 2001).
24. For 2003, the proposal – yet to be ratified at the time of writing this report – is for a feed-in tariff of HUF 24 (approximately US cents 10) per kWh for peak electricity and HUF 15 (approximately US cents 6) per kWh for non-peak electricity. CHP and large hydroelectricity capacity are not eligible.

Hungary's renewable energy potential largely remains to be developed. Significant near-term potential resides in bioenergy resources and renewable municipal wastes for electricity and heat production, and in geothermal energy for heat. Efforts have been made to launch the exploitation of a wide range of other renewable energy applications, such as wind, passive solar, etc.

In the past, Hungarian energy policy focused primarily on fossil fuels rather than renewables. This situation is changing. The government has decided to implement a variety of support mechanisms, ranging from grants to feed-in tariffs, to encourage renewable energy technologies to demonstrate their potential contribution to the energy mix. The likelihood of Hungary joining the EU is a strong incentive to expand the renewable energy sector and to study possibilities of developing tools such as green certificates. These are welcome developments.

However, the current situation does have certain shortcomings. Grants and funds given on the basis of application without clear technology or market priorities may eventually support technologies that have little economic relevance to Hungary. Similarly, the use of a single feed-in tariff for renewable electricity is a double-edged sword. It might support relatively high-cost renewable energy options while generating rents for lower-cost options. The review team acknowledges Hungary's interest to learn from the experiences that could emerge from these measures. Capacity to achieve full cost-effectiveness should remain a principal factor in developing renewable energy projects. Uncertainties regarding tariffs beyond 2010 increase commercial risk, reduce incentives for potential investors and increase the cost of capital, thereby increasing the overall project costs for projects that do go ahead. In order to reduce these risks, increased predictability over a longer period may be required. An appropriate mechanism to encourage cost reduction also needs to be integrated into the long-term support scheme. One option for addressing both these objectives would be advance commitment on a clear timetable of a gradually reducing feed-in tariff.

At present, renewable energy systems are only allowed to connect to the grid using preferential rights if their capacity is superior to 100 kW, thus disqualifying small domestic renewable energy systems, which are commonly found in other European countries (such as Germany). The only requirement for Hungary to open the way for smaller systems to be connected to the grid is the implementation of technical standards for appropriate equipment to be installed, so as not to impair the operation of the grid. Hungary is already a member of the International Electrotechnical Commission (IEC) and there should be no major problems in devising arrangements to allow smaller systems to be connected to the grid.

A standard portfolio with provision for green certificate energy could be another option for promoting renewable energy in a more market-based manner.

However, this option depends upon the existence of an advanced energy market where competition prevails and a significant quantity of renewable energy capacity exists. This is not yet the case in Hungary.

RECOMMENDATIONS

The government of Hungary should:

- *Create a roadmap for renewable energy resource development, highlighting economic potential in priority technologies.*
- *Evaluate the added value of expanding technology co-operation through the IEA Implementing Agreements.*
- *Anticipate that the future level of support will gradually decline as viable technologies are identified and sustainable markets are developed.*
- *Work towards the introduction and development of market-oriented policy instruments as the mainstream for cost-effective exploitation of renewables.*

OIL

OVERVIEW

In 2000, oil represented 6.9 Mtoe, almost 28% of TPES. The volumes consumed and the share of oil in TPES have continuously decreased during the past two decades. This share is relatively low compared to other IEA countries where oil represents an average of 40% of primary energy supply.

In 2001, Hungary produced 1.1 Mt of crude oil[25], or 21.2 kbd for proven oil reserves of 110 million barrels. In 2000, Hungary imported 5.5 Mt of crude oil. Hungary also traded products (1.4 Mt of imports and 2 Mt of exports in 2001) with Austria, Germany and non-OECD Europe. The principal products being traded are diesel and gasoline. Over the past decade, crude oil production has either been stable or marginally decreased, while consumption decreased slightly. In 2000, Hungary's external oil dependence amounted to 72%, with 5.3 Mt of crude oil net imports.

MOL is Hungary's principal oil company. It was created in 1991 by the merger of nine affiliated enterprises of the Hungarian Oil and Gas Industry Board (OKGT) and privatised in 1995. It is the only company that has refineries in Hungary, namely the Duna, Tisza and Zala refineries. MOL owns and operates all crude oil and most of the oil product pipelines and storage facilities in the country. MOL has ambitions to become a leading regional oil company. The government is considering selling the remaining state-held 25% stake to a private investor. MOL is listed in the Budapest, London, Luxembourg and New York stock exchange markets. The oil products market was liberalised in 1991.

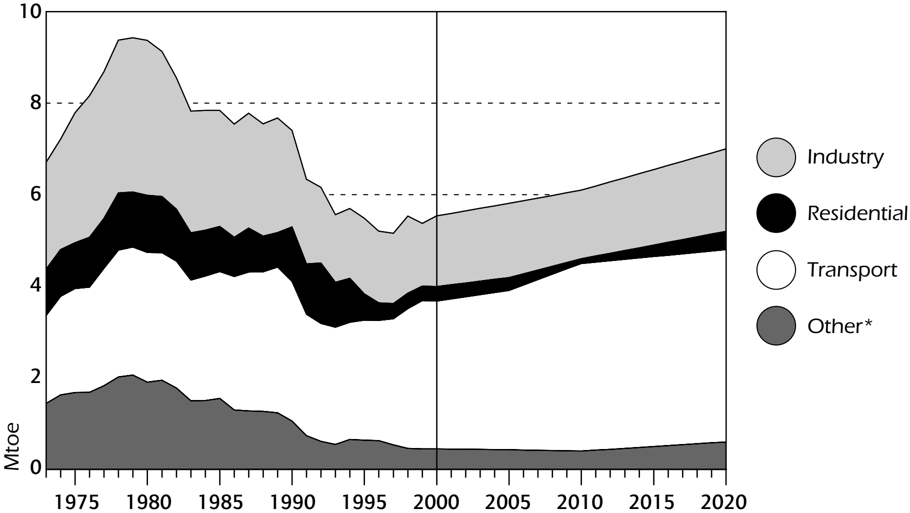
OIL DEMAND

Oil and oil products consumption decreased to 6.9 Mt in 2001, from 7.7 Mt in 1998. Most of this was for the transport sector, which has regularly been increasing its share from 33% in 1990 to 42% of the total oil consumption in 2000. Industry consumed 19% of the total oil products, while the agricultural and residential sectors consumed 6% each.

25. MOL, *Annual Report 2001*, Budapest.

Figure 14

Final Consumption of Oil by Sector, 1973 to 2020



* includes commercial, public service and agricultural sectors.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2002; and country submission.

PRODUCTION AND EXPLORATION

Since its transition from a state-controlled economy to a market economy, Hungary has become an "open" country for oil and gas exploration and production. Until 1994, MOL was the sole holder of a production and exploration licence in Hungary. The adoption of the Concession Law in 1991 and the Mining Law in June 1993 (Act XLVIII of 1993 on Mining)[26] changed this situation and established the framework for exploration and development of Hungary's oil and gas fields. The Mining Act defines the concept of "closed area" as a specific area designated for competitive bidding[27]. In 1993, there was only one bidding round in Hungary. MOL was purposely excluded, while four international companies applied for exploration and production concessions and later signed concession agreements with the Hungarian government. In 1999, the Hungarian Bureau of Mining cancelled the concept of "closed areas" because the government did not wish to

26. The 1993 Mining Law was partially inspired by similar laws existing in Norway and the United Kingdom.
27. "Closed areas" can comprise one or more areas of land where explorers and geo-experts believe that there is high potential for oil and/or gas discovery. They were classified as "closed areas" because exploration permits could only be obtained by tender.

organise other bidding rounds in Hungary. Following this decision, by way of a simple procedure, oil companies can apply freely and directly for exploration and production permits for any area in the country, provided its total exploration area is no larger than 3 200 sq. km[28]. For both the initial bidding procedure or the more recent application for a permit, the exploration period is identical – four years – renewable once for two years.

Several companies currently involved in exploration in Hungary include MOL (Hungary), Gustavson (US), POGO (US), Hungarian Horizon Energy (Hungary), Pangea (US), Geomega (US) and El Paso (US). The distribution of exploration areas is as follows:

Exploration by MOL.:	34 450 km^2
Exploration by foreign companies:	13 298 km^2
Concession exploration area:	5 505 km^2
Total:	53 253 km^2

In addition to its domestic exploration efforts, MOL has made several investments outside Hungary to diversify its oil sources, namely in Yemen, Pakistan and Siberia.

Domestic exploration activity has been successful in recent years. New discoveries and extensions resulted in significant growth of proven reserves, from 60.9 million barrels (8.3 Mt) in 1998 to 80.6 million barrels (11.0 Mt) in 2001. This helped moderate the decline in crude oil production, which began in the mid-1980s, when crude oil production was around 40 thousand barrels a day (2 Mt per annum). The Mining Law fixes the royalty rate for hydrocarbons at a level that is negotiable in some cases, but not below 12%.

The Mining Law allows free access to the oil transmission pipelines for domestically produced crude oil and natural gas. This will be sustained in the future since possible discoveries are not expected to be important. There is no immediate need to develop additional pipelines.

TRANSPORTATION AND TRADE

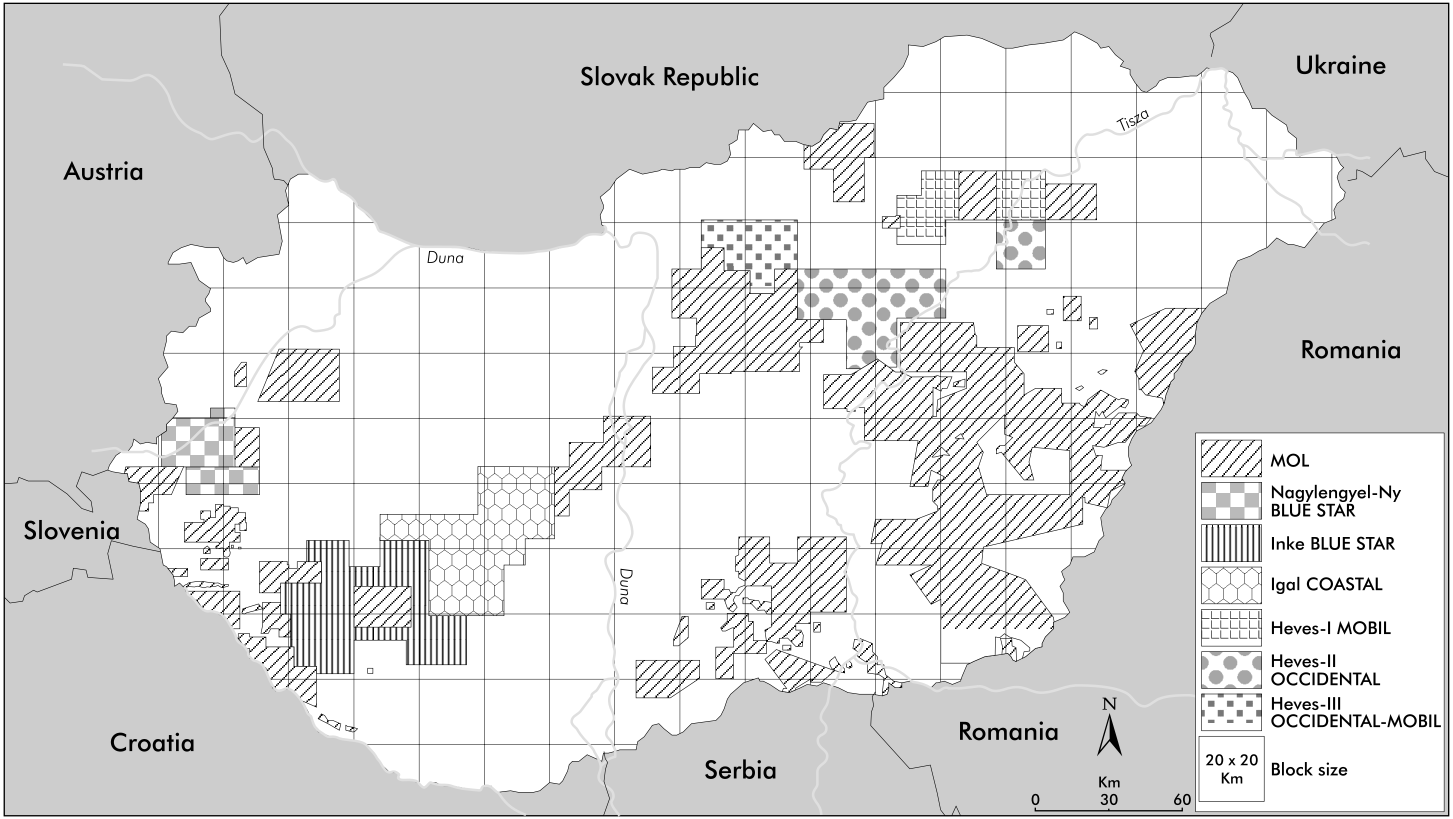
Hungary imports crude oil through three pipelines:

- Brotherhood I, coming from the Slovak Republic to the Duna refinery, with an annual 5 Mt capacity.

28. MOL is exempt from this restriction.

Figure 15

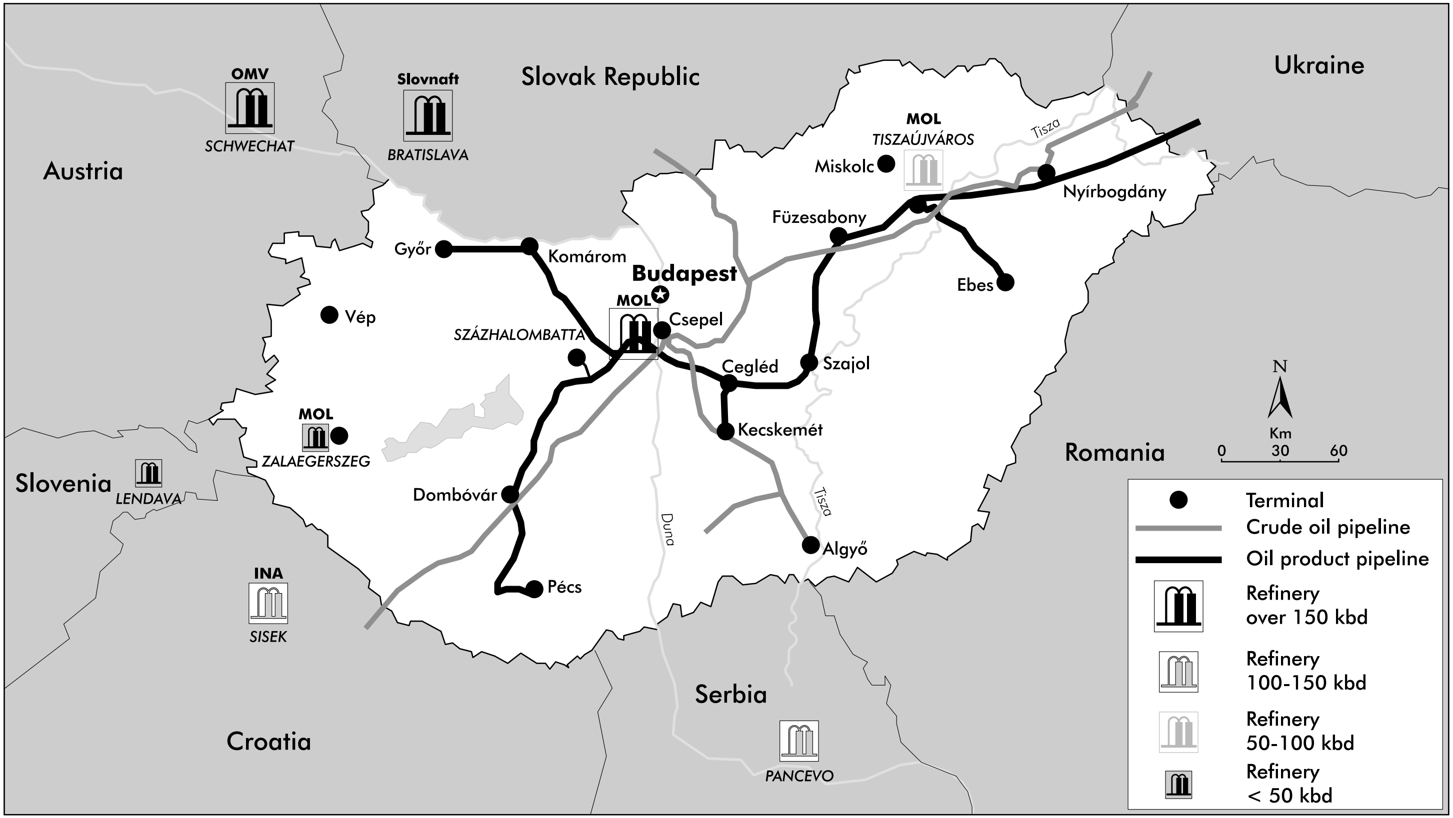
Oil and Gas Exploration Concession Areas



Source: Ministry of Economy and Transport.

Figure 16

Oil Infrastructure in Hungary



Source: MOL.

- Brotherhood II, entering Hungary from Ukraine, which is capable of transporting 10 Mt per annum of crude oil to the Duna and Tisza refineries;
- Adria pipeline, starting from Krk Island in Croatia and ending at the Duna refinery. Between 1991 and 1995 the Yugoslav conflict caused the Adria pipeline to be closed. Its capacity is 10 Mt per annum[29].

In addition to the pipelines for imported crude oil there are two domestic crude oil pipelines connecting the Duna and the Zala refineries. Hungary's network of crude oil pipelines measures 848 km. MOL owns all crude oil pipelines.

All crude oil, namely "Russian export blend", is imported from Russia. All Hungarian refineries belong to MOL, which is also Hungary's sole importer of crude oil. MOL has commercial relations with several producers and exporters so the necessary quantities come from several suppliers. The majority of Hungary's imported crude oil is delivered through the Brotherhood II pipeline.

Hungary is also a transit country. In 2001, 9.7 million barrels (1.2 Mt) of crude oil moved through the Brotherhood II, Brotherhood I and Adria pipelines, *en route* to Bosnia-Herzegovina, Croatia and Serbia. Third party access (TPA) is enforced on the main transit pipelines.

Hungary's 1 200 km oil products pipeline network connects the Duna refinery to the Tisza refinery and to the storage places for mineral oil products. MOL has 13 wholesale storage places, including the Duna and Tisza refineries storage facilities, connected to the oil product pipelines. All oil product pipelines, except for one pipeline running from Ukraine, are on Hungarian territory.

Imports and exports of crude oil and oil products are liberalised, the only requirement being the obtention of a permit from the Authorisation Office of the Ministry of Economy and Transport. Under the 1993 Security of Stockpiling of Imported Crude Oil and Petroleum Products Act, importers are obliged to pay a contribution for stockpiling.

REFINING

Since November 2001, crude oil has been exclusively processed in the Duna refinery located in Százhalombatta, which is the largest of the three Hungarian refineries. Crude oil processing was stopped at the Tisza refinery

29. The pipeline was originally intended to deliver Middle Eastern or African crude oil to Hungary, but has mainly been used for flows in the opposite direction, *i.e.* to export Russian crude, since it is reversible up to Sisak in Croatia.

in Tiszaújváros in June 2001 and at the Zala refinery in Zalaegerszeg in November 2001. From that time, only flue gas desulphurisation, gasoline blending and MTBE-processing work have been carried out at the Tisza refinery and only bitumen blowing at the Zala refinery.

The Duna refinery has a distillation capacity of 8.3 Mt per annum. In 2001, new sulphur recovery and hydrogen production plants and new coking units complemented the existing processing capacity. In 2001, the Duna refinery processed 7.8 Mt of crude oil, with a 94% average rate capacity factor. These two figures have remained relatively stable since 1999.

Hungarian refineries were built in the 1960s and are now in the middle of their lifetime. MOL has invested significant amounts to improve productivity and product quality, and to comply with volatile organic compounds emissions standards, as well as air and water quality specifications. The quality of fuels produced in the Duna refinery complies with the EU 2005 specification on fuel quality standards. The Duna refinery also manufactures gasoline that meets the expected EU 2009 specifications, namely maximum sulphur content of 10 parts per million (ppm) and maximum aromatic content of 35%. Since 1999, heating oil has been produced with a maximum 0.2% sulphur weight content in accordance with EU regulations. From January 2003, fuel oil will be produced with a maximum sulphur weight content of 1% in accordance with EU regulations.

Though the wholesale products market is liberalised, competition is limited, with MOL supplying 70% of the products. Shell and OMV[30] are two other important wholesale market operators with a share of about 9% to 10% each. In 2000, MOL acquired a strategic share of 36.2% in Slovnaft, the Slovakian oil company. This strategic partnership enabled MOL to acquire the Slovnaft refinery and a number of filling stations in Central and Eastern European countries[31], thereby putting MOL in a favourable position to produce more products.

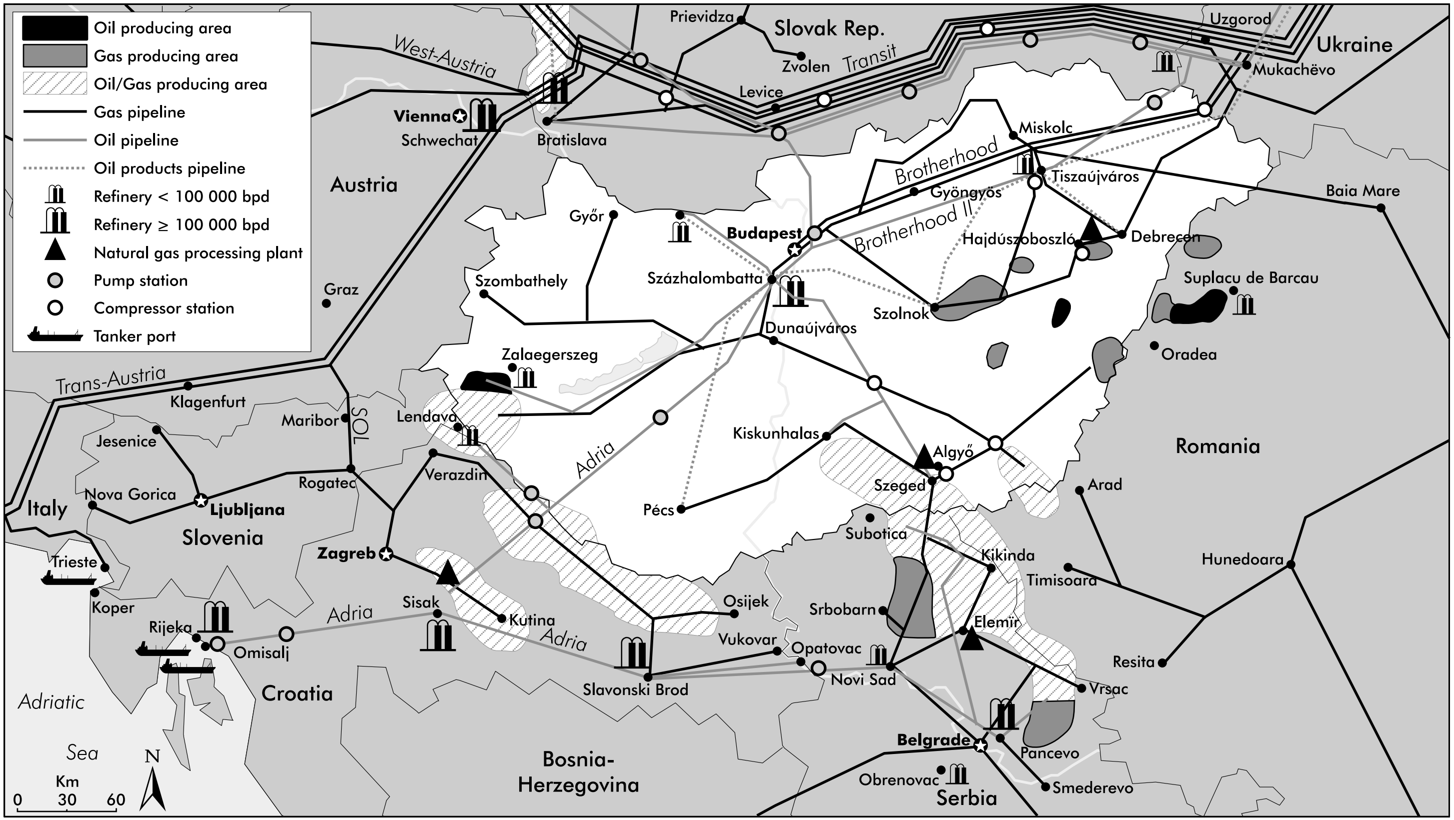
RETAIL SUPPLY

Since January 1991, the trade of crude oil products has been entirely liberalised. Soon after, competition on the retail side increased significantly, in stark contrast with the upstream and wholesale market dominated by MOL. Imported products currently represent around 20% of market demand.

30. OMV is the largest industrial company listed on the Austrian stock exchange. It is a leading oil and natural gas group operating in Central and Eastern Europe, with a US$ 7.5 billion turnover in 2001.
31. Slovak Republic: 314; Czech Republic: 40; Poland: 3; Ukraine: 2.

Figure 17

Refineries in Central and Eastern Europe



Source: IEA.

International oil companies operating in Hungary source 75% to 80% of fuels sold by MOL.

Products retailing is a competitive activity. Imports and exports were liberalised in 1991. An additional tax (customs clearance fee of 2% and statistical duty of 1.5%) that was in effect in the mid-1990s was slowly phased out by 1998. Retailing is subject to the excise duty law, the compulsory crude oil and mineral oil products' legal requirements for refiners on stocking, and the competition law.

Ten international oil companies and numerous smaller companies operating the so-called "white" petrol stations, which sell non-branded petroleum products, are competing in the retail market. The number of these "white" petrol stations has significantly reduced with the implementation in the early 1990s of more stringent environment protection requirements and stricter product quality controls[32]. The market share of "white" petrol stations decreased from 23% in 1995 to 11% by 2001. MOL, Shell and OMV are the market leaders.

Table 8

Petrol Stations in Hungary, 1998 to 2000

	1998	*1999*	*2000*
MOL	363	389	383
Shell	121	124	125
OMV	82	113	116
Agip	83	83	101
Aral	45	51	61
Total	58	59	60
Avanti	51	54	52
Esso	26	27	29
Conoco	31	31	33
Tamoil	10	10	11
BP*	28	–	–
"White" stations	898	800	685
Total	**1 796**	**1 741**	**1 656**

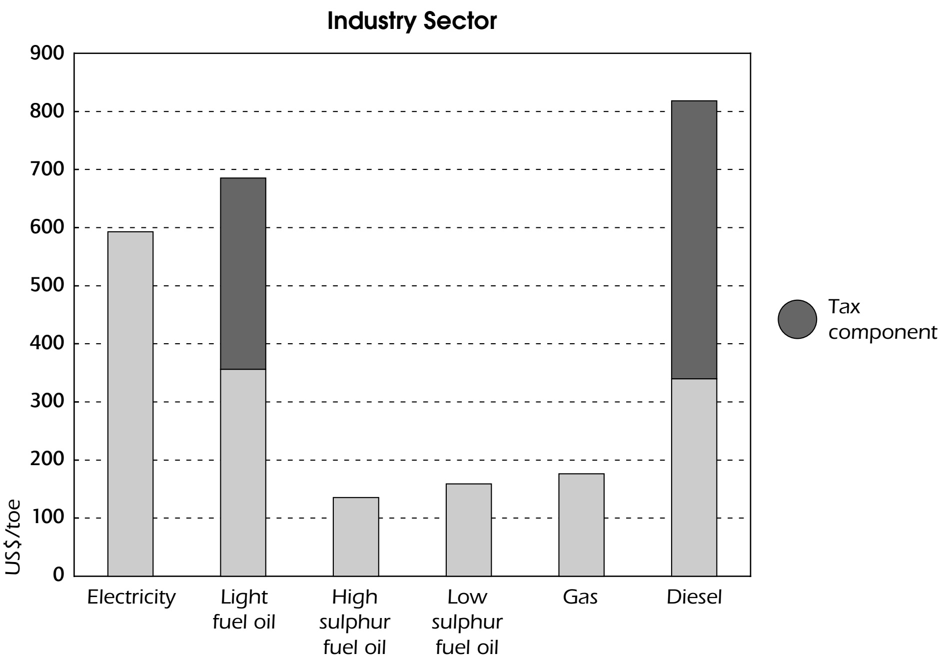
* BP sold its petrol stations to OMV after 1998.

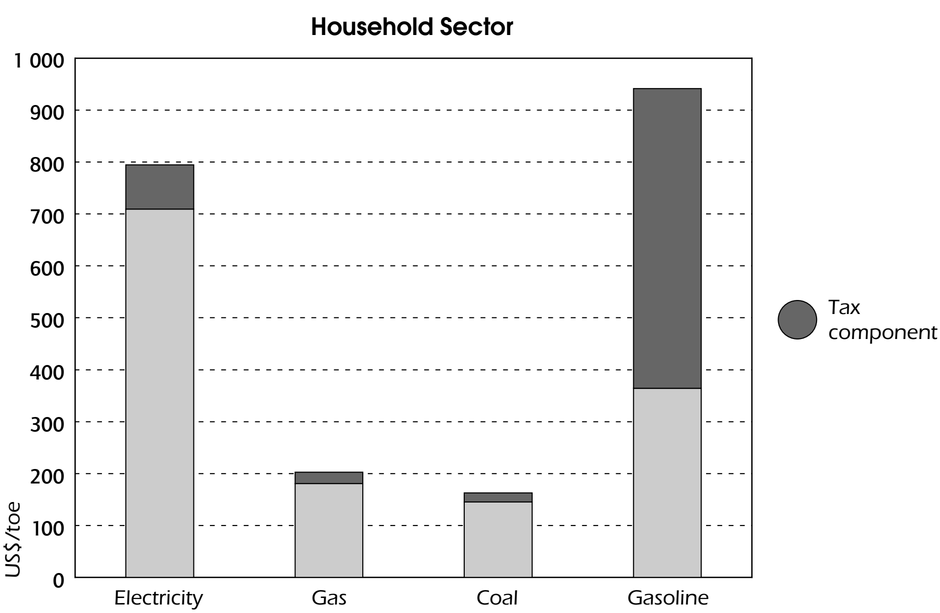
Source: Hungarian government.

32. The last In-depth Review noted a large decrease in fraudulent behaviour on the part of these "white" stations after the introduction of increased government controls following the 1992 diesel market crisis, where MOL and other players incurred major losses due to the sale in Hungary of illegal smuggled diesel.

Figure 18

Fuel Prices, 2001





Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2002.

In 2001, gasoline consumption reached 1.9 Mt, heating oil 0.96 Mt and fuel oil consumption 1.5 Mt. In the past, a large number of companies traded products on the wholesale market. A significant movement of concentration has taken place, following the implementation of stricter rules to apply excise duty and increased competition. The number of companies in this market segment does not exceed 35 today.

PRICING AND TAXATION

In 1999 and 2000, the majority of Hungarian oil market developments were a consequence of high oil prices. Crude oil and oil products prices are set freely by the market. The government has limited influence on these prices, except for taxation. In 2001, oil prices reduced and oil demand grew again.

Wholesale price changes are basically generated by modifications in the booking price and the HUF/US$ rate. Retail prices are built up by adding the retail margin, excise duty and VAT to wholesale prices. The market leader MOL's pricing is influenced by price conditions in neighbouring countries. Oil forced out of the domestic market can only be sold outside Hungary, where prices could be lower. This tends to constrain price growth in Hungary.

Fuel taxes (excise duty + VAT) are relatively high in Hungary. The possibility of a growing differential between consumer prices of road fuels in Hungary and its neighbouring countries may constitute a growing incentive for consumers to go outside Hungary to purchase diesel or gasoline. For example, since July 2002, this differential has favoured purchases in Austria. High tax levels are particularly evident for certain products, such as light fuel oil[33].

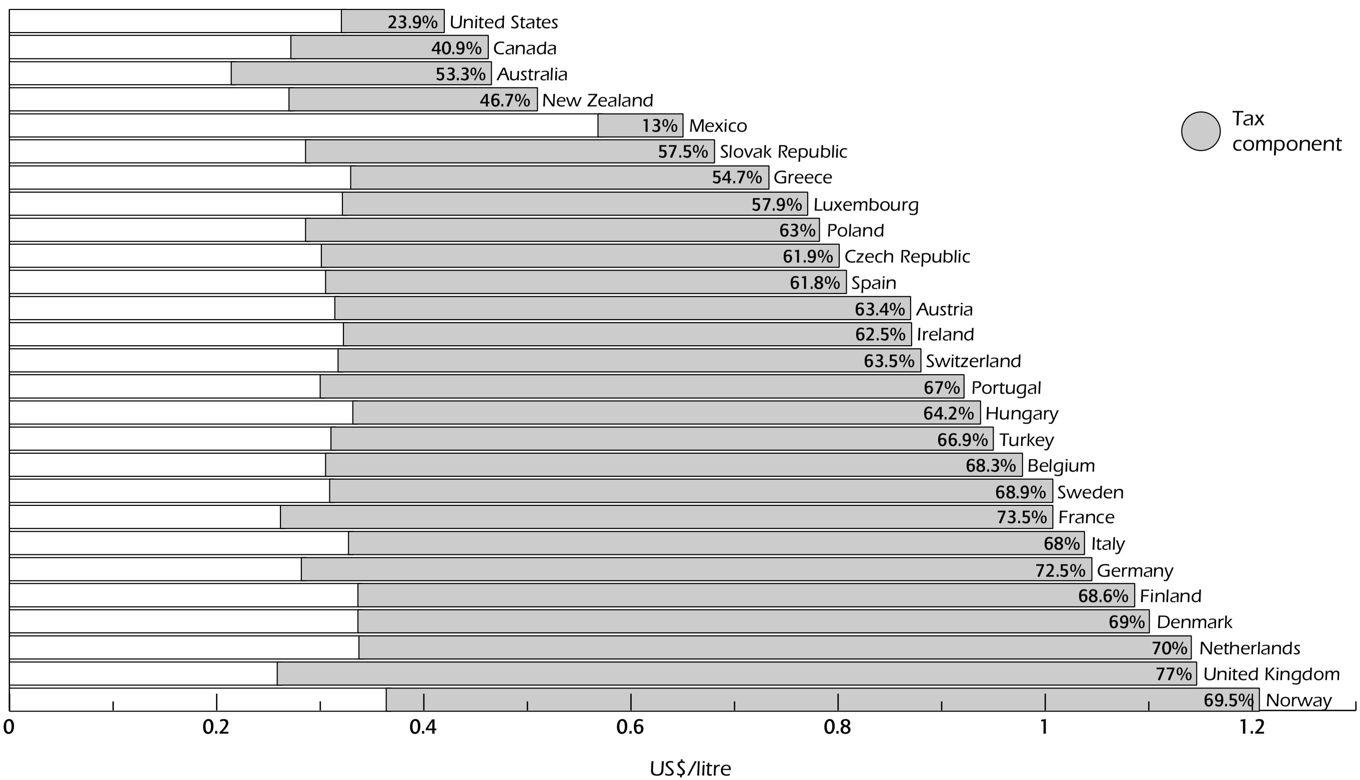
EMERGENCY PREPAREDNESS

Oil security is a high priority of Hungarian energy policy. Since 1995, in accordance with the 1993 Security of Stockpiling of Imported Crude Oil and Petroleum Products Act, Hungary has continuously held above 90 days of net imports based on IEA calculation methods, and established a national Crude Oil and Oil Product Stockholding Association (KKKSZ). All crude oil and oil product importers are obliged to be members of this association. The association has five projects to build 1 mcm of floating roof above ground storage for crude oil and petroleum products. This law also gives the government power to act in conformity with IEA procedures, measures and

33. In 2001, light fuel oil was taxed at 48.1% in Hungary, the highest rate among all IEA countries, except Italy with 53.7%.

Figure 19

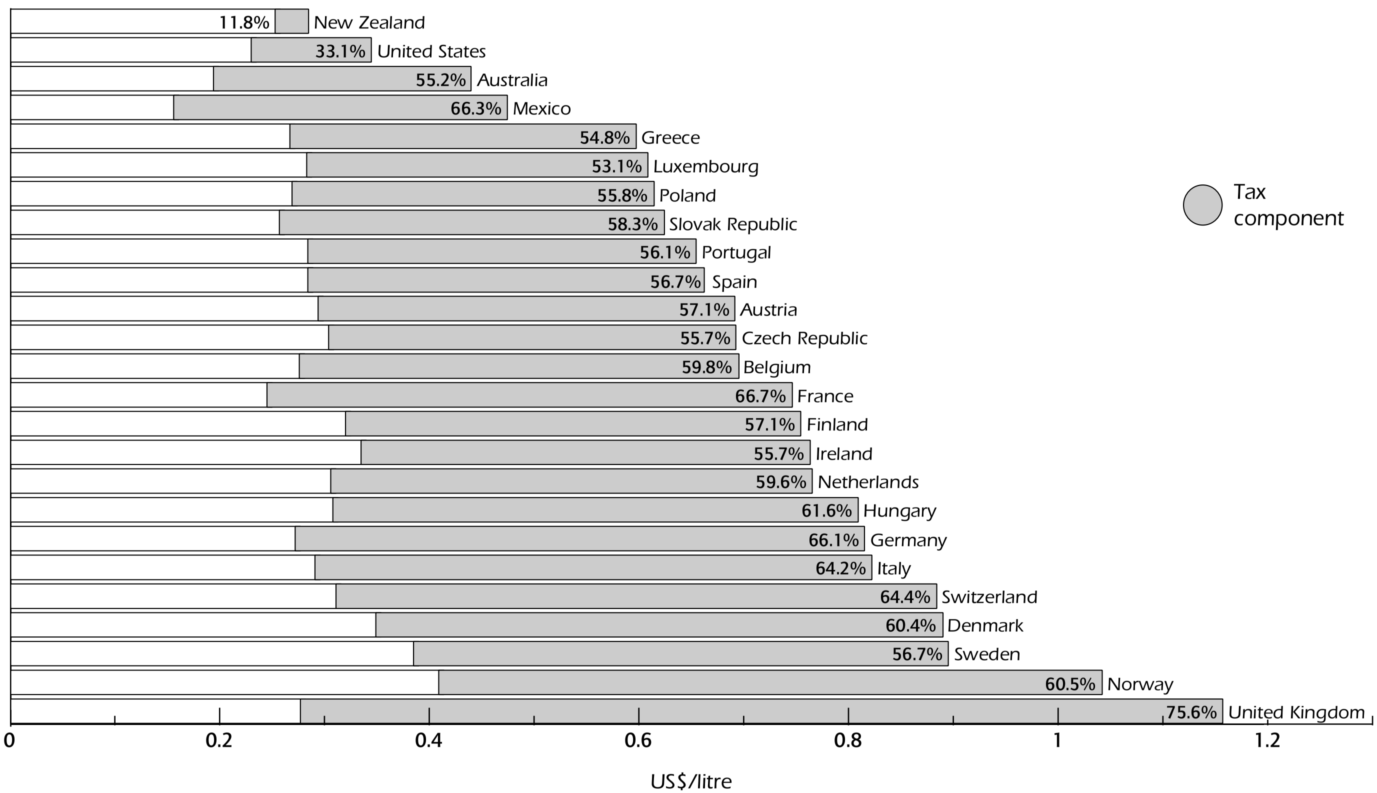
OECD Unleaded Gasoline Prices and Taxes, Third Quarter 2002



Note: data not available for Japan and Korea.
Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2002.

Figure 20

OECD Automotive Diesel Prices and Taxes, Third Quarter 2002



Note: Data not available for Canada, Japan, Korea and Turkey.
Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2002.

decisions, including the power to draw down stocks from KKKSZ in both crisis and pre-crisis oil supply emergencies. In 2000, amendments to the above-mentioned Stockpiling Security Act made it compulsory for companies involved in the emergency framework to report information on oil and oil products data to IEA and EUROSTAT.

CRITIQUE

Approximately 80% of Hungary's oil supply comes from Russia. Oil produced domestically in Hungary is trending downward. No major new oil findings are expected in Hungary, given that the country's geology is more likely to result in gas rather than oil discoveries. The Adria pipeline is strategically very important because it can be used as an alternative for Russian oil coming in from the East, which could discourage a price increase in Russian oil. Though expectations for more domestic oil findings are limited, the Hungarian exploration policy is commendable as it generates an appropriate climate for upstream investments, producing yet another incentive for foreign investors. MOL's efforts to diversify supply sources are also commendable, especially given Hungary's high dependency on a single country, Russia, for its supply.

Since the last In-depth Review, competition has been increasing in the Hungarian oil sector. The downstream oil sector is fully liberalised while exploration and production are shared between MOL and foreign companies. There are no restrictions on the participation of foreign companies. TPA is enforced on the main transit pipelines crossing Hungary. The 1999 In-depth Review raised the issue of pipeline access within Hungary by companies other than MOL, which is the sole owner and operator of pipelines inside Hungary. MOL argues that the pipelines should be considered an internal network of MOL, as they exclusively interconnect MOL refineries and are not interconnected with the larger pipelines. According to the government, companies other than MOL could find alternative, cheaper ways to transport their products within Hungary if required, without having to provide them with TPA on their pipelines. Moreover, the geographic size of the Hungarian market is small enough to make alternative transport options more viable. The review team judged that imposing TPA on these product pipelines is not indispensable in the present situation, although it should be monitored by the authorities to ensure that companies other than MOL do not suffer from anti-competitive discrimination in transporting their products.

MOL is the only company operating refineries in Hungary. In addition, it has an increasing role in the regional supply of products with its investment in Slovnaft, which owns and operates the Slovakian refinery, and its expansion in Romania. The Hungarian market is supplied with oil products manufactured domestically or imported, the majority of imports coming from the Slovak Republic. The market is relatively small and there is increasing concern about a possible oligopoly over regional sources of products, in which MOL, for example, plays a major role. Continuous monitoring by the appropriate authorities is necessary.

The excise duty on light fuel oil, in particular for household consumption, has been maintained at a high level, following a policy initially implemented to avoid its possible illegal use in vehicles. This is now distorting the price signal, artificially inflating demand for other heating fuels such as natural gas, which has benefited from a relatively low end-user price.

The liberalisation of the oil sector and the privatisation of MOL have generated a growing need for companies to increase the confidentiality level of their operations. This is affecting the reporting requirement for information supplied by companies to governmental organisations. Despite the amendments to the Stockpiling Security Act requiring MOL to report additional information to IEA and EUROSTAT, data submission is still insufficient.

NATURAL GAS

MARKET OPERATORS

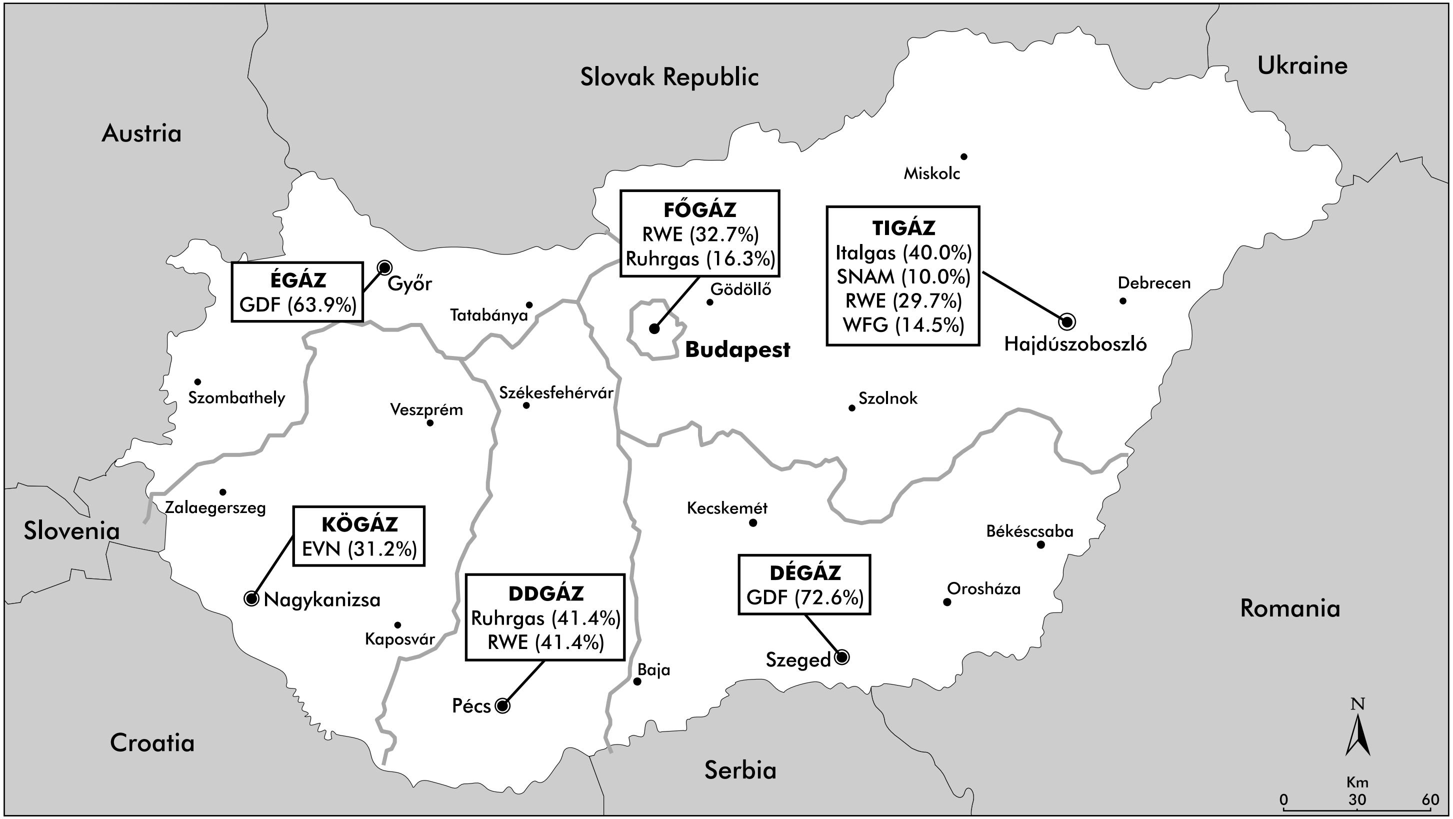
Distribution of manufactured gas (town gas) in Budapest began as early as the 19th century, whereas Hungary's indigenous gas reserves were only discovered during the 1960s.

Before the political change of the 1990s, the domestic gas and oil markets were dominated by the Hungarian Oil and Gas Industry Board (OKGT), 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 OKGT took over gas distribution responsibilities from the municipalities, initially mainly town gas distribution. The only exception being 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 industries. The National Gas and Oil Pipeline Company (GOV) was responsible for pipeline transportation of oil and natural gas in Hungary and across borders to neighbouring countries. Five affiliated gas distribution companies, namely DDGÁZ, DÉGÁZ, ÉGÁZ, KŐGÁZ and TIGÁZ were responsible for gas distribution and supply. OKGT performed all the activities integrated into the oil and gas business, except import and export of raw materials and products, which was carried out by Mineralimpex, a fully state-owned foreign trade company under supervision of the Ministry of International Economic Relations and its predecessors.

Figure 21

Main Gas Distribution and Supply Areas in Hungary



Source: IEA.

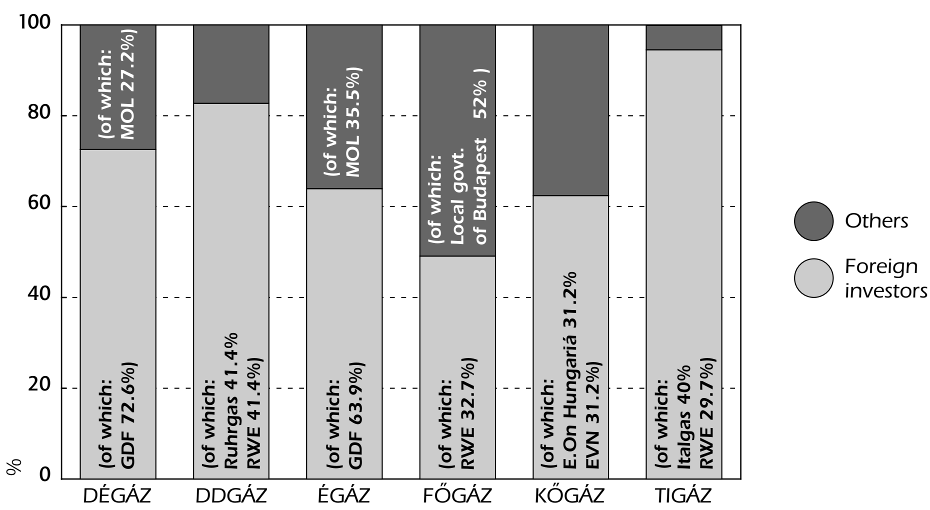
In 1995, the government began to privatise MOL, separate and privatise the regional gas distribution companies and integrate Mineralimpex into MOL. MOL's majority shares were issued in several tranches on international exchanges for financial investors. As of 31 December 2001, foreign investors owned 46.3% of MOL's capital, the Hungarian government retaining 25% of the capital and a golden share through the Hungarian State Privatisation and Holding Corporation (ÁPV). The rest of the capital is shared between OMV (10%) and Hungarian private and institutional investors (18%).

Though this situation is expected to change, MOL is currently the sole producer of natural gas in Hungary and the principal company responsible for foreign trade. MOL also owns the Hungarian high-pressure natural gas transmission and gathering pipeline network, which transports both domestically produced and imported gas to the gas distribution companies' local pipeline systems. MOL is the only licensed gas wholesale supplier in the country. It performs production, import, storage, transmission and sales to gas distribution companies and large industries and generators connected directly to the high-pressure transmission grid. In October 2000, prior to EU accession, Hungary decided to implement some of the guidelines from the 1998 EU directive on natural gas, by vertically unbundling MOL's activities: MOL established three separate, affiliated firms for gas transportation, underground storage and gas trading.

The majority of the six major regional gas distribution companies' shares were sold as international tender to foreign investors, such as Italgas (Italy), Gaz de

Figure 22

Ownership Structure of Regional Gas Distribution Companies



Source: Association of Gas Distribution Companies.

France (GDF, France), Ruhrgas (Germany), RWE (Germany), EVN (Austria) and Bayernwerk (Germany). The capital of these companies has changed hands since their initial privatisation. The current situation demonstrates that MOL once again owns large shares in some of these gas distribution companies.

NATURAL GAS TRANSPORTATION

MOL operates a fully integrated transportation system, with 14 entry points feeding gas into the high-pressure transmission system and 385 gas delivery stations. Two entry points, namely Beregdaróc, located in the north-east on the Ukrainian border, and Mosonmagyaróvár, located in the north-west on the Austrian border, receive imported gas. Gas sold to partners in Bosnia and Serbia and Montenegro transits at the Kiskundorozsma measuring station [34].

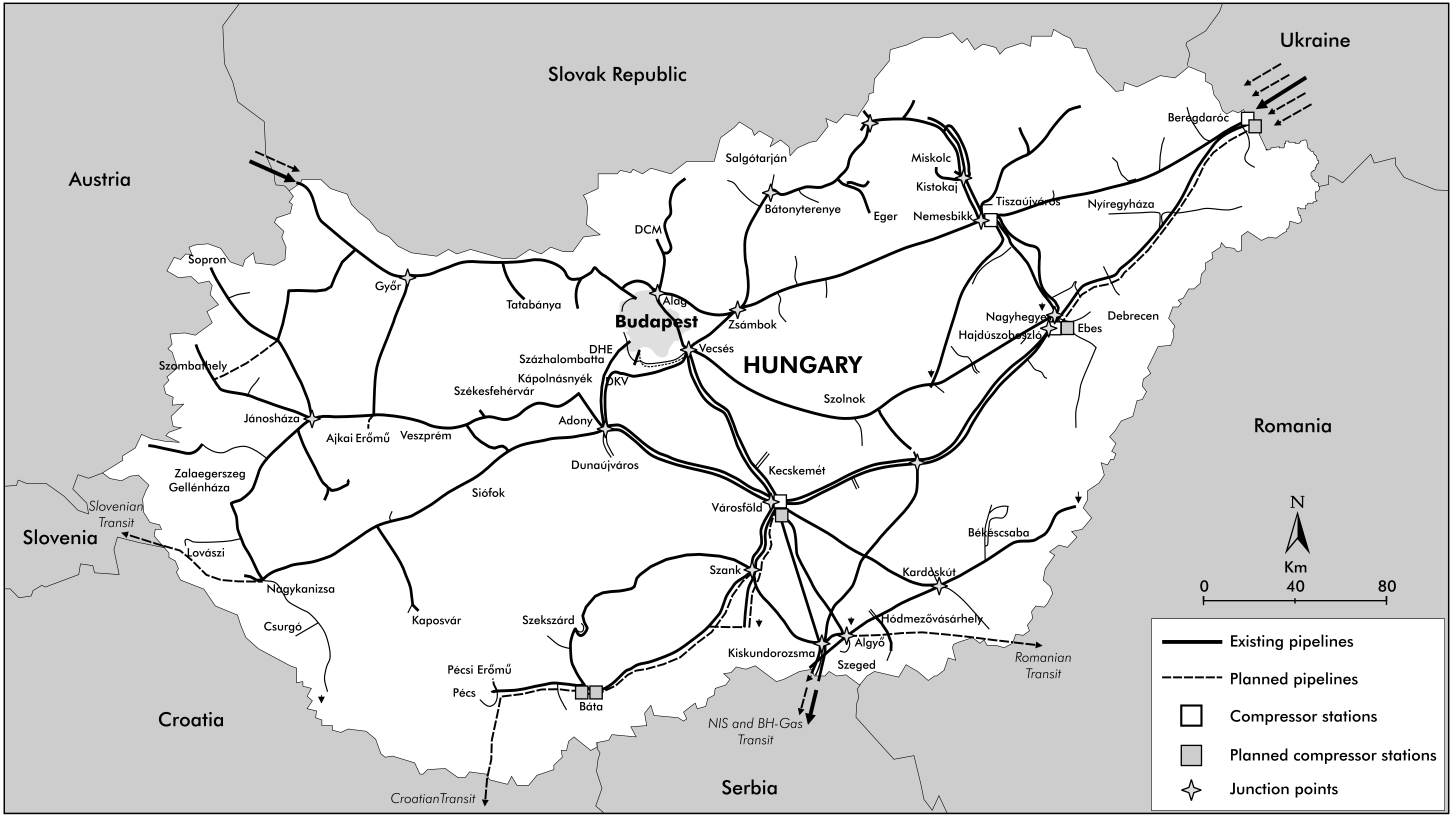
MOL owns Hungary's 5 278 km (2002) network of high-pressure gas transportation pipelines through MOL Földgázszállítás (Natural Gas Transmission), its gas transportation unit and the successor organisation of KFÜ, which, although unbundled from MOL in accounting and managerial terms, remains fully owned by MOL. Typical operating pressure across the system is between 63 and 75 bars, with pipe diameter measuring between 100 and 800 mm. Construction began in 1963, with almost 50% of the system being built between 1963 and 1980. Since the early 1990s, MOL has carried out regular inspections with "intelligent pigs" and the results have confirmed that most sections of the aged pipelines need major reconstruction work, though adequate maintenance has ensured security of supply, safety of operation and no major damage to date. The Hungarian gas pipeline network is interconnected to Russia via Ukraine, via the "Brotherhood" pipeline. The daily capacity of this pipeline is 42 million m^3 per day. The total capacity is divided into 30 million m^3 per day for Hungarian and 12 million m^3 per day for transit purposes. This translates into 15 bcm maximum annual capacity and 10 to 12 bcm average annual capacity. MOL has transported natural gas to former Yugoslavia since 1979. In 2001, the former Yugoslavia and BH-Gas of Bosnia-Herzegovina concluded an amendment on long-term natural gas transportation. Under these contracts, MOL transmits 1.7 bcm per annum of natural gas to former Yugoslavia and 0.2 bcm per annum of natural gas to Bosnia-Herzegovina.

Since October 1996, the Hungarian gas grid has been interconnected to the west European grid via the HAG natural gas pipeline between Győr in Hungary and Baumgarten in Austria. This pipeline is 120 km long, 70 km of

34. There is another measuring station at the centre connecting the Hungarian and Slovakian systems, but it is currently not in operation.

Figure 23

Natural Gas Transportation Infrastructure



Source: *Natural Gas Information 2002*, IEA/OECD Paris, 2002.

which are on Hungarian soil, and has an annual capacity of 4.4 bcm. Construction began in September 1995 and the line was in operation by October 1996. A compressor station was constructed in Mosonmagyaróvár in 2001.

NATURAL GAS DEMAND

Natural gas is essential to the Hungarian economy. In 2001, it represented almost 41% of Hungary's primary energy supply, with 11.4 Mtoe, or 12.85 bcm, an absolute peak in Hungarian gas supply history.

Gas demand from industry shrunk substantially after the collapse of the political and economic systems in the early 1990s. The share of industrial gas consumption decreased from 42% in 1990 to only 18% in 2000[35]. The shares of the residential and commercial sectors grew significantly to represent 30% and 20% respectively, against 18% and 7% in 1990.

The number of household customers increased continuously and linearly for many years to reach three million in 2001 (out of the four million Hungarian households), close to saturation level. The same is true for the commercial sector. Consumption by the industrial sector may increase slightly in the future, but no major change in the growth trend is expected. Demand by the power generation industry is uncertain and will be affected by the future role of nuclear. In 2000, 61% of the total thermal non-nuclear electricity generating capacity was multi-fired, with plants running mostly on natural gas, but able to switch to other fuels, namely liquid or solid if necessary.

Table 9

Gas Consumption by Sector, 2000

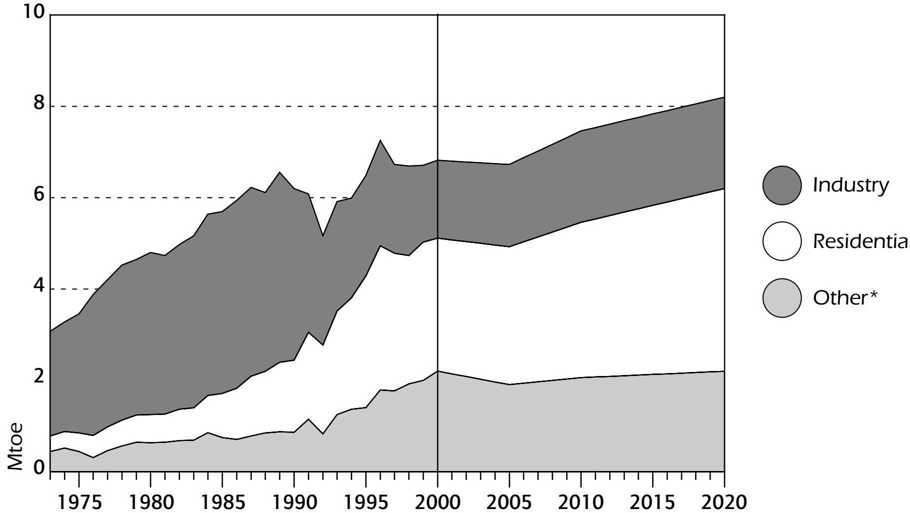
Sector	*Share (%)*	*Consumption (bcm)*
Power	18	2.1
Industry	18	2.1
Residential	30	3.6
Commerce - public services	20	2.4
Others	14	1.7
Total	**100**	**12.0**

Source: IEA.

35. Sectoral final consumption as a percentage of primary supply.

Figure 24

Final Consumption of Natural Gas by Sector, 1973 to 2020

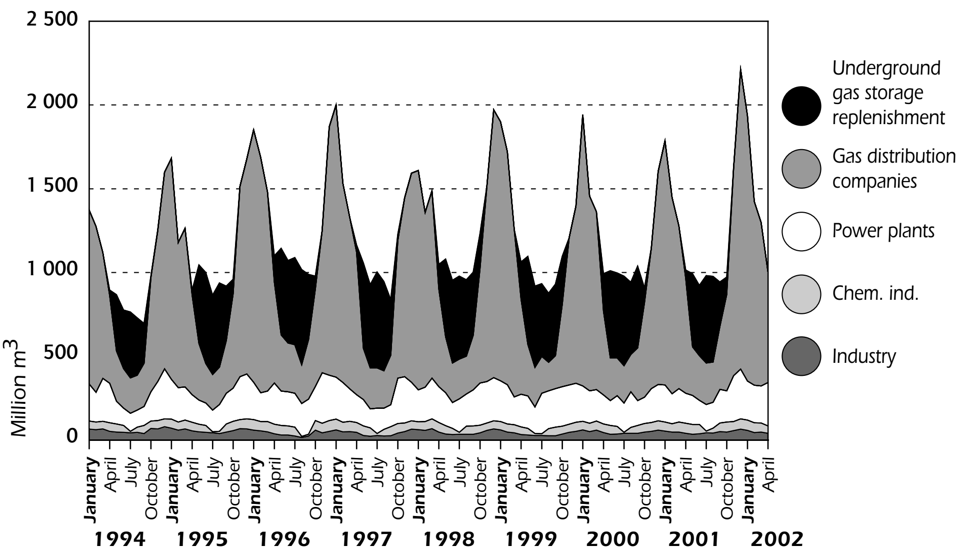


* includes commercial, public service and agricultural sectors.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2002; and country submission.

Figure 25

Monthly Gas Consumption, January 1994 to April 2002



Source: Hungarian Energy Office.

Demand seasonality has been accentuated by the fall in industrial gas use that significantly reduced baseload gas demand. High gas penetration in the residential sector brought a strong increase in temperature-dependent gas consumption. The ratio between gas sales in the peak and lowest demand months of the year was 4.2 to 1 in 2000, a very high level compared to other European countries.

Winter monthly peak gas consumption is largely satisfied by drawing from underground storage, which represents up to 35% of annual demand. MOL reduces production from its own wells in the summer months but sends large amounts of gas into storage, especially from imports under TOP contracts.

NATURAL GAS SUPPLY

Domestic Production

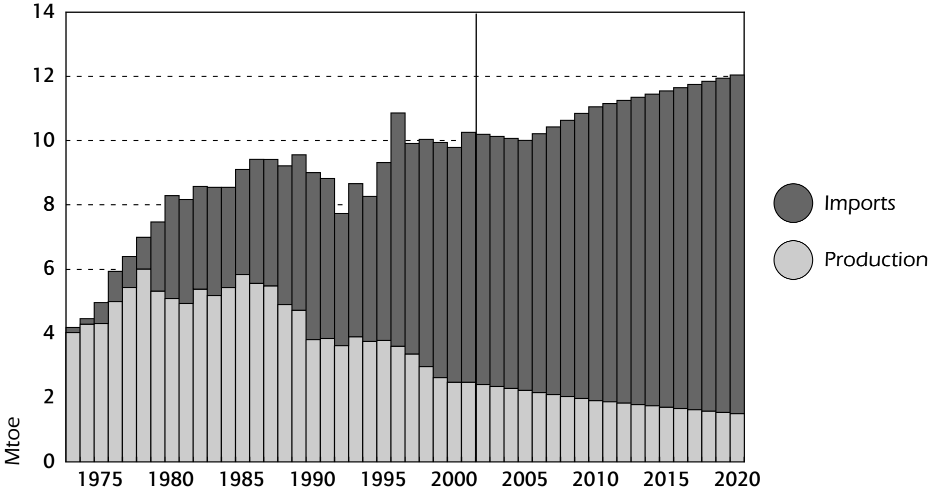
According to the Hungarian government, Hungary has 38 bcm of natural gas reserves, corresponding to an 11-year reserve-to-production ratio. At the beginning of 2000, domestic production reached 3.2 bcm. Gas production began soon after the discovery of Hungary's natural gas reserves in the 1960s and peaked in 1985. In 1973, Hungary could meet 96% of its domestic demand from its own production. By 2001, the country's self-sufficiency had reduced to 25%, with three-quarters of gas supplied to domestic consumers having to be imported.

The government forecasts that in 2010 domestic gas production will decline from its current level of around 3 bcm to approximately 2 bcm. All the gas in Hungary is produced by MOL, which also holds licences in more than 30 of Hungary's exploration areas for oil and gas. Several foreign companies also carry out oil and gas exploration in the country. Although Hungary is relatively well explored, the upstream regime for oil and gas has been successful in attracting new international companies. El Paso (US) has discovered commercial quantities of gas in south-west Hungary (south of Lake Balaton), and is now preparing to produce and market the gas. Initially, this will be done through MOL, given that until the new Gas Law comes into effect, independent producers are prohibited to sell their gas directly in Hungary. Avco Horizon (US) has also found gas in western Hungary, while Pogo International (US) and MOL have made discoveries in central Hungary. All natural gas production permits are issued by the Hungarian Bureau of Mining. The mining royalty for natural gas produced in Hungary is 12% of the average gas fee.

Under the 1993 Mining Law, "old" gas (*i.e.* discovered before 1993) should be sold domestically under Hungarian government price control, while "new" gas (*i.e.* discovered after 1993) will be liberalised. The "old" gas makes up about 85% of Hungary's gas reserves. Until export licences are granted or market liberalisation takes effect, "new" gas is effectively the same as "old" gas, with

Figure 26

Indigenous Gas Production and Imports, 1973 to 2020



Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2002; and country submission.

its price capped at an artificially low level (see below). Hungary exports small quantities of natural gas to former Yugoslavia (80 mcm in 2000 and 4 mcm in 2001).

Imports

MOL and Panrusgáz[36] are Hungary's sole importers of natural gas. Their three major suppliers for imported gas are Gasexport[37], Ruhrgas and GDF. MOL is the only licence holder authorised to sell wholesale gas in Hungary. All imported gas is Russian. Natural gas imported by Panrusgáz enters Hungary at Beregdaróc via the Brotherhood pipeline (68% of the imported gas) and Mosonmagyaróvár via the HAG (Győr-Baumgarten) pipeline, while supplies contracted from Ruhrgas and GDF only enter at Mosonmagyaróvár via the HAG pipeline. Supplies from Panrusgáz represent 14% of imports, while supplies from European wholesalers represent 12%, and those from Ukraine represent 6%.

In 1975, Hungary began to import natural gas from Russia. The Orenburg contract, concluded within the framework of the COMECON between the

36. Panrusgáz is a joint venture owned by MOL and Gazprom (50%), created to import Russian gas in Hungary.
37. A subsidiary of Gazprom.

former Soviet Union and Hungary on 21 June 1974, was the first supply contract signed with Russia. Under this contract, 2.8 bcm of natural gas per annum from the Orenburg field were delivered to Hungary up to 31 December 1998. The Yamburg contract, amounting to 2 bcm per annum 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. On 7 November 1996, a 20-year contract was signed between MOL and Panrusgáz for delivery of 194 bcm of gas – including the Yamburg extension – between 1 October 1996 and 31 December 2015, with the possibility to purchase an additional 2 bcm per annum between 2000 and 2015. This contract amounts to 10.2 bcm per annum and covers the largest part of future gas needs, estimated by MOL to reach 14.2 bcm by 2010.

Based on the possibility of diversifying physical gas deliveries opened up by the HAG pipeline, MOL signed a 10-year supply agreement with Ruhrgas on 10 May 1995 for the delivery of 0.5 bcm of gas per annum, which came into effect in October 1996 when the HAG pipeline opened. On 6 December 1996, MOL signed an additional 15-year contract with GDF for the supply of 0.4 bcm of gas per annum through the same pipeline, starting on 1 January 1997. In October 1997 another 15-year contract was signed with Ruhrgas, for delivery through the HAG pipeline from 1998 onwards with a starting volume of 0.1 bcm of gas per annum, to increase to 0.76 bcm after 2006.

Gas contracted from western European suppliers is essentially supplied through swaps, *i.e.* Russian gas delivered on its way to France or Germany. In 2001, about 2.5 bcm of gas was delivered through the HAG pipeline, of which 1.1 bcm was contracted from western suppliers. These deliveries are priced above direct supplies from Russia, which are still the cheapest. Though other potential sources exist[38], it is unlikely in the near term that large amounts of gas will be imported from other sources than Russia.

Given that the HAG pipeline is linked to the western European gas grid, it could offer some additional security of supply if Russian gas supplies are interrupted to Hungary. It is not clear how much physical supply could be expected through the western interconnector if Russian deliveries to western Europe were curtailed.

Natural Gas Storage

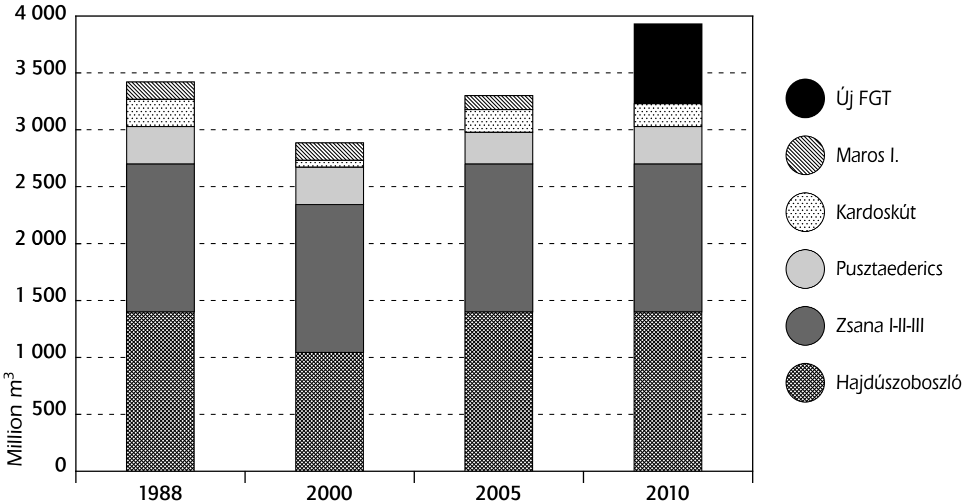
MOL is the largest owner of storage capacity in Hungary. In 2001, Hungary had 3.24 bcm of working gas storage capacity, with a daily withdrawal

38. In the long term, Iranian gas could be supplied through Turkey and Romania. An LNG terminal could also be built on the Croatian Adriatic coast that would enable gas supply from countries such as Algeria or Qatar.

capacity of 43.2 mcm from five underground gas storage facilities, which are all depleted natural gas fields. This relatively large working gas capacity enables MOL to meet a high percentage of peak winter demand. Storage capacity is expected to increase by 700 mcm by 2010.

Figure 27

Gas Storage



Source: Hungarian Energy Office.

NATURAL GAS PRICES

At the time of writing this report, price regulation was still carried out under the 1994 Gas Supply Act and Gas Pricing Decree, pending new legislation in the form of a Gas Law still before Parliament. The regulatory framework set out in the 1994 legislation was initially intended to apply between 1 January 1997 and 31 December 2001. It was extended until 30 June 2002, and then maintained. The MEH calculates wholesaler and final consumer tariffs, but does not implement them. Final price levels are determined by the Ministry of Economy and Transport.

Wholesale prices are calculated using a cost-plus formula based on the following factors:

- Domestic gas production cost.
- Price of imported gas.
- Justified operational costs of gas supply including an 8% real return on equity.

- Domestic industrial sales price index excluding food and energy industries.
- HUF exchange rate.
- Efficiency improvement factor forcing the gas industry to reduce costs by reducing allowable prices (ranging from 5% to 15%).

The natural gas end-user price is the same throughout the country. In 1999, a Ministry of Economy Tariff Decree (11/1999.GM) introduced two-component retail tariffs, which have been applied to every consumer category since 1 July 1999. This decree implemented the EEC recommendation 83/230/EEC calling for the introduction of a capacity charge in addition to consumption-related tariffs in end-user gas prices. The following basic principles and requirements were taken into consideration:

- Charges should reflect, as much as possible, the incurred costs and, if possible, any cross-subsidies must be abolished.
- Social considerations should not play a role in establishing prices.
- Prices must be value-proportioned and reflect safety and value of service.

The gas consumption charge consists of two parts: *i)* a standing charge or capacity charge[39]; *ii)* a commodity charge.

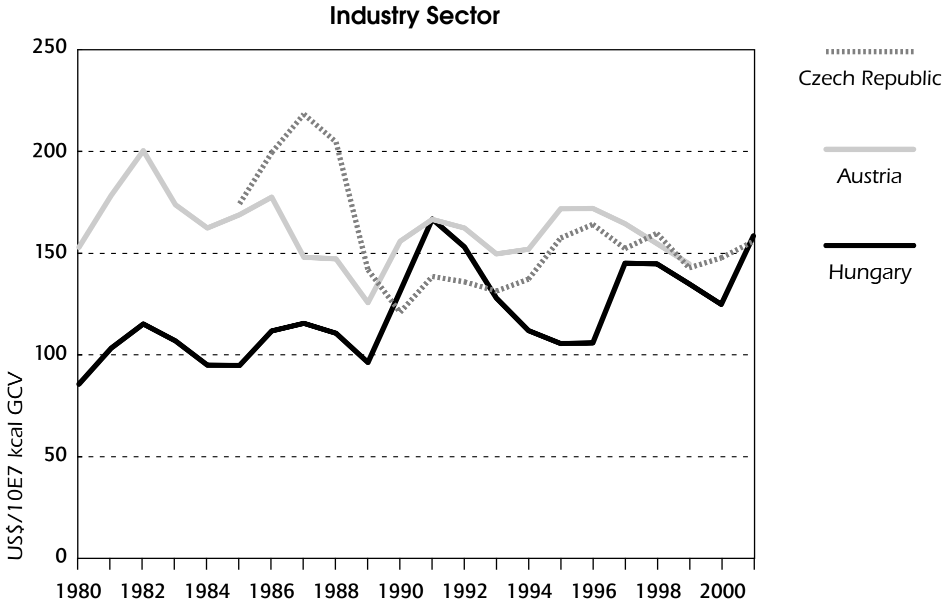
Price reviews have been triggered by demands from interested parties as well as through the quarterly price adjustment mechanisms, every January, April, July and October. Price increases after 1994 substantially lowered household and industrial natural gas price subsidies. In 1999 and 2000, the Hungarian gas market experienced large price increases, as did the oil market. In the July 2000 round of price revisions, consumer prices increased by 12%. In the November 2000 round, prices for industrial consumers with a capacity above 500 m^3 per hour increased by 43%, bringing prices close to cost levels. In July 2002, there was a 4.2% gas price increase for industrial consumers only. Despite relatively high inflation levels, real gas prices increased above inflation, helping to catch up with costs. On average, natural gas prices grew by 5% per annum in real terms for households and by 6% for industry between 1994 (first quarter) and 2002 (second quarter)[40]. However, this proved insufficient to catch up with costs, which have also grown, especially for households, where service costs are higher given seasonality of demand and a relatively lower load factor.

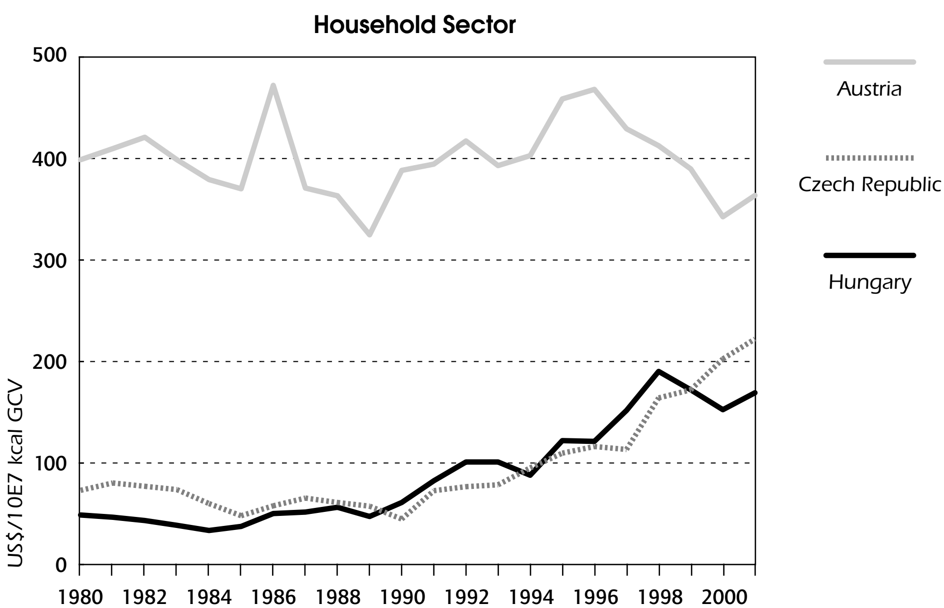
Despite these price increases, private Hungarian gas supply and distribution companies are demanding higher prices because they consider that their costs

39. If the rated (total) capacity of the gas meter(s) is 100 m^3 per hour or lower, the consumer pays a standing charge on the basis of the capacity of the meter, and if the rated (total) capacity of the gas meter(s) is higher than 100 m^3 per hour, a capacity charge in accordance with the capacity demand (specified in cubic metres per hour) stipulated in an individual contract is payable.
40. Calculated from IEA and OECD databases.

Figure 28

Gas Prices in Hungary and in Other Selected IEA Countries, 1980 to 2001



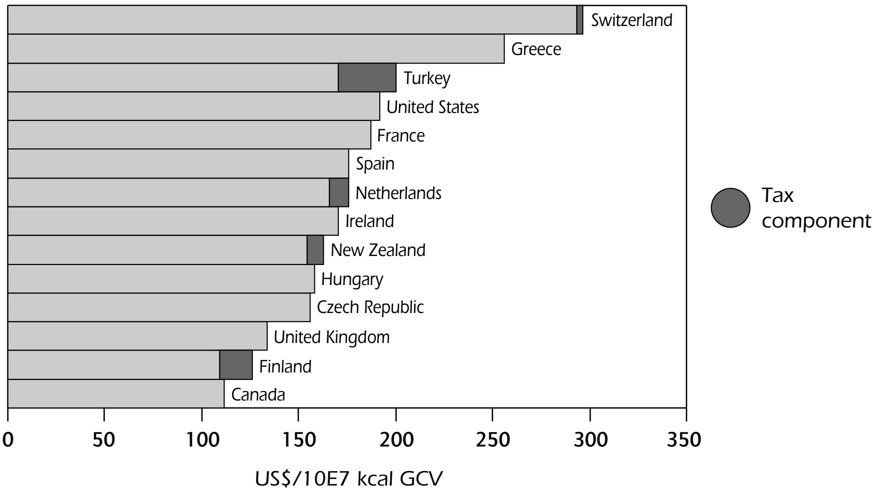


Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2002.

Figure 29

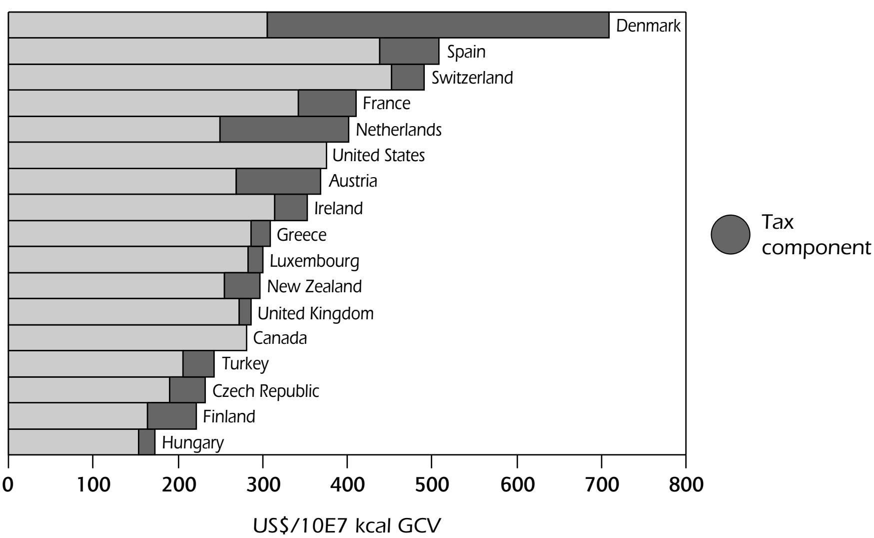
Gas Prices and Taxes in IEA Countries, 2001

Industry Sector



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

Household Sector



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

Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2002.

for purchasing gas from MOL are not being fully recovered. MOL is in difficulty because it must sell gas at prices that are capped at levels below the acquisition costs. This situation has generated some conflict between the suppliers, MOL, the MEH and the Ministry of Economy and Transport. In 2000, 2001 and 2002, the gas price increase restrictions led MOL to incur losses for the first time in its history, totalling about US$ 1 billion. Consequently, MOL has suspended most infrastructure improvements of its gas transmission system, as well as investments in pipeline and storage capacity to improve its ability to respond to demand seasonality. MOL is considering the option of selling its gas division to a commercial buyer or to the State. MOL has been working with the Hungarian government to rework the natural gas price structure. In January 2003, the government announced a 12% price increase for residential customers and a 15% price increase for non-residential customers, with a capacity demand below 500 m^3 per hour, effective from 15 May 2003. These price increases are insufficient given that a 22% to 25% average price increase is needed to break even. If the price distortion is not corrected, its repercussions will be even worse when the new environmental regulations take effect in 2004 and natural gas becomes a fuel of choice for generating power. This will bring the risk that decisions on investment in new gas-fuelled power plants for peak power demand and their subsequent operation will be influenced by incorrect price signals. The artificially low regulated price of gas could have substantial negative implications for security of supply, and work against the efficient allocation of energy resources within the Hungarian economy.

TOWARDS A NEW GAS MARKET MODEL

The Hungarian government is still in the process of debating a Gas Act that would pave the way for the implementation of a new gas market model. Many of the elements currently under discussion were being debated during the preparation of the last IEA In-depth Review. By 1999, the government had already completed the partial privatisation of MOL and the separation and privatisation of the gas distribution companies.

The government's approach to privatisation of the oil and gas industries 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 (considered as the minimum government shareholding in strategic, previously state-owned companies). After separating MOL from its distribution (and other) affiliates in 1991, the government sought a strategy that would yield maximum revenue from gas industry privatisation. In 1993, this engendered plans to allow or even promote vertical reintegration 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 was completed down to 25% plus one share by 1995. At the end of 1994, the government decided to go ahead with full privatisation of the gas distribution companies, except FŐGÁZ, in which it wanted to retain one golden share. In 1995, a tender for foreign investors was launched. Initially, ÁPV offered investors majority stakes of 50% plus one vote. A further 40% of the shares were transferred from ÁPV to the municipalities supplied by the companies. Soon after the gas distributors were publicly listed, the municipalities also decided to sell most of their shares. The only exception being KÓGÁZ, where the municipality decided to keep all of the shares attributed to it. 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. FŐGÁZ's owner, the Budapest municipality, offered investors the choice between majority and minority shareholdings. Investors chose minority shareholdings with all the associated rights.

Although MOL is still Hungary's only licensed gas producer and transporter and still dominates gas imports and exports, competition does exist 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 must provide TPA to its high-pressure gas transportation infrastructure under the following two conditions:

- There has to be spare pipeline capacity.
- The gas shipped must be produced in Hungary.

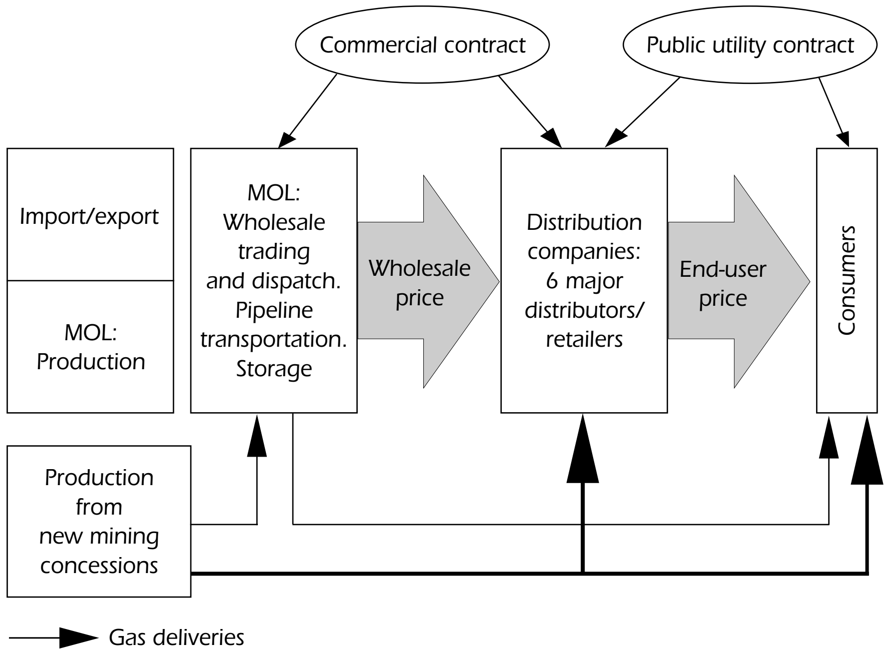
A 1991 government decree stipulated that MOL must offer the same gas transportation tariffs to third parties as it uses in its own internal accounts. Regarding access to gas storage facilities, the legal framework determines that access must be provided where the storage facilities are independent from producing gas wells. These provisions have not yet resulted in effective competition for end-user supply.

Until recently, several areas were not covered by the existing gas distribution companies. Supply to these areas was opened to competition by the MEH and supply licences have been attributed separately municipality by municipality. The heterogeneous pattern of supply areas, already present under the previous system, is thus enhanced, which could be a good starting point for competition in distribution.

In the mid-1990s, the government decided that the EU Gas Directive (98/30/EC) would be implemented by the time Hungary becomes a full member of the EU. The government elected in April 2002 decided to make several changes to the Gas Act proposed in 2001, hence delaying it being presented to Parliament. Provided it is adopted, the act could come into force in 2003 or 2004.

Figure 30

Functional Model of the Hungarian Gas Industry



Source: Hungarian Energy Office.

The implementation of this act would signify the emergence of two markets; a competitive market for eligible gas consumers and a regulated market for public or captive service consumers. As a first step, 40% of the largest natural gas consumers would become eligible. New market participants could begin importing gas freely. Companies responsible for supplying gas to non-eligible consumers would have to buy natural gas from a wholesale supplier. Eligible consumers would be allowed to purchase gas directly from traders.

MOL is already preparing for the new Gas Act that would require further unbundling between gas transportation (system operation), storage, public utility wholesaling, trading and cross-border importing activities. In the new market model, the government will guarantee transparency and fair access to transmission and storage facilities. The MEH will control TPA and the implementation of the network code.

Additional changes could include the creation of a new gas pricing mechanism and the discontinuation of centrally setting prices for gas produced in Hungary. The government is also envisaging raising the royalty fees, to limit the production of domestic gas and to preserve domestic resources, and raising extra revenue to fund possible direct support to low-income households who would be adversely affected by rising gas retail prices. The mechanism to increase mining fees could be based on international changes in gas prices. If the global price of natural gas falls below US$ 92 per 1 000 m^3, the levy would be 12% (as it is now) and if it rises above US$ 110 the levy would be 40%. The levy between these two gas price thresholds would be negotiated in the range of 12% to 40%.

CRITIQUE

Security of natural gas supply is vital for Hungary given its large share in the energy mix. In this context, it is commendable to seek to diversify the natural gas supply by increasing quantities coming through the HAG pipeline.

The opening of the Hungarian upstream market is also commendable, especially in view of the potential contribution of indigenous gas production in improving security of supply and facilitating competition. However, the prospect for domestic production could be hampered by several factors.

First, the remaining arrangements differentiating between "old" and "new" gas creates distortion and uncertainty, which discourages domestic producers. Moreover, as long as the gas market is not liberalised, "new" gas has to be sold on the domestic market at prices which are still artificially low, to the point that it may not appear economical to do so. This will seriously discourage further investment in domestic production. All gas should be priced in the wholesale market on a market-related basis.

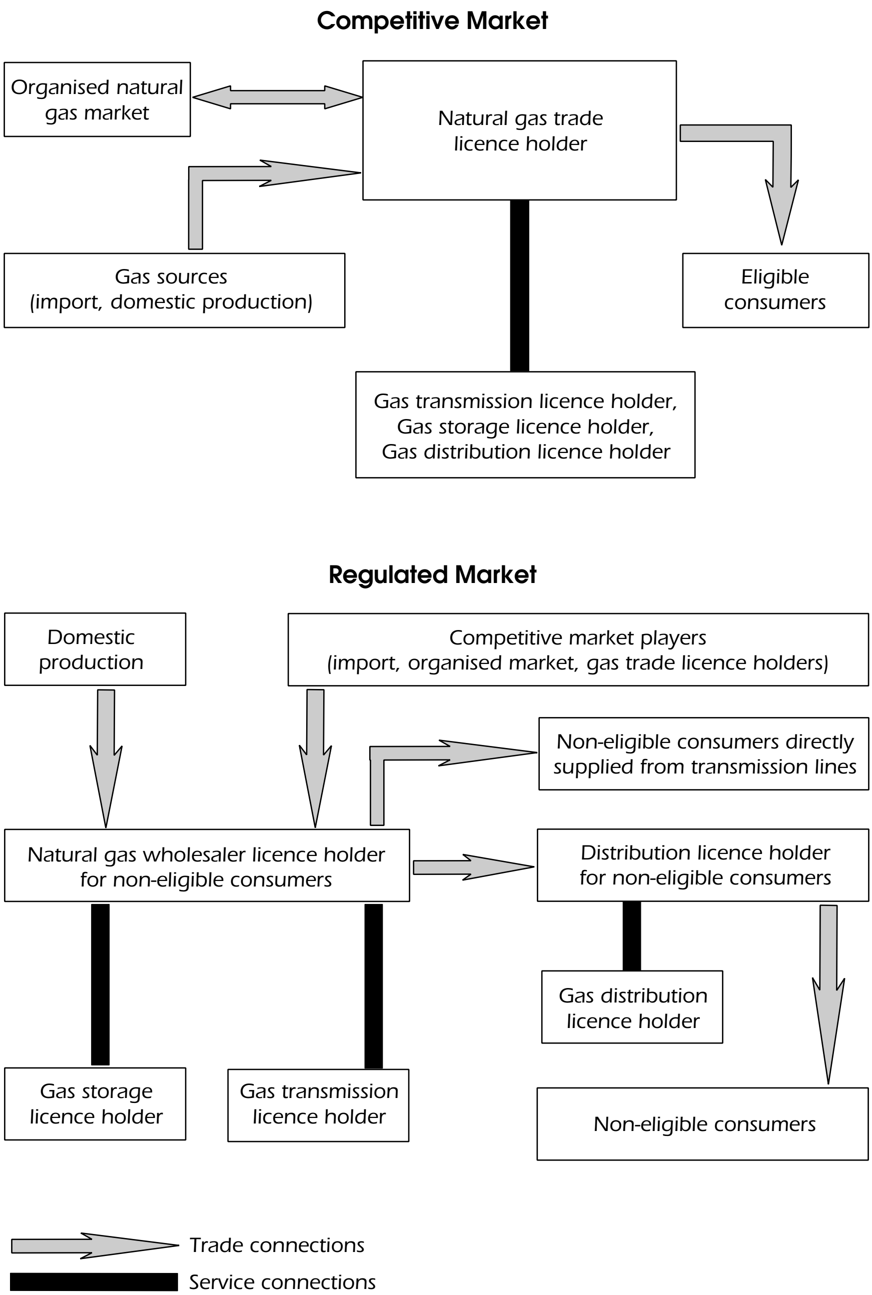
Second, if for fiscal policy reasons the government decides to impose an excess profits tax on incumbent producers whose facilities have been fully amortised – perhaps in order to raise revenues to mitigate the impact of gas price increases on low-income households –, it should make sure not to go beyond the energy policy objective to capture excess profits and avoid cutting deeper.

Third, while sufficient pipeline capacity seems to exist when the time comes to extract the gas, companies express difficulty in obtaining export licences for the sale of gas outside Hungary. The government considers that domestic natural gas should be kept for domestic consumption, given the limited reserves and growing consumption. For example, if the implementation of EU environmental standards boosts gas demand for power production. However, this policy will not be successful while economic viability of domestic production is uncertain, owing to artificially low domestic gas prices and export constraints.

Fourth, the proposed linkage between the royalty regime for domestic gas production and the new pricing arrangement under the proposed Gas Act

Figure 31

The New Gas Market Model



Source: Hungarian Energy Office.

could have a negative impact on domestic production. The government is envisaging increasing royalty fees to partly finance support to low-income consumers affected by natural gas retail price increases. This could result in discouraging domestic production, which is contrary to Hungary's energy security interests.

Finally, delays in adopting the new Gas Act generated many uncertainties for domestic gas producers.

The solution to these issues would basically be to implement the proposed Gas Act as soon as possible, since it would clarify the regulatory framework and reduce uncertainties for all the natural gas market participants. To design the new Gas Law proposed in 2001, the government and the MEH have been investigating ways in which the Hungarian gas market can be adapted to the EU gas directive, debating over the following issues:

- *Eligibility of the regional distribution companies.* MOL directly supplies its 18 largest customers above 5 mcm per annum; 12 of these are not distributors and will be eligible for competition according to the rules of the directive. The current government's policy is that the distributors could become partially eligible to competition – for the part of their market which is eligible – to allow them to gain lower prices, otherwise they would face the risk of losing customers both to new market entrants and to MOL, thus creating stranded costs. The dense Hungarian high-pressure gas grid, with its many take-off points, is thought to give MOL an easy opportunity to out-compete the distributors with respect to their eligible industrial customers.

- *Take-or-pay contracts.* The issue of TOP contracts, and especially the possibility that Gazprom may out-compete MOL in its downstream market, is another area of concern. If this happened and MOL lost sales volumes, it would trigger MOL's TOP obligations with respect to either of the companies. A possible solution would be to reduce the TOP obligation by exactly the amount lost to Gazprom because of competition, although this solution would only work in the case of bilateral conflicts of interest.

- *Security of supply.* Hungary and Austria have traditionally used strategic storage to address security of supply. In particular, Hungary has an explicit policy of responding to its declining domestic gas production and the increasing import dependency on Russia via strategic storage. Russian gas will remain the least expensive, at least in the near future. In the absence of a European policy on strategic gas storage, this raises the question of how to recuperate the cost of such storage, which is considerable, in the competitive gas market.

The potential for strong and healthy competition in the Hungarian natural gas market is small given the intrinsic constraints to the development of competition, particularly on the gas wholesale supply side:

- All of Hungary's gas is Russian gas, which eliminates the possibility for suppliers to compete over gas supply sources, at least in the near future.

- While the share of gas in the electricity sector is likely to increase after the implementation of EU environmental standards, future growth of the volume of gas demand is uncertain because there are doubts whether electricity demand will increase at sustained rates over the next few years. Consequently, Hungarian gas demand could exceed the total existing gas supply contracted through long-term arrangements, thus requiring additional imports at prices that may be higher than existing contract prices. Alternatively, Hungarian gas demand could also be equal to, or lower than, contracted gas supply, leading to limited or no scope for market entry by competitors, or to stranded costs for MOL.

Furthermore, competition between distribution companies is likely to be reduced because GDF and Ruhrgas are key shareholders of four of the six companies.

Taking these constraints into consideration, the development of the gas market will have to be monitored carefully to ensure that there is sufficient scope for competition to deliver significant benefits to consumers. The appropriate authorities, including the MEH, should continue to monitor the effects on competition of existing TOP contracts, limited sources of supply and interaction with stranded costs.

Natural gas demand displays high seasonality, mainly because of important temperature-related household consumption. This problem may become more of an issue as gas is increasingly used for power generation. It raises security of supply issues. There are four theoretical ways to handle this demand seasonality, namely:

- Demand-side measures, *e.g.* curbing demand through interruptible contracts to induce temporary fuel switches during peak demand in case of possible tensions on gas supply.

- External supply-side measures, increasing capacities of gas transmission and distribution pipelines to avoid possible shortages.

- Domestic supply-side measures, discovering and exploiting new gas fields for swing supply purposes to increase the gas supply.

- Domestic supply-side measures, storing gas to face peaks.

Interruptible contracts have been introduced for some large consumers in Hungary to decrease peak demand. This is still the most practical way to address short-term requirements to meet peak gas demand since most of this demand arises from households, which cannot substitute gas with other fuels.

Recuperating the high cost of storage is a challenging task in a competitive market. There are several options. One solution under consideration is to raise a levy from all consumers, exploiting the EU directive clause on public service obligations since the gas required during peak time is principally for households. Another solution would be to raise the price of gas for those consumers responsible for peak demand. In any case, the government should set up the necessary conditions (through levy or household price increases) to facilitate MOL's investments and keep this option under review in consultation with the MEH.

Although major problems have been avoided through adequate maintenance, most sections of the gas transportation and distribution pipelines are old and in need of major reconstruction works, which increases risks of supply disruption. Given the strong dependency on natural gas, both the operation of the market and the consumers would benefit from a government contingency plan that could be implemented in an emergency disruption of the gas supply. Such a plan does not yet exist.

Gas has a central position in the Hungarian energy economy. Artificially low household gas prices have had major impacts in a number of areas, including weakening the security of gas supply, distorting fuel choice and providing a weak incentive for taking demand-side energy efficiency measures. The Hungarian administration acknowledges this problem. The decision in 2001 to restrain household gas prices at a time of sharp increases in the price of imported gas is therefore regrettable. It exacerbates market distortions from underpricing, and makes it more difficult to move to market-related prices. The IEA review team recognises the social impacts of bringing gas prices to market-related levels, since the purchasing power of some of the population is still relatively low. The social issue should be addressed through targeted direct support to those most affected.

COAL

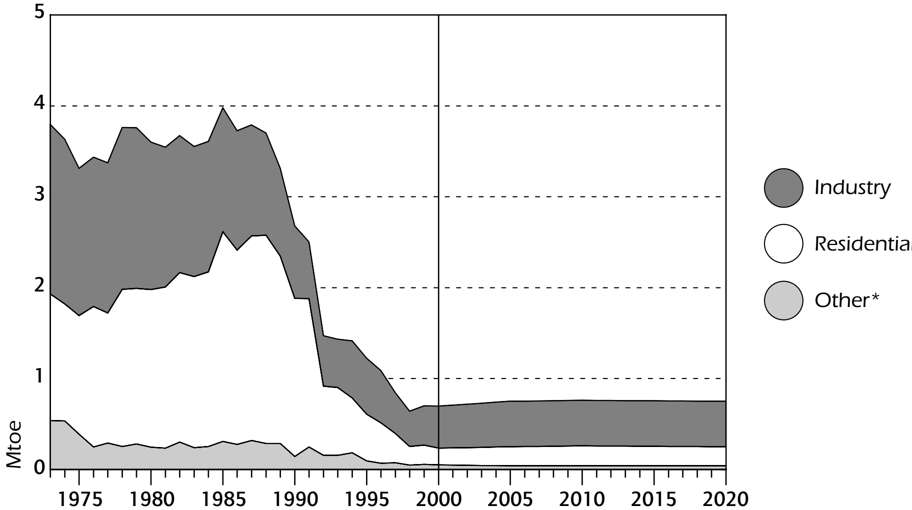
COAL PRODUCTION AND IMPORTS

Coal represented 16% of TPES in 2000, against 22% in 1990, displaying a constant regression over the period, a phenomenon that has lasted for several decades. More than 90% of sub-bituminous coal supply (brown coal) is used for power production. Though it was important until the beginning of the 1990s, household use of coal has almost disappeared.

Coal supply in 2000 amounted to 4 Mtoe, of which 1.2 Mtoe (approximately 30%) was imported, principally from the Czech Republic, Poland, Russia and Ukraine.

Figure 32

Final Consumption of Coal by Sector, 1973 to 2020



* includes commercial, public service and agricultural sectors.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2002; and country submission

Today, Hungary produces very little coal. However in 2001 it produced almost 4 Mtce (14 Mt) of sub-bituminous coal. This production is stagnating or even decreasing depending on the years. Of the 1.5 Mtce of imports, 1 Mtce was coking coal and the rest sub-bituminous coal and coal products.

Hungary has more than 3.1 billion tonnes of estimated coal reserves. The bulk of this is lignite, with 2.7 billion tonnes, followed by 0.2 billion tonnes of sub-bituminous coal and 0.2 billion tonnes of hard coal. Hungarian coal has comparatively low calorific value and high ash and sulphur content. Sub-bituminous coal has a heat content of about 10 000 to 14 000 kJ/kg, and lignite has a heat content of about 6 000 to 8 000 kJ/kg. The significant amount of sulphur (>1% by weight) in sub-bituminous coal means that power plants using it must invest in flue gas desulphurisation retrofits to remove sulphur dioxide produced by the combustion of this coal.

Coal production costs are high at many of the remaining mines, especially those situated underground because the coal must be mined quite deeply. The Pécsi hard coal opencast mine and the Visonta and Bükkábrány lignite opencast mines are profitable. Lignite deposits located in north-east Hungary may offer the only profitable future investment possibility in coal production in Hungary.

Today, coal is produced in 12 opencast and nine underground mines. Sub-bituminous coal is extracted from seven mines, two of them having yearly outputs of more than 1 Mt. All of these are underground mines, which affect the cost of coal and the subsequent economics of sub-bituminous coal use. The underground mines remain economical either because of their proximity to power plants that use the coal or, in the case of very small mines, their proximity to municipalities where the coal is used for home heating. Some marginal production of hard coal also exists in Hungary, though its mining is in decline. There are only two active opencast mines, both in the south of Hungary. Hard coal in Hungary is actually fairly plentiful, but it is neither easy nor very economical to mine; the seams are not very thick, are at times steeply sloped and contain relatively large amounts of methane. A Canadian and an Australian company attempted to extract methane from these seams, but the procedure has so far proved uneconomical[41].

COAL REFORM

After the collapse of the communist system, the coal sector entered a major financial crisis, forcing the government to implement a restructuring policy that began in the early 1990s. A programme to close uneconomical mines was initiated and continued through the last four years, with the closure of several hard and sub-bituminous underground coal mines. Whenever possible, mines were integrated with power plant companies. Integrated mines received neither direct state aid nor indirect support through the price of the generated electric energy. Their existence has been linked to the expiry of the power generators' operating licence. A majority of the integrated mines are owned by MVM, the incumbent electricity monopoly wholesaler. The non-integrated mines received a subsidy in the transition period before closing, as well as support through power industry purchasing contracts concluded as a result of government pressure on the power industry, since most of these mines were located in areas of high unemployment. There are at present about 8 000 coal miners in Hungary, down from 19 000 in 1995. The Nógrád mine (Nógrádi külfejtés), an opencast sub-bituminous coal mine, is the only mine that is still not attached to a power plant in Hungary. It is profitable and does not receive subsidies. All the others have now been closed.

From 2000, the government decided to eliminate state operational subsidies. There are no plans to provide further state aid except to finance the remaining

41. The Hungarian Geological Survey and the United States Geological Survey (USGS) have positively assessed coalbed methane availability in Hungary. In the Mecsek basin in south-west Hungary, where most of the Hungarian hard coal used to be mined, coalbed gas resource potential could reach 30 to 115 bcm of methane (USGS, 2002, *Coalbed Gas in Hungary – A Preliminary Report*, USGS Open File Report 01-473, US Department of Interior).

Table 10

Principal Coal Mines in Hungary

Mine Name	*Coal Type*	*Mine Type*	*Company*	*Supplying Power Plant*	*Merged with Power Plant Co.*	*Closure Date*
			Mines integrated with a power plant			
Pécs külfejtés	Hard coal	Opencast	Mecsek	Pécs	Pannonpower Ltd.	–
Ármin	Sub-bituminous	Underground	Veszprém	Ajka	Bakony Power Plant Co.	–
Balinka	Sub-bituminous	Underground	Veszprém	Inota	Bakony Power Plant Co.	–
Márkushegy	Sub-bituminous	Underground	Oroszlány	Oroszlány	Vértes Power Plant Co.	–
Mány	Sub-bituminous	Underground	Tatabánya	Bánhida		
				Tatabánya	Vértes Power Plant Co.	2003
Lyukóbánya	Sub-bituminous	Underground	Borsod	Borsod		
				Tiszapalkonya	Borsodi Energetikai Kft	–
Visonta	Lignite	Opencast	Mátraalja	Mátra	Mátra Power Plant Co.	–
Bükkábrány	Lignite	Opencast	Mátra	Mátra	Mátra Power Plant Co.	–
			Mines non-integrated with a power plant			
Putnok	Sub-bituminous	Underground				2000
Feketevölgy	Sub-bituminous	Underground				2000
Lencsehegy	Sub-bituminous	Underground				2003
Dudar	Sub-bituminous	Underground				1999
Rudolf	Sub-bituminous	Underground				2000
Nógrádi külfejtés	Sub-bituminous	Opencast				–

mine closures. The rehabilitation of mines is to be continued with private and state financial resources.

Hungary's accession to the EU is likely to accelerate the final steps of restructuring the coal industry, with the implementation of more stringent environmental regulations, especially if it results in the closure of some existing coal-fuelled power plants. However, many of the power plants have been or will be modified with retrofits, and no major changes are expected in the mining sector in the immediate future. The government is aware that the Hungarian Mining Act will need to be updated to keep up with changes in industry and the entry of new players in the energy exploration field, but this updating effort is likely to affect other types of mining and quarrying more than coal.

CRITIQUE

The government has managed well the transition from a centrally-planned coal industry to a market economy. Given the limited cost-effectiveness of Hungary's coal mining industry, the government chose to import increasing quantities of coal, while moving strongly towards restructuring the domestic industry. The decision to address coal industry issues in the context of a competitive international coal market is commendable.

The fact that mines to be closed are located in regions of high unemployment is still a problematic issue. The government has decided to accompany the closure of unprofitable mines with transitional financial help to rehabilitate the regions affected by the closures. The mechanisms in place to mitigate the costs of mine closure and compensate workers who are made redundant seem appropriate and sufficient.

It is remarkable that the government has maintained its determination to eliminate unprofitable coal mines, which is a positive step in the restructuring process. The policy to integrate unprofitable coal mines with power plants could however weaken the overall value of the government-owned power plant companies.

RECOMMENDATIONS

The government of Hungary shoud:

Oil

- *Make sure that the relevant competition authorities continue to monitor whether oligopoly is developing in the regional market, and if there is a need for regulatory action.*

- *Consider reducing the price distortion created by the relatively high excise duty on light fuel oil in order to diversify energy supplies for heating.*

- *Ensure the implementation of the law requiring that MOL submit the necessary data for the reporting requirement under international commitments.*

Natural Gas

- *Adopt the proposed Gas Act as soon as possible to implement a stable regulatory tax and pricing regime as a means to reduce uncertainties for all market participants, including domestic gas producers.*

- *Price all gas in the wholesale market on a market-related basis.*

- *If the government decides to impose an "excess profits tax" to capture, for the public benefit, excess profits derived from gas production at facilities that have been fully written down, ensure that such a tax only captures genuine "excess" profits.*

- *Continue to monitor the effects on competition of existing TOP contracts, limited sources of supply and interaction with stranded costs.*

- *Set up the conditions to facilitate the decision by MOL (or others) to install additional gas storage facilities, keep this option under review in consultation with the MEH and allow tariffs to reflect storage costs.*

- *Address the social consequences of bringing gas prices to market-related levels through targeted social policy measures.*

- *Develop a contingency plan for possible supply disruption, to ensure that appropriate co-ordinated emergency arrangements are put in place to avoid gas supply shortfalls, and for the safe reconnection of consumers in the event of a gas supply shortfall.*

ELECTRICITY AND NUCLEAR

ELECTRICITY

INDUSTRY STRUCTURE

Since 1999, the Hungarian electricity supply industry has not changed dramatically. The industry structure is still largely dominated by MVM, which was created in 1992 following the government dismantling of the MVM Trust, formed in 1963. In 1992, the subsidiaries responsible for generation, transmission and distribution/supply of electricity were formed into independent joint stock companies, which continued to be owned by MVM and the government.

The 1994 Electricity Act (Act XLVIII of 6 April 1994 on the Production, Transport and Supply of Electric Energy) came into force in 1994. This act describes the MEH's tasks and responsibilities[42]. 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 the power companies comprise several power plants. Paks Nuclear Power Plant owns and operates Hungary's only nuclear power plant.

In December 1994, it was decided to privatise all generating companies except Paks Nuclear Power Plant and the six distribution and supply companies. MVM would retain Paks Nuclear Power Plant and the transmission grid company OVIT. MVM would also continue to be responsible for the operation of electricity import and export, transmission, wholesale trading, supply, and investments in the development of all these segments. All of these functions were to be carried out at minimum cost. By early 1998, all distribution and supply companies and all generating companies, except Paks Nuclear Power Plant and Vértes, were at least partly privatised. MVM and Paks Nuclear Power Plant remained in state ownership, and no official decision regarding their privatisation has yet been taken. Some important players from outside Hungary took this opportunity to enter the market, such as Tractebel (Belgium), RWE (Germany) and AES (US).

The basic transmission grid consists of 400 kV and 220 kV networks, maintained by OVIT, a 100% subsidiary of MVM. MVM still owns the grid's assets. OVIT

42. Important legal provisions for the establishment of the MEH were also established earlier through the 1994 Natural Gas Act.

is also responsible for maintaining the 750 kV Albertirsa substation and the interconnection to Ukraine. Since February 2002, the newly created state-owned independent system operator (MAVIR) has been separated from MVM. Its new owner is the Ministry of Economy and Transport. MAVIR does not yet own the licence to operate the system and is therefore licensed by MVM, the system operation licence holder. MVM is also responsible for wholesale supply in the country. MVM has import-export monopoly rights until the next steps of the reforms laid out in the December 2001 Electricity Act begin to be implemented in 2003 (see below).

Six regional distribution companies are responsible for 120 kV or below network operation and the supply of electricity to end-users, with exclusive supply areas namely: ÉDÁSZ[43], ELMŰ[44], ÉMÁSZ[45], TITÁSZ[46], DÉMÁSZ[47] and DÉDÁSZ[48]. Their ownership is fairly concentrated, as three companies share the majority of their capital: EDF, E.On, RWE.

Table 11

Licence Holders of the Hungarian Electricity Industry, 2001

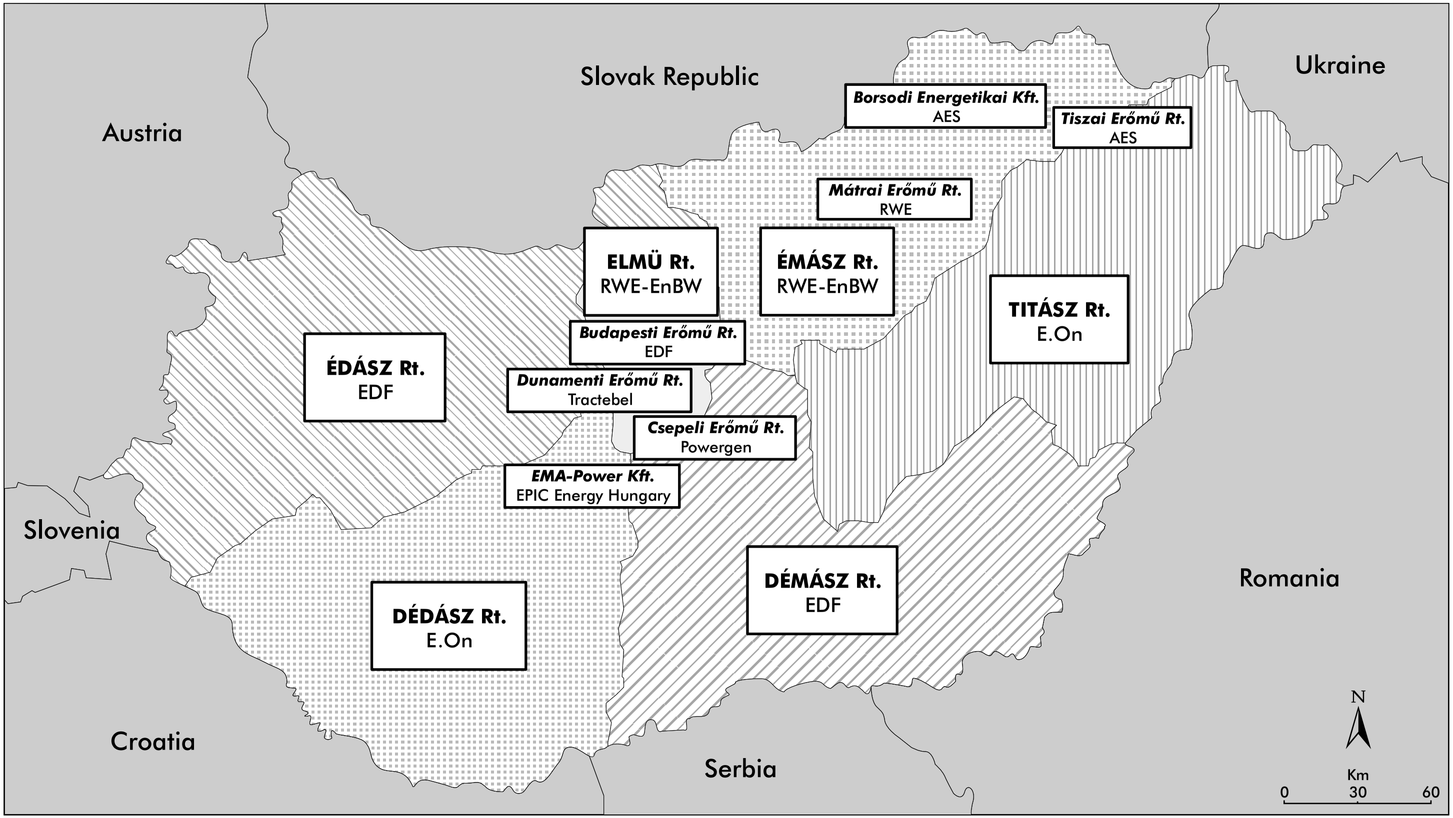
Generators	*Transmitter*	*Distributors*
AES Borsodi Energetikai	MVM	DÉDÁSZ
AES Tisza Erőmű		DÉMÁSZ
Bakonyi Erőmű		ELMŰ
Budapesti Erőmű		ÉDÁSZ
Csepeli Aramtermelő		ÉMÁSZ
Debreceni Combined-cycle Power Plant		TITÁSZ
Dunamenti Erőmű		
EMA-Power		
Mátrai Erőmű		
Paksi Atomerőmű		
Pannonpower		
Tiszavíz Vízerőmű		
Vértesi Erőmű		

Source: Hungarian Energy Office.

43. Észak-dunántúli Áramszolgáltató (Northwest Hungary Electricity Supply).
44. Budapesti Elektromos Művek (Budapest Electric).
45. Észak-magyarországi Áramszolgáltató (Northern Hungary Electricity Supply).
46. Tiszántúli Áramszolgáltató (Eastern Hungary Electricity Supply).
47. Dél-magyarországi Áramszolgáltató (Southern Hungary Electricity Supply).
48. Dél-dunántúli Áramszolgáltató (Southwest Hungary Electricity Supply).

Figure 33

Electricity Distributors and Retailers in Hungary



Source: MVM.

GENERATION

At the end of 2000, the Hungarian electricity supply industry comprised 8.1 GW of public utilities capacity and 220 MW of industrial autoproduction[49]. 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 were generally very small and located near coal mines. Their thermal efficiency is low and many of them are in the process of being decommissioned or refurbished. Hungary's lignite deposits situated in the north-east of the country were developed in the 1970s. This fuel was used in the Mátra (formerly Gagarin) power plant that has 100 MW and 200 MW generating units. Around the same time, larger "hydrocarbon" (oil and gas dual-fired) boiler plants were built, *e.g.* the Dunamenti and Tisza II plants, equally with larger block sizes of above 200 MW. Between 2001 and 2005, 800 MW of old plants are expected to be decommissioned, and 270 MW of new plants could come on stream. For this reason, the total installed and operating capacity is expected to be smaller in the coming years than in 2000 (7.77 GW in 2005). However, it is expected to increase, with plans to build 360 MW of new plants, mainly gas and perhaps oil, between 2006 and 2010 (total expected capacity of 8.13 GW), and 1 020 MW between 2011 and 2020 (total expected capacity of 9.15 GW)[50].

With a reserve margin currently reaching 25% to 30%, Hungary has surplus generating capacity. One of the reasons is that several of the coal-fired power stations expected to be closed were not closed. Temporarily, there will be a larger reserve margin since additional generation has been contracted and some coal plants were not closed. Some tensions may arise after 2005 when new and more stringent EU environmental regulations will take effect that will accelerate the retirement of older coal-fuelled units. In the future, it will become increasingly difficult for Hungary to fulfil the UCTE requirement of a reserve margin in generation. Imports may grow as a result of a gap in domestic generation. By 2010, this shortage could reach as much as 1 000 MW if no new capacity is brought on line. The market will guide choices to either build new capacity or import power. If new capacity is constructed, it will probably be gas-fired, at least through the middle of the decade. After that, coal-fired power could increase its share if the cost of natural gas becomes too high. Coal would then be imported since domestic coal may not be of good enough quality[51]. The most probable

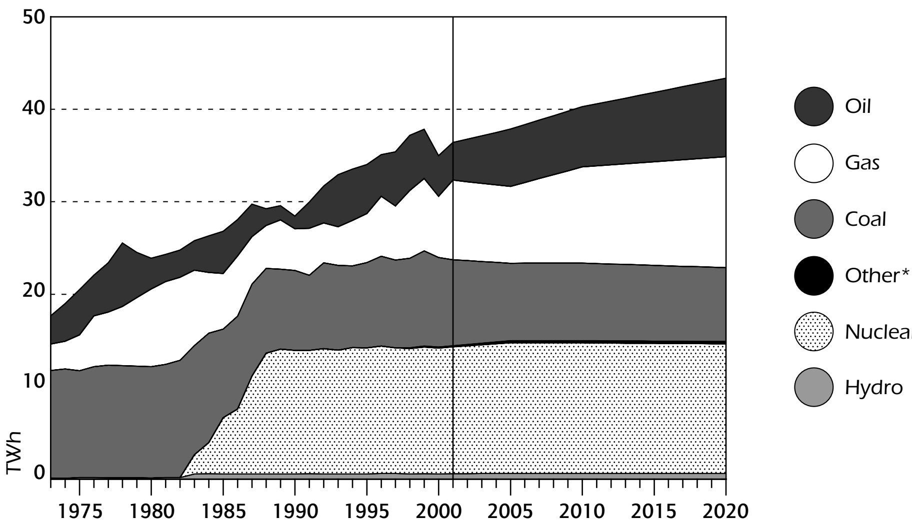
49. The total capacity includes combined heat and power plants (CHP).
50. Source: IEA. These figures have to be used with caution because of the uncertainties concerning investment plans.
51. MVM has expressed reserve as to the possibility of developing fluidised-bed combustion (FBC) plants to utilise its sub-bituminous coal and lignite reserves, though the reasons behind this position may be based on coal cost as much as coal quality considerations. An installation of fluidised-bed combustion was reportedly cancelled at the Inota power plant, where the local mine has about a 20-year supply of sub-bituminous coal.

scenario is that Hungary will rely upon electricity imports from neighbouring countries. This is an acceptable situation since there is an anticipated surplus capacity in the region. This would however require increasing the cross-border transmission capacity (see below).

The Paks plant was commissioned in 1981 to 1987 (see section on nuclear power, p. 128). Originally, there were plans to build two more nuclear units of 1 000 MW each at the Paks plant in the early 1990s, but the fall in demand made the plants unnecessary.

Figure 34

Electricity Generation by Source, 1973 to 2020



* includes solar, wind, combustible renewables and wastes.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2002; and country submission.

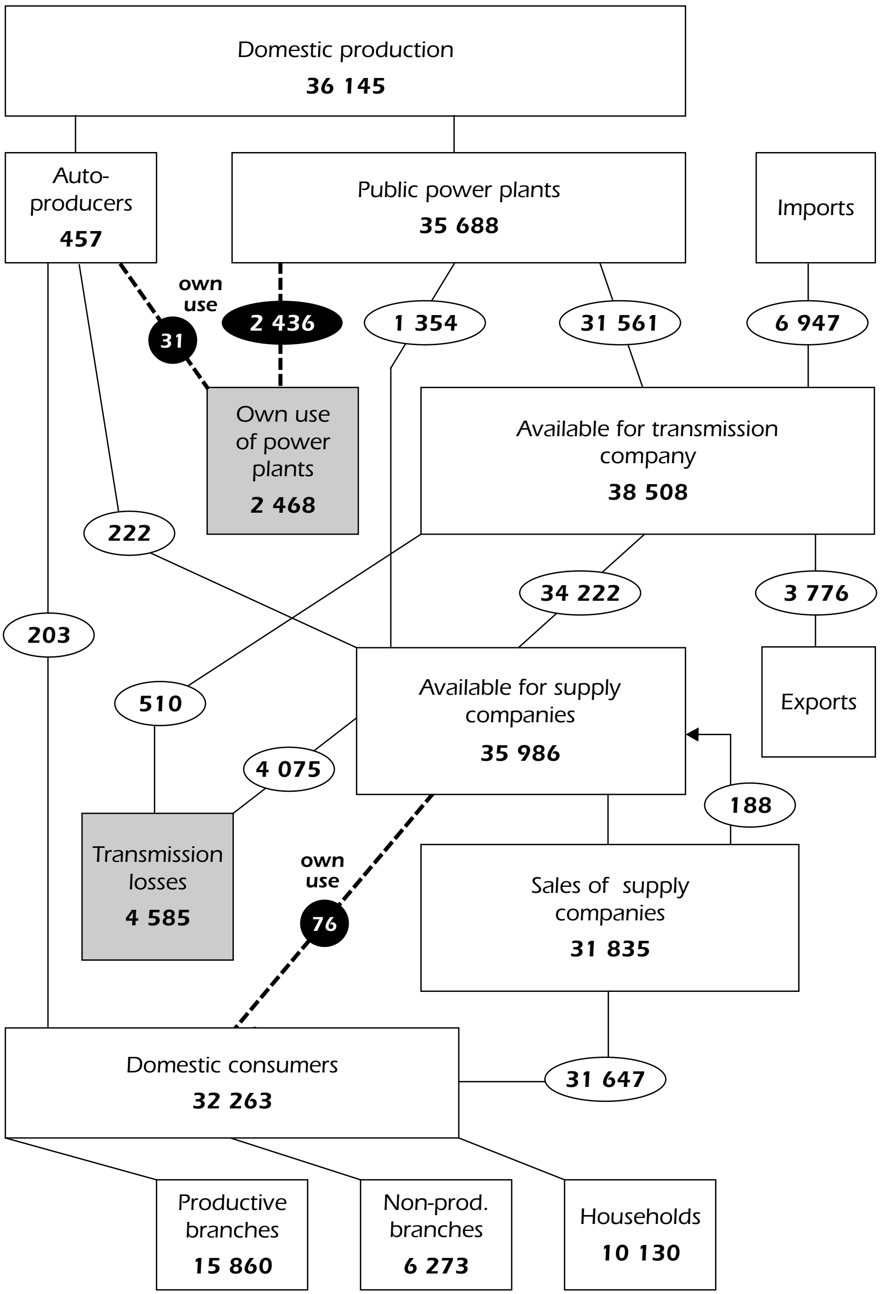
In 2000, 40% of the electricity produced in Hungary was generated by nuclear, 28% by coal, 19% by natural gas and 13% by oil. The crucial importance of the Paks plant is clearly discernible. Renewables, mainly small run-of-the-river hydroelectricity plants, amount to less than 1% of power production.

In 2001, the Hungarian electricity industry produced 36 TWh of electrical energy (4.8 TWh of it being CHP), with transmission and distribution losses of 4.6 TWh and sales reaching 32 TWh. On average, the efficiency of electricity generation is 38.3%, and has improved in the past decade. Transmission and distribution losses reached almost 13%. Much of the losses are non-technical, due to electricity pilferage, an issue that the electricity companies are trying to solve. The total level of losses remains high by European standards (7% in the EU in 2000) but this figure is decreasing.

Figure 35

Electricity Flow Diagram

(GWh)



Source: Hungarian Energy Office.

In 2000, electricity imports reached 9.5 TWh (5% from Austria, 79% from the Slovak Republic and 16% from Ukraine), while exports from Hungary reached 6.1 TWh (13% to Austria, 74% to Croatia and 13% to Serbia and Montenegro). Net imports represented less than 12% of annual Hungarian electricity consumption.

The interconnection of the Hungarian grid is quite extensive. In the past, Hungary was highly dependent on electricity imports. More than one-third of its electricity consumption was imported (net imports) from Ukraine (within the COMECON)[52], through one high-voltage alternating current (AC) power line, of 750 kV/2 000 MW capacity, entering Hungary from Ukraine and ending at the Albertirsa substation in the centre of the country. Long-distance transport of electricity over this type of transmission line is economic only for very large amounts of electricity; it is used in a few exceptional cases where energy conversion into electricity cannot be carried out closer to consumption centres. This power line came into service in the late 1970s and is part of a larger 750 kV network that linked Bulgaria, Hungary and Poland to the former Soviet Union's large-scale power plants, including the Chernobyl power plant in Ukraine. Hungary contributed financially to the construction of this line and some of the power stations it connects. There are two other power lines, a 400 kV and a 220 kV line, along a parallel corridor terminating at the Sajószöged substation in eastern Hungary. The importance of these lines cannot be denied, both for their capacity and their structuring effects on Hungary's transmission system. Ukrainian imports stopped in 1993 as a consequence of domestic shortages. Shortly afterwards, the Ukrainian power system was isolated from the United Power System/Integrated Power System (UPS/IPS). Hungarian imports from Ukraine have begun again, but are far below their previous levels. As imports from the East reduced, Hungary increasingly imported electricity through the Slovak Republic, part of which originates from Polish power plants.

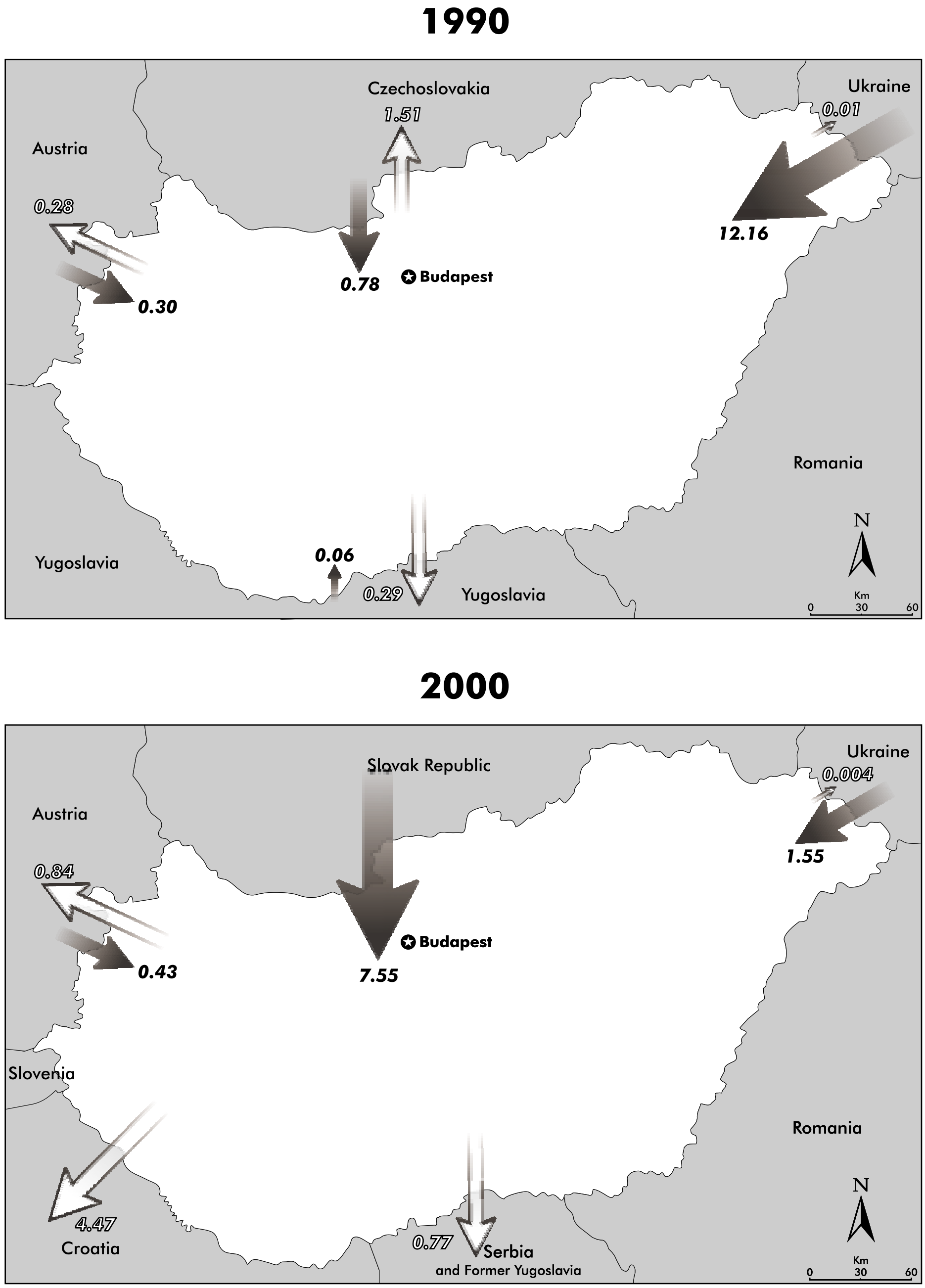
In the early 1990s, Hungary sought to leave the UPS/IPS power system and to connect itself to the western European Union for the Co-ordination of Transmission of Electricity (UCTE) system. Hungary had to improve certain aspects of its power system. AC interconnection requires member utilities' systems to be "in phase". The UCTE system requires frequency control in a narrow band of +/– 0.1 Hz. Compliance with these technical requirements generally means that additional power plant capacity must be put in place. This capacity delivers so-called ancillary services, *e.g.* it generates only to maintain frequency or voltage at the required levels and must therefore be

52. In comparison, electricity imports currently account for less than 10% of electricity consumption in IEA Europe and less than 2% in North America.

Figure 36

Import and Export of Electricity, 1990 and 2000

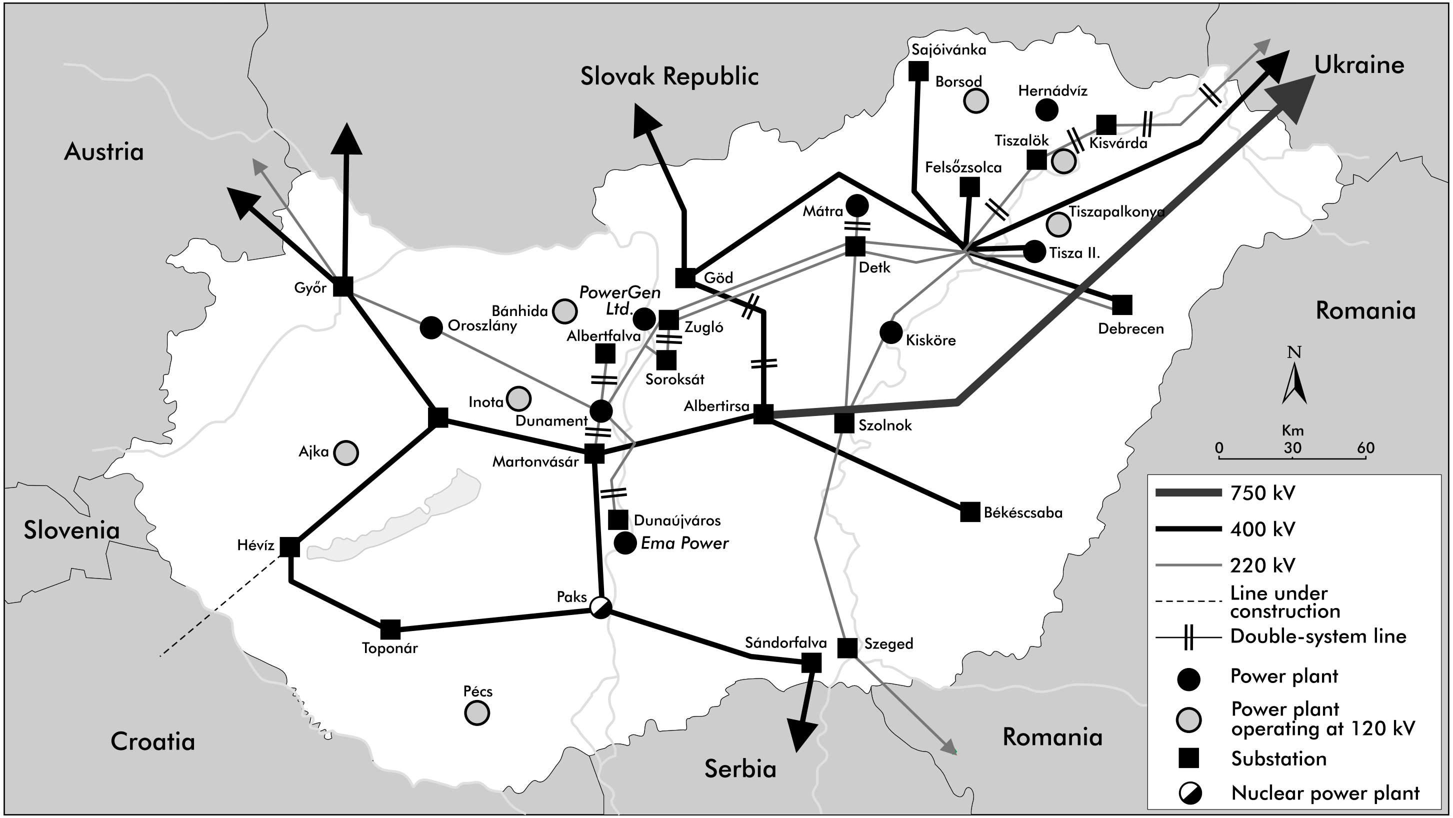
(TWh)



Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2002.

Figure 37

The Hungarian Transmission Network and Main Power Plants



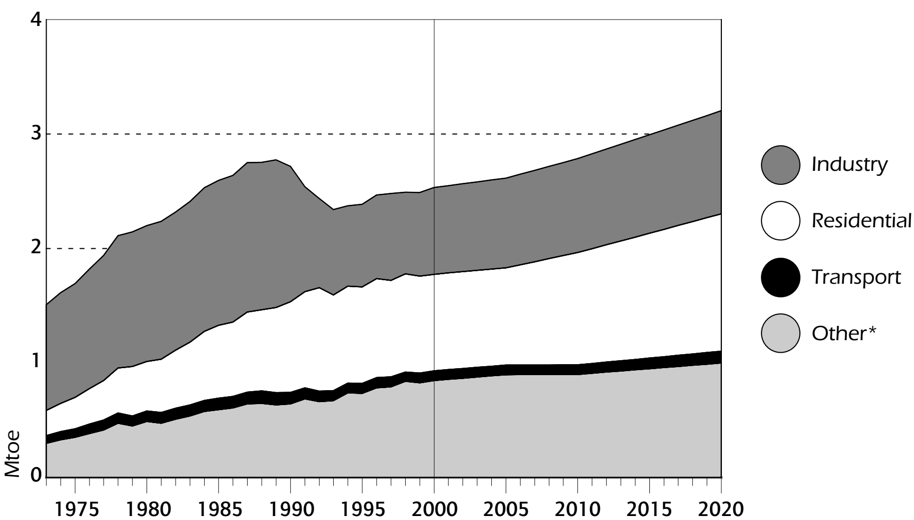
Source: MVM.

capable of starting generation very quickly. Since Hungary does not have mountainous areas suitable for hydro plants with storage capacity, a number of gas turbines were installed. After several encouraging test runs, the CENTREL and UCTE systems were synchronised in 1995 and continued to run in parallel[53]. In May 2001, Hungary became a full UCTE member. A future connection with the Slovak Republic is contemplated. The 750 kV high-voltage link with Ukraine is not currently operational; 400 kV links exist with former Yugoslavia and Romania.

This grid layout reflects the gradual development of the generation and distribution system and Hungary's past as a country that was largely dependent on electricity imports, and whose main concern was to distribute imported electricity. Although large parts of the grid, especially the 220 kV grid, are old and in need of overhaul, external supply sources are currently more diversified and there are no transmission constraints within Hungary itself.

Figure 38

Final Consumption of Electricity by Sector, 1973 to 2020



* includes commercial, public service and agricultural sectors.

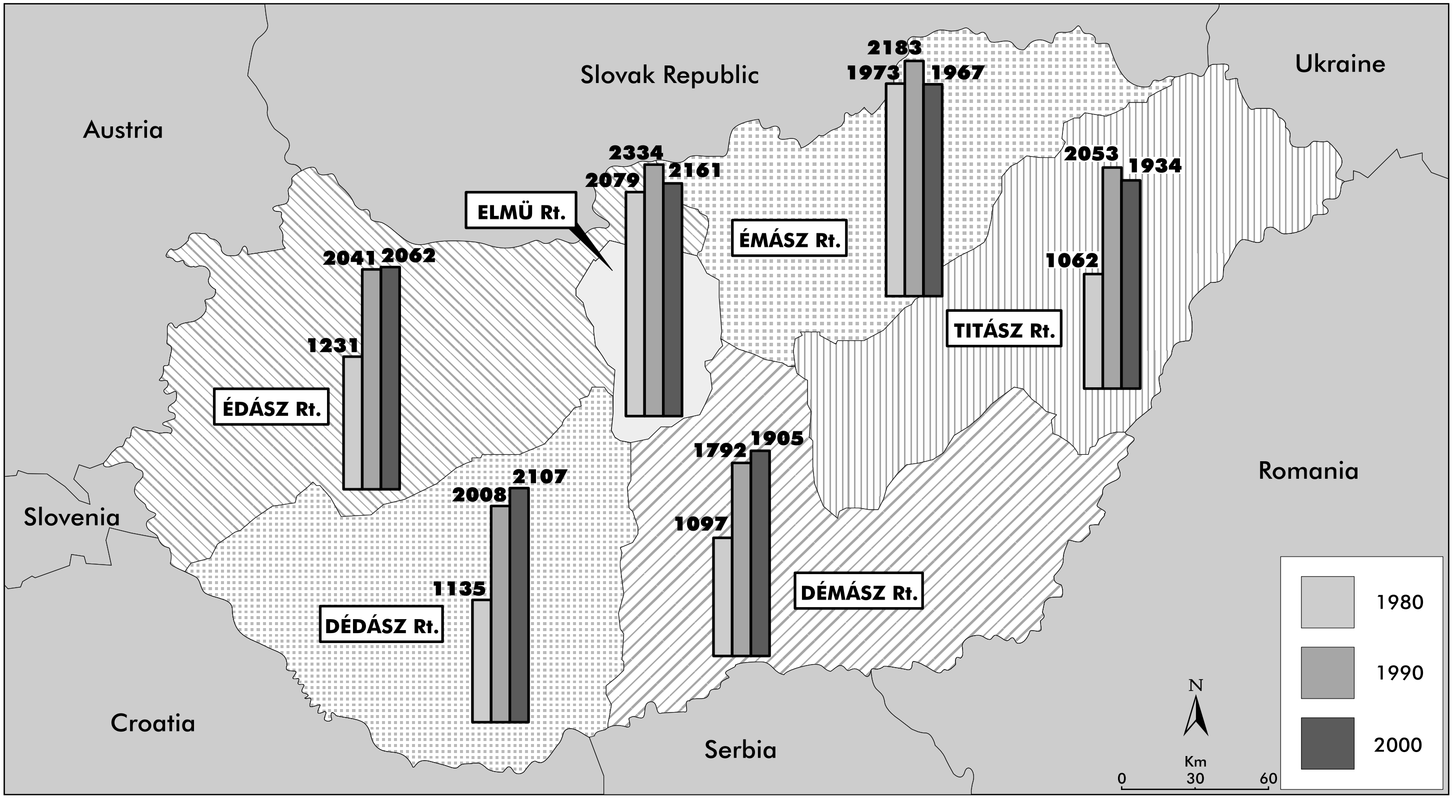
Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2002; and country submission.

53. Poland and the Czech and Slovak Republics founded CENTREL to co-ordinate their electric power companies. CENTREL's objective was to rapidly improve their power systems to attain UCTE standards, to synchronise their networks and to become UCTE members. Synchronisation with UCTE meant disconnecting the CENTREL system from the UPS/IPS system. The CENTREL countries achieved this in 1993; following which, their possibilities to trade with electricity suppliers outside of CENTREL was strongly reduced.

Figure 39

Yearly Electricity Consumption per Inhabitant in the Supply Regions, 1980, 1990 and 2000

(kWh)



Source: MVM.

DISTRIBUTION AND CONSUMPTION

On average, Hungarians consumed around 2 900 kWh of electricity per capita in 2000 (against 5 900 kWh in the EU).

It is important to note that electricity demand, which reached 40.7 TWh in 1989, collapsed after 1990 as a consequence of the breakdown of the centrally-planned economy. Although it began to grow again in mid-1992, consumption did not reach its 1989 level in 2001 when total sales amounted to 32 TWh.

Final electricity consumption in industry collapsed after 1990 but recovered in the mid-1990s, with electricity demand increasing unabated in the residential and commercial sector and remaining unchanged in the transport sector.

TOWARDS A COMPETITIVE ELECTRICITY MARKET

Two Parallel Electricity Markets

The Hungarian administration has already transposed the EU Directive on Electricity (Directive 96/92/EC) into Hungarian law. The new Electricity Act was presented to the Parliament on 18 December 2001 (Act CX of 2001 on Electricity) and adopted on 1 February 2002. The Electricity Act envisages competition from 2003 when it will open the retail market with the largest consumers (above 6.5 GWh per annum consumption, representing around 35% of the market share) obtaining the right to choose their supplier. A gradual opening of the market until all customers are free to choose their suppliers is planned by 2010. The new law recognises the three existing categories of market players (power producers, distributors and the grid operator) and defines a new group, the power traders that will operate from 2003 onwards. Some provisions of the act were implemented immediately after the act was adopted, namely the status and independence of the MEH were reinforced (see below), and MAVIR was given the mandate of independent system operator.

The Electricity Act is in full harmony with the recommendations made in the 1999 IEA In-depth Review and the OECD regulatory review on Hungary[54]. Secondary legislation is currently being designed, which will cover purchasing power agreements (between the wholesaler and power generating companies); stranded costs[55]; cross-border regulation; price regulation of non-eligible consumers, renewable energy, CHP and system services. The price

54. *Regulatory Reform in Hungary*, Reviews of Regulatory Reform, OECD Paris, 2000.
55. Stranded costs could possibly arise with new entrants selling power at prices below the prices in existing long-term purchasing power agreements.

regulations will include fees for funding possible stranded costs up to 2010 (for long-term contracts signed before the market opening), fees for renewable energy development and CHP, and fees for unsolved past problems, such as investments to pursue environmental retrofits of old plants.

The main provisions of the Electricity Act are the following:

- Opening of the market will be introduced by a government decree.
- In 2003, two parallel electricity markets will be created, namely a market to supply non-eligible consumers[56] and a competitive market to supply eligible consumers. In the first market, there is no competition and prices are determined by the MEH (see below), MVM is the exclusive wholesaler company and the six regional distribution companies will supply non-eligible customers since they are themselves eligible consumers.
- Eligible consumers are free to choose their own suppliers.
- Foreign electricity trade is liberalised.
- MAVIR is responsible for maintaining the balance of the system, for integrating short- and long-term capacity plans and for integrating electricity trade contracts. MAVIR is also responsible for monitoring transmission prices.
- TPA to the electricity grid is guaranteed at regulated prices. Transmission, distribution and system operation tariffs are set and published by the Ministry of Economy and Transport.
- New capacities are established on a commercial basis through an authorisation process.
- Licensees must legally unbundle their transmission, distribution and supply activities.

The MEH is currently responsible for licensing energy suppliers[57], supervising the satisfaction of consumer demand and the standards of service provision, and protecting consumer interests. In a liberalised electricity and gas market the MEH has become more autonomous and its duties and competences have increased:

- The MEH is a budgetary corporate body with separate and independent financial management.

56. Also referred to as public utility market, for captive consumers.
57. New licences must be issued in the liberalised market. MVM currently operates with one licence, but requires five in the liberalised framework: one licence for MAVIR as system operator, one licence for MVM to transmit, one licence to manage the regulated wholesale activity, one licence for trading and one licence to generate.

- The MEH will be self-financing. Licensees will be charged a regulatory fee for its supervisory activities.

- Following a proposal by the Ministry of Economy and Transport, the prime minister will appoint and dismiss the MEH president and vice-president. Their appointment is for a six-year term.

- The MEH president will report to Parliament, on an annual basis, on the MEH's activities and publish an annual report.

- MEH resolutions can only be challenged and amended in court.

Some major pieces of the regulatory framework, such as grid code, distribution code and commercial code are yet to be designed by the regulator and adopted by government.

Electricity Prices

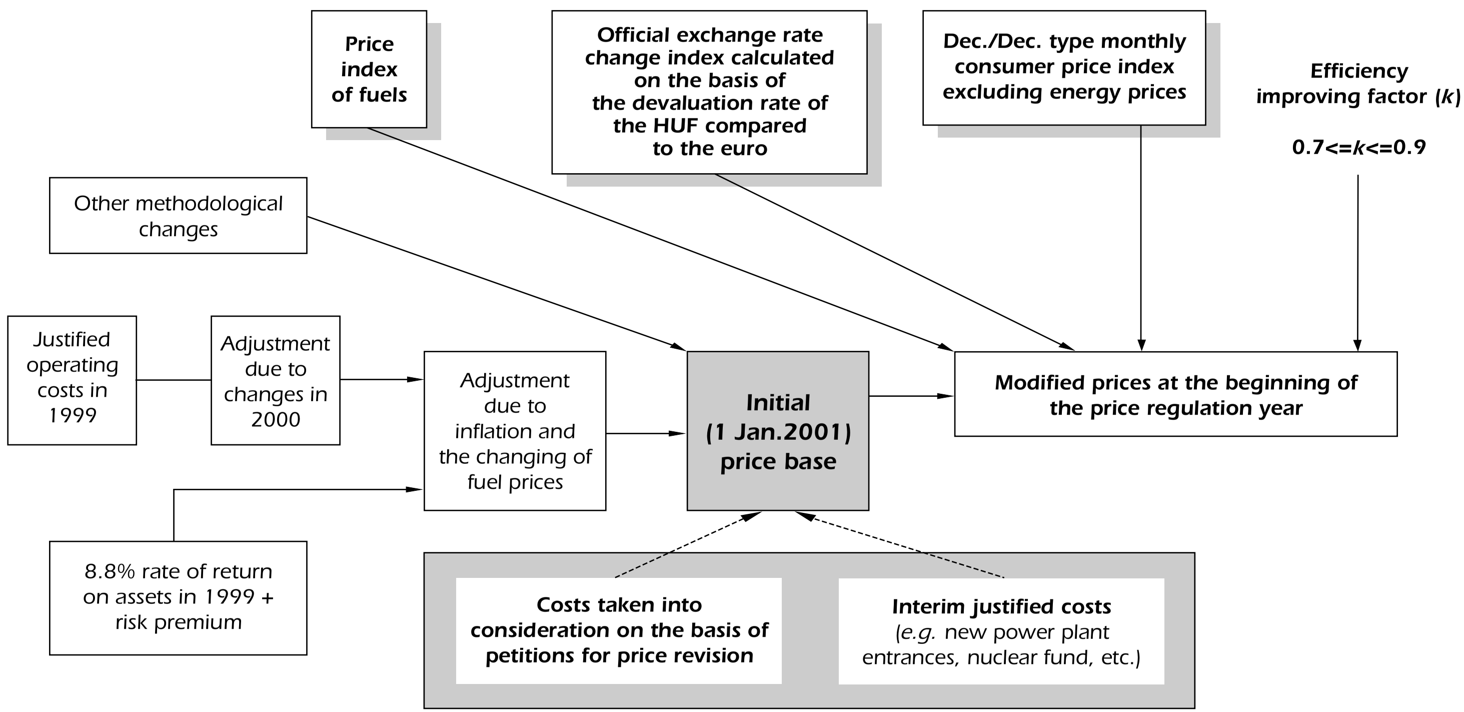
Hungarian consumers spend approximately 3.8% of GDP on electric energy, which is far more than in most other IEA countries[58]. In the absence of competition, efficient price regulation plays important micro and macroeconomic roles. Electricity price regulation is currently based on price caps. The price regulation systems proclaimed in the ministerial decrees in November 1995 entered into force on 1 January 1997. The prices were determined on the basis of cost revisions carried out in the generation companies. The regulated price mechanism was established for a four-year period, from 1997 to 2000. During this period, the official energy prices were modified on the basis of a cost-plus price formula, thereby preventing excessive price growth and providing predictable price regulation. Since 1 January 1999, electricity and heat price regulation are based on the calendar year.

The end-user price regulation mechanism used by the MEH applies to heat and electricity prices. After the initial four-year regulation period, a new period began in 2001 and is expected to end in 2004. During this period, the price prevailing at 1 January 2001, the so-called starting price, is used as the basis for price escalation. This starting price was based on the 1999 MEH cost survey of all concerned energy companies, which updated the surveys that were carried out in 1995 and 1996. It contains justified operational costs, including capital investment required for power production. In order to fulfil its function as a price regulator, the MEH monitors electric utilities' costs on a continuous basis, and puts downward pressure on the costs by disallowing certain costs or cost elements.

58. Hungarian Energy Office, *Privatised Electricity Suppliers in Hungary, 1996-2000*, Budapest, 2002.

Figure 40

Electricity and Heat Regulated Price Formation, 1 January 2001 to 31 December 2004



Source: Hungarian Energy Office.

From 2004, the regulated annual price revenue determined per power plant and business branch (electricity and heat) will still include two main groups of justified costs (fixed and variable) and will comprise the following features:

- Initial prices and individual tariff rates, at least in the case of power plants, are determined in such a way that the capacity and performance fees can ensure a fair return on fixed costs, while the energy fees can ensure a return on variable costs.

- The electric energy wholesale price is determined on the basis of the transporter's justified annual price revenue, which contains the transporter's justified electric energy generating and purchasing costs (including the reserves), and the supplier's justified annual price margin. The cost of the transporter's three main activities (system control, transmission, wholesale) is taken into consideration when determining this price margin. The performance fee (HUF/kW) and a double zone-time energy fee (HUF/kWh) continue to be included in the wholesale tariff.

- The end-user price is determined on the basis of the service providers' justified annual price revenue, which includes the suppliers' electric energy producing costs, if any, their purchasing costs and their justified annual price margin (including regional system control, distribution and trade costs). The consumer tariff system, valid since July 1999, will not change, only the value of the tariff rates will change. Consumer tariff rates will not be geographically differentiated at this early stage of market liberalisation.

In 2000, the MEH carried out an analysis of the price regulation methodology applied in the preceding four years, in order to improve it and make the tariff determination more compatible with international practices. Several features were modified accordingly and have been applied in the 2001 to 2004 regulated tariff, namely:

- *Cost of capital.* On top of electricity supply cost, the tariff includes a rate of return on capital (9.3% for electricity suppliers and 9.8% for power plants, including the risk premium), which is determined on the 1999 assets and not on equity as it was in the 1997 to 2000 tariff. In this way, price regulation does not risk to influence companies' financing structures, but encourages companies to make modernising investments.

- *Amortisation.* The amortisation rate was modified to better reflect the reality of the electricity supply industry (longer lifetime of equipment, lower inflation).

- *Price index reference.* The index changed from using the producer price index to the consumer price index. One of the reasons put forward by the MEH for this change was that public opinion concentrates more on the development of the consumer price index, and that methodology to measure the consumer price index is more reliable. Fuel price changes are accounted separately because of the weight of fuels in electricity costs and the volatile nature of fuel prices. Additionally, Hungarian utilities are expected to make efficiency improvements and reduce costs, so an efficiency factor *k*, reducing prices by 10% to 30% (against 5% to 15% before), is included.

- *Network losses.* The MEH analysed the physically justified network technical losses and lowered the justified figure to 8.9% from 12%.

The market opening is likely to bring about significant institutional changes in the Hungarian energy sector. Following the partial privatisation of the electricity supply industry in the mid-1990s, real end-use electricity prices have increased about one and a half times, gradually reaching cost-covering levels and approaching prevailing prices in the EU (tax excluded). During the 2001 to 2004 period, regulation will continue to be based on price formula whose main elements continue to be monthly consumer price indices (excluding energy products), inflation adjustment and fuel price indices.

Real price growth facilitated modernisation investments in the electricity sector. However, these were insufficient for electricity suppliers to significantly improve the technical quality of the service, and a systematic deterioration of quality was observed during 1997 to 2000. Despite the cost reviews carried out in 1995 and 1999 and the different improvements to upgrade the pricing methodology, price regulation is still using a cost-plus and price cap system with all its limitations. The MEH is currently considering

Table 12

Average Electricity Prices of Representative Consumer Groups (taxes excluded), 2000

(euro/MWh)

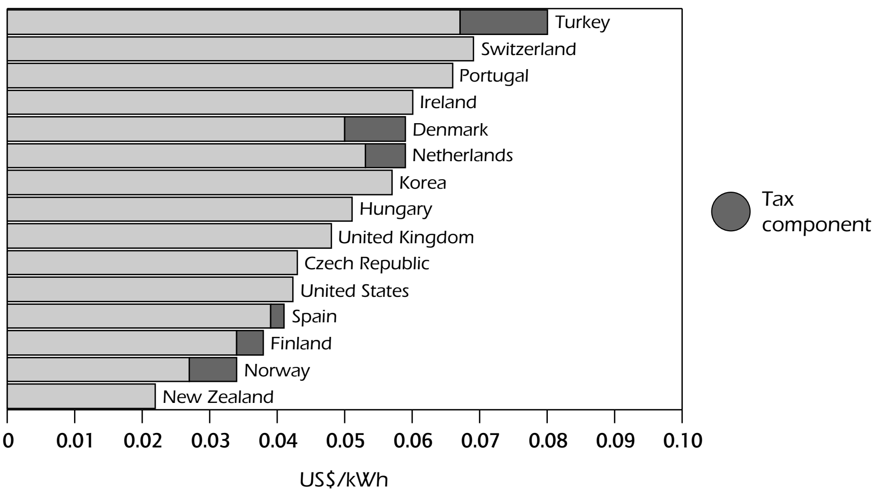
	Medium-sized households (below 3 500 kWh)	*Small industrial consumers (±0.16 GWh)*	*Medium-sized industrial consumers (±2 GWh)*	*Large industrial consumers (±70 GWh)*
Hungary	63	79	49	38
Sweden	65	49	39	21
Germany	107	81	52	37
France	91	78	55	43

Source: Eurostat and the Hungarian Energy Office.

Figure 41

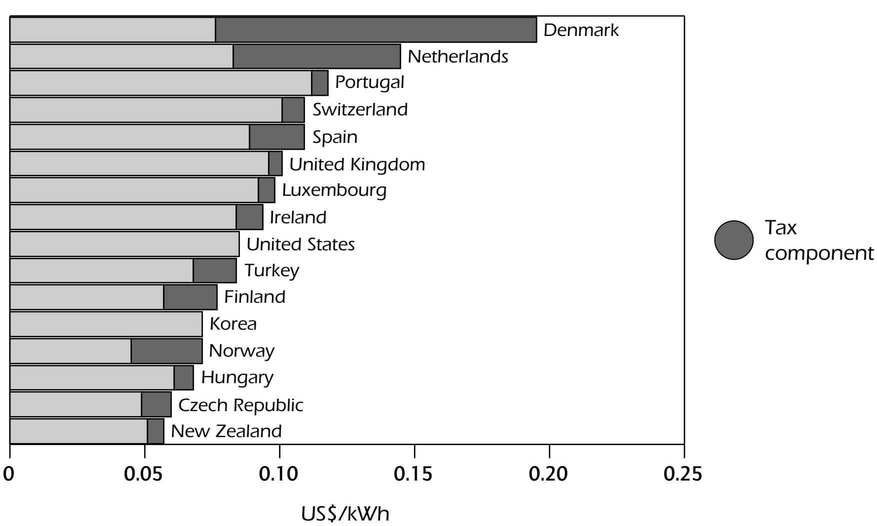
Electricity Prices in IEA Countries, 2001

Industry Sector



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

Household Sector

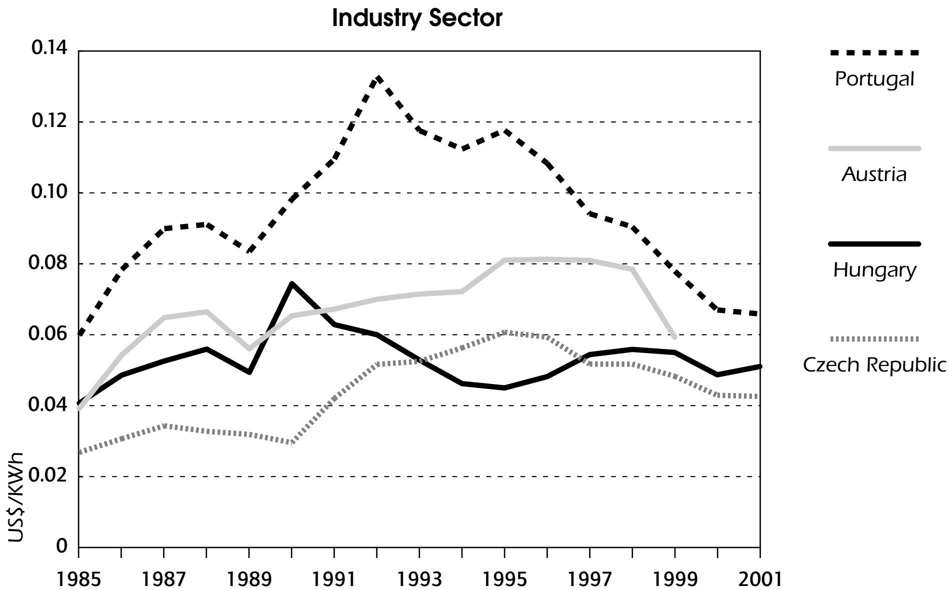


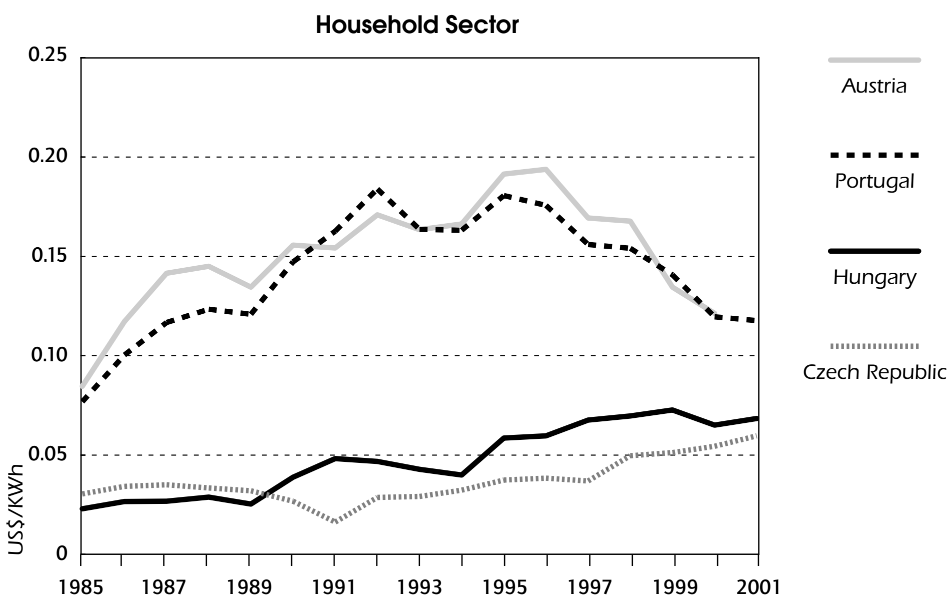
Note: Price excluding tax for the United States. Tax information not available for Korea. Data not available for Australia, Austria, Belgium, Canada, France, Germany, Greece, Italy, Japan and Sweden.

Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2002.

Figure 42

Electricity Prices in Hungary and in Other Selected IEA Countries, 1985 to 2001





Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2002.

replacing the present price regulation structure with a supply tariff system that will depend on capacity demand and voltage level, and will be paid by the consumer or the energy trader. The next price cap period for non-eligible consumers, starting on 1 January 2005, will probably use such a transportation and distribution tariff system in association with international benchmarking rather than cost reviews.

In the new liberalised framework, transmission pricing will be based on a postalised tariff – an identical stamp rate for the whole country that is differentiated according to voltage. The MEH acknowledges that it should be prepared to introduce regional transmission price differentiation if it deems necessary.

Competition

Privatisation has been an important driver of company restructuring and enabling new entrants to produce and distribute electricity. The current market structure for production and distribution is rather oligopolistic, while transmission is a monopoly. More than 60% of the generation sector (capital invested) and 90% of the distribution sector have been privatised and sold largely to foreign investors. Policy measures to cover competitivity issues were implemented during the privatisation phase, mainly to avoid abuse by dominant positions.

In 2003, the single buyer model no longer dominates market relations in the electricity sector. Previously, the incumbent company MVM was the market's unique wholesaler and importer. All electricity that was bought and consumed was contracted and assured by MVM. The current market scheme preserves a prominent role for MVM whose important share in electricity production (around one-third) is complemented by long-term contracts that might moderate the intensity of future competition. The main achievement of the current regulatory framework is that it puts an end to the vertical integration of MVM, since MVM had to separate the activities of the system operator, MAVIR, which is now owned by the Ministry of Economy and Transport.

MVM is considering acquiring additional electricity generating companies outside Hungary (in 1999 it purchased a generator in Slovakia). However, years of low electricity prices have reduced its investment possibilities. MVM may eventually be privatised, though no precise timetable has yet been announced. The company would probably be privatised via the institutional investor route, with a certain percentage of the stock being reserved for the open market. There would also probably be some limitations on ownership rights. MVM is considering the option of floating part of the Paks plant capital to financial institutions. Some foreign companies, such as EDF, have expressed interest. However, before taking such strategic and structural decisions, MVM prefers to wait for the market rules to be clarified so that the value of its assets are better defined.

Table 13

Origin and Distribution of Capital Ownership in the Hungarian Electricity Sector, 2001

Ownership	*Generation*	*Transmission*	*Distribution*	*Electricity sector*
State	5.85	99.87	0.09	39.89
Municipalities	0.26	0.11	3.81	1.67
Other Hungarian investors	59.21	0.02	8.65	5.99
Total Hungarian	**65.32**	**100.00**	**12.55**	**47.55**
German investors	6.64	0.00	58.90	26.49
French investors	4.47	0.00	16.79	8.91
Belgian investors	8.75	0.00	0.00	4.63
US investors	11.32	0.00	1.39	6.53
Other foreign investors	0.02	0.00	9.67	5.41
Total foreign investors	**31.20**	**0.00**	**86.75**	**51.97**
Other	3.48	0.00	0.70	0.48
Total	**100.00**	**100.00**	**100.00**	**100.00**

Source: Hungarian Energy Office.

Concentration measures indicate that there is limited competition in both electricity generation and distribution, with only a few companies controlling most of the trade. In generation, this is done through four groups: MVM (33% of production – mainly from the Paks plant), Tractebel (25%), AES (15%) and RWE (10%). RWE also has interests in electricity distribution. On the distribution side, despite having six regional licence holders with exclusive rights over a given area, three major groups control the whole sector, namely E.On, RWE and EDF. RWE and E.On represented 77% of electricity sales in 2001. More importantly, almost all potentially eligible customers are situated in areas served by E.On and RWE.

Along with the December 2001 decisions taken to reinforce the MEH's powers, the government took the following practical measures to facilitate, protect and improve competition (*i.e.* restricting mergers):

- No individual company can control more than 30% of domestic generation.
- No individual company can control more than three distribution/supply companies or 50% of domestic distribution/supply.
- No individual company can control more than 15% of domestic generation if it owns more than 15% of domestic distribution/supply, and vice versa.

Despite these measures, control exerted by MVM on the wholesale supply of electricity through long-term contracts has generated concern among other market participants that MVM may use this power to impose unfair competition once the market is opened, especially since MVM has access to low-cost electricity sources, such as nuclear. In response to these concerns, regulation has paved the way for the gradual elimination of long-term contracts with a possibility to auction electricity volumes under contract if an eligible consumer shifts away from the contracted supply once the market is opened.

NUCLEAR

NUCLEAR POWER REACTORS

Hungary's only nuclear power plant, the Paks plant, is run by Paks Nuclear Power Plant (Paksi Atomerőmű). The plant has four reactor units of a little more than 460 MW each, amounting to a total of 1 880 MW. The plant provides approximately 40% of Hungary's electricity generation. MVM owns more than 99% of Paks Nuclear Power Plant . The remaining less than 1% is owned by local authorities.

The units are pressurised-water Soviet-style VVER-440/V-213 units, which belong to the second generation of VVER-440 reactors. They use light water as moderator and coolant. Safety of the plant is ensured by localising (bubbler-condenser) towers, which make up the pressure containment system in case of accidents caused by pipe ruptures.

The former Soviet Union provided the reactor design, equipment and co-operation in completing the technical side of construction. The Hungarians made a number of modifications to the original design to improve safety features and manned the plant. The four units went on stream in December 1982, September 1984, September 1986 and August 1987 respectively.

The Paks plant has proved to be technically and economically satisfactory. The plant runs in baseload and the production is allocated to the public and price-regulated electricity market. In 2002, the sales price was HUF 7.2 per kWh (approximately US cents 2.96 per kWh[59]). In 2001, the four units achieved load factors ranging between 80.4% and 91.4%.

During Hungary's accession process to the EU, higher importance is being attached to nuclear safety issues. During 1996 to 2002, Paks Nuclear Power Plant invested HUF 60 billion (approximately US$ 250 million) to implement

59. Against US cents 3.5 to 4.0 per kWh for lignite-fired power plants to US cents 10 for old coal-fired power plants.

safety enhancement measures, principally in refurbishing the reactor protection system, improving earthquake resistance and introducing symptom-oriented Emergency Operation Procedures.

In order to maintain the Paks plant's competitivity, programmes have been launched to increase production capacity by 8% and extend the plant's lifetime by twenty years. The estimated cost for the lifetime extension is US$ 400 million and for the power uprating US$ 20 million. The plan is to reach the new power level for all units between 2006 and 2008. The design lifetime of the four Paks plant power units is 30 years expiring between 2013 and 2018 respectively. A systematic lifetime management and ageing monitoring programme is already in place. This programme includes complete safety assessment as well as technical and economical feasibility studies.

NUCLEAR REGULATORY FRAMEWORK

The 1994 Electricity Act and the decrees based on it set out the relevant legal framework for the operation of the power industry as a whole. The Atomic Energy Act (Act CXVI of 1996 on Nuclear Energy) came into force on 1 June 1997, and was followed by a number of decrees defining the rights and duties of the Hungarian Atomic Energy Authority (HAEA).

Construction of new nuclear power plants or reactor blocks, which is highly hypothetical in the near term, requires initial consent from the Hungarian Parliament. In concordance with regulations in force, a licence must be obtained from the necessary authorities for site selection, construction, commissioning, operation and decommissioning throughout the lifetime of the nuclear power plant. An environmental protection licence is a prerequisite to begin the licensing procedures to install a nuclear power plant. Proof of the availability of an interim storage or final disposal site, conforming to international standards, must be provided. The public must be informed and a public hearing should take place. A final safety analysis report is prepared prior to issuance of an operating licence. The HAEA would then have six months to evaluate the licence application.

The Atomic 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[60], and for damage caused from transport of nuclear fuel, up to 5 million SDR.

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

Prior to implementation of the Atomic Energy Act, Paks Nuclear Power Plant and Hungarian insurers established an insurance pool with the intention to seek re-insurance in international pools in compliance with these requirements. Subsequently, an extensive international review of the Paks plant's safety features was undertaken on behalf of the national and international insurers, and damage liability insurance contracts were concluded.

In addition to the domestic Periodic Safety Reviews, the latest being finalised in 2001, almost 30 international reviews have taken place since 1984, involving organisations such as the EU Atomic Questions Group, the International Atomic Energy Agency (IAEA) or the World Association of Nuclear Operators (WANO). Following these reviews, a large number of technical adjustments were made.

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 former Soviet Union for fuel element fabrication. The cost of this uranium was high, corresponding to about three times the world market price. The mine was shut down at the end of 1997. The site's rehabilitation has already begun and will terminate end 2004.

The Public Agency for Radioactive Waste Management (PURAM) was established by the HAEA and financed by the Central Nuclear Financial Fund. It is responsible for planning, construction and management duties associated with the storage and disposal of radioactive waste, including spent fuels. It is responsible for the operation of the Püspökszilágy Radioactive Waste Treatment and Disposal Facility and the Interim Storage Facility for Spent Fuel located at the Paks plant. It is also responsible for activities relating to decommissioning of nuclear facilities. PURAM's duties include preparation of annual, intermediate and long-term plans for the Central Nuclear Financial Fund.

The Central Nuclear Financial Fund, established in 1998, is funded from payments of parties using nuclear energy. Its goal is to provide financing for interim storage and the final disposal of radioactive waste, including spent fuel, as well as decommissioning of nuclear facilities. At the end of 2002 the estimated accumulated fund totalled HUF 32 725 million (about US$ 136 million).

Low and intermediate radioactive waste generated by the Paks plant could be temporarily stored in the power plant's auxiliary buildings. Until 1996, solid low- and intermediate-level wastes were transported to the Püspökszilágy final disposal facility. Transportation ceased because of public opposition and the long distance between power plant and disposal site. The Püspökszilágy disposal site is currently only used for non-nuclear origin radioactive wastes. Studies have begun to find a site for a new disposal facility for low- and intermediate-level wastes of nuclear power plant origin, including decommissioning wastes.

PURAM's second mid- and long-term activity plan was adopted in May 2002. It indicates that PURAM hopes to have a new nuclear waste disposal facility in operation by 2008, where all low- and intermediate-radioactive waste generated by nuclear power plants will be disposed; the Bátaapáti (Üveghuta) vicinity is being considered a possible site for this new facility. No decision has yet been taken on the back-end of the fuel cycle; however, direct disposal of the spent fuel is being considered. The Boda claystone formation close to the Pécs' former uranium mine is considered a promising site for this direct disposal and investigations regarding the site are currently under way. Operation of this disposal facility for high-level waste is planned to begin before 2050.

Originally, spent fuel was sent back to the former Soviet Union and later to Russia. In 1995, spent fuel reshipment was brought to a sudden halt. Faced with the problem of storage capacity, the Interim Storage Facility for Spent Fuel was constructed at the Paks plant site. The first seven modules (each of 450 spent fuel assemblies) are in operation. The construction of the next four modules began in 2000 and was completed by the end of 2002. The facility is designed for 50 years of storage time. By the end of February 2002, 3 017 assemblies had been put into this interim storage. The number of spent fuel assemblies arising yearly is around 350 to 450.

CRITIQUE

ELECTRICITY

During the past decade, Hungary made great efforts to restructure its electricity supply industry. The privatisation programme brought new players to electricity generation and distribution. The recommendations made in the 1999 In-depth Review called for a number of important measures to be taken to facilitate competition in the electricity supply industry, stimulate investment and improve overall economic efficiency. These measures concerned the regulation of transmission prices and implementation of non-discriminatory grid access rules; opening the retail market to competition; unbundling generation, transmission, distribution and supply; establishing an independent system operator; strengthening the MEH's independence and choosing a competitive model compatible with EU directives. The Hungarian government and the regulatory office must be commended for making substantial progress in line with the recommendations contained in the last IEA In-depth Review.

The next steps must now be addressed, namely implementing the first phase of market opening and ensuring that possible market distortions, which could arise from MVM's dominance in long-term contracts with generators and suppliers, or the growing need for electricity imports are avoided.

Long-term Contracts and Market Power

At the beginning of market opening, long-term contracts with generators and suppliers currently held by the incumbent company MVM are unlikely to lose their commercial importance. This is reinforced given that some of the power companies' initial interest in setting up a power exchange has diminished, and most transactions can now be settled through bilateral contracts. There are concerns that these contracts could diminish the pressure of competition. The MEH believes that, soon after the market is opened, the domestic generation companies and MVM may consider that it is in their mutual interests to renegotiate the long-term contracts binding them. This may also be the case for contracts between electricity distributors and their large consumers. The new Electricity Act provides for gradual removal of the existing long-term contracts provided one of the parties is willing to abandon its rights to the power contracted. When an eligible consumer chooses the competitive market, leaving the incumbent wholesaler MVM, the outstanding capacity contracted from MVM will be auctioned to the rest of the market and the stranded costs incurred by MVM will be covered partly by these auctions. In theory, the regulator would like to reduce the share of long-term contracts in the total electricity supply, but caution persists regarding the existing long-term contracts that enable MVM to exercise market power. MVM currently has access to low-cost nuclear electricity. The new market regulations do not prohibit the signing of additional long-term contracts, but only eliminate the possibility for these contracts to be compensated for stranded costs.

Transmission, Congestion and Capacity Constraints

Since the beginning of the power sector privatisation, there have been some limited additions to generation and transmission capacity. Most investors avoided green field investments, preferring to refurbish old power plants or reorganise distribution companies. The risk of capacity constraints may not be immediate, but it could arise sooner than expected, perhaps around 2005, when some of the old coal-fuelled power plants are closed down following the implementation of EU environmental directives. The appropriate authorities should continue to monitor the electricity sector's capability to meet market requirements.

To ensure non-discriminatory access to transmission, MVM had to abandon its control over the system's operations and MAVIR became an independent institution in 2002. MAVIR is now under the control of the Ministry of Economy and Transport. Though this operation creates a distance between MVM and the activities of the system operator, MAVIR does not own the transmission assets. Consequently, MAVIR does not have the full rights of a transmission system operator. The ownership of the transmission lines remains with MVM, while MAVIR is responsible for decisions on the development of the lines, including the distribution networks.

Electricity trading arrangements will be based on bilateral contracts and balancing services will be provided by MAVIR. It is essential that the balancing electricity requirements should be acquired on a competitive basis by MAVIR on the open market and that MAVIR is allowed to price these services accordingly. This is the only way to send the appropriate market signals to the supply and demand sides of the electricity market.

Growing imports and larger power exchanges between the different regions in Hungary could also require additional capacity in the monopoly infrastructure.

Before the market is opened, it is difficult to assess the degree of congestion problems that may arise in the transmission network. The government's hypothesis is that the internal transmission network system will not face severe congestion in a competitive market. However, growing imports and larger power exchanges between the different regions of Hungary could require additional transmission network capacity. In particular, there might be severe congestion in the interconnection between the Slovak Republic and Hungary. If electricity prices are lower in the Slovak Republic and some Slovakian power is available for imports into Hungary, the risk of a congested interconnection could have an impact on the market power of companies able to export or import electricity from the Slovak Republic. The government should therefore ensure that MAVIR monitors the adequacy of the transmission network. In this context, the government is to be commended for envisaging a mechanism through which MAVIR will have the option to commission the construction of new electricity transmission lines. It will be the role of MAVIR, responsible for the management of foreign trade, to ensure that the principle of non-discriminatory use of the network is respected. The government should also ensure that there are appropriate arrangements for monitoring the adequacy of the cross-border capacity by the system operator.

Non-technical Losses

Transmission and distribution losses are high in Hungary. The regulated price of electricity takes into account an incentive to reduce losses, principally technical losses, and will affect only the price of electricity sold to non-eligible consumers. Unfortunately, transmission and distribution losses are generally a consequence of electricity pilferage by certain consumers. This may lead to unfair cross-subsidies and higher prices for other consumers and will constitute an obstacle to the development of a fully competitive market. The government should develop an alternative solution to price regulation to address electricity pilferage.

Price Caps, Social Requirements and Price Determination

The government has limited the growth of end-user electricity prices to reflect the restricted purchasing power of some of the Hungarian population. Similar motivations have been among the main drivers for limiting the MEH's decision power to set tariffs, while its independence has significantly increased. This policy will discourage efficient use of electricity, which is crucial for energy security and environmental protection. It will also discourage investment by electricity companies, which could cause a serious threat to future security of supply. Once the market has been opened to competition, the government will have to reconsider the arrangements for the regulation of electricity prices through price caps. It will need to separate social policy from energy policy, addressing social requirements through means other than electricity prices. The government should allow the prices to increase to cost levels before opening the market, otherwise the market will suffer from a distortion signal. This will result in consumers lacking incentive to switch suppliers if they are receiving subsidised prices from their existing supplier, and conversely providing a greater incentive for the companies buying power above cost levels to switch suppliers (see also Chapter 3).

Regulated electricity prices are calculated by the MEH, but are set by a decision of the Ministry of Economy and Transport. This is also the case for TPA charges, unlike in many other countries where they are set by the independent regulator rather than the government. In particular, since MVM and MAVIR are both publicly-owned, price setting by the government does cause a conflict of interests that the government will not be in a position to ignore for long.

NUCLEAR

Introduction and utilisation of nuclear power in Hungary have been successful. Safety records are good and the generation costs low compared to other energy sources. The Paks plant has undergone major safety improvements and the current safety level is comparable to western plants of the same vintage. The company appears to be financially stable. Continuous efforts are necessary to ensure the future safety of the Paks plant. Safety is a prerequisite for increased production capacity and nuclear plant lifetime extension. Provided that safety is guaranteed, lifetime extension and power uprating appear to be economically reasonable options for maintaining sufficient production capacity in Hungary.

The storage of spent fuel and low- and intermediate-level nuclear wastes of nuclear origin is well organised. However, the ultimate disposal of these wastes must be finalised. The technological and economical feasibility of possible low and intermediate nuclear waste disposal solutions have been assessed positively. Efforts still need to be made to ensure timely progress. The programme to develop a final disposal facility for the high-level radioactive wastes is still in a very early phase and several important political and technological steps need to be taken.

The Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management of the IAEA stipulates that each Contracting Party, in accordance with its legislative and regulatory framework, shall take the appropriate steps to ensure effective independence of the regulatory functions from other functions where organisations are involved in both spent fuel or radioactive waste management and regulation. Currently, the HAEA acts as owner of PURAM and the managing director of PURAM reports to the director-general of HAEA.

The approach taken to ensure that back-end costs are covered through the Central Nuclear Financial Fund increases the transparency of the total production costs of nuclear power. Attention should be paid to ensure that funds are sufficient to cover the back-end costs when they are needed.

RECOMMENDATIONS

The government of Hungary should:

Electricity

- *Give MAVIR more extensive responsibilities in the management and operation of the network and strengthen MAVIR's responsibilities as an independent system operator.*
- *Ensure that balancing services provided by MAVIR are priced on a competitive basis.*
- *Ensure that appropriate arrangements are made for MAVIR to monitor the adequacy of the transmission network cross-border interconnection capacity.*
- *Monitor the development of competition to avoid excess market power exerted by companies through long-term contracts.*
- *Address the problem of electricity pilferage.*
- *Review the arrangements for price caps as a means of price regulation, ensuring that social objectives are pursued through means other than energy prices.*
- *Strengthen the MEH's autonomy in regulating electricity.*

Nuclear

- *Take decisions on the nuclear waste disposal framework as soon as possible, consistent with a full safety assessment.*

- *Continue to ensure a high level of safety and maintain public confidence in nuclear plant operations, by securing the independent position of the HAEA to regulate nuclear safety.*

- *Take the necessary steps to separate the management of PURAM from HAEA in order to clarify the relationship between the safety regulator and the licensee.*

RESEARCH, DEVELOPMENT AND DEMONSTRATION

OVERVIEW

The government is willing to pay particular attention to the improvement of science and technology policy and innovation. The Science and Technology Policy 2000 was launched to create a medium-term development programme. The Office of the National Committee for Technology Development (NCTD), in charge of science and technology policy and implementation, was integrated into the Ministry of Education as a new division on 1 January 2000, and is headed by a deputy state secretary.

The economic and financial crisis experienced during the transition period towards a market economy resulted in a sharp decrease in gross expenditure on R&D. Between 1990 and 1996, the rate of expenditure on R&D relative to GDP decreased from 1.6% to 0.67%, the lowest value in the 1990s. After 1999, the favourable economic situation made it possible to increase R&D expenditures. In 2000, gross expenditure on R&D increased to 0.82% (from 0.68% the previous year). This ratio is still low by European and also most OECD countries' standards. The government target is to reach the EU average by 2006.

Economic recovery and the availability of skilled labour at relatively low cost have increasingly led more multinational companies to establish their research centres in Hungary, primarily in pharmaceuticals, information technology, automobiles and telecommunications. The government, while promoting R&D, puts particular emphasis on enhancing the innovative capacities of the small and medium-sized enterprises sector, by introducing target-oriented programmes and methodological support. Between 1998 and 2000, the number of research units belonging to companies increased from 258 to 478. In 2001, in order to enhance the human resources in science and technology, the government significantly increased salaries of researchers engaged in public research organisations. A similar measure was taken in 2002. Universities, regional human resource development and training centres and the Innovation and Business Incubator (INNOSTART) have launched courses for the development of human resources for innovation, focusing on quality control and technology management in close co-operation with private enterprises.

As the economy has been opened, Hungarian R&D organisations have had an increasing opportunity to participate in multilateral and bilateral scientific programmes. A large number of international science and technology co-operation links have been developed during the past decades. Hungary has become a full member in most European and Euro-Atlantic research organisations and programmes, such as COST, EUREKA, CERN, EMBL, ESA/PRODEX and the NATO Science Programme. During the period under review, Hungary continued to be fully associated with the EU Fifth Framework Programme on R&D as well as with the EURATOM Framework Programme. The financial and institutional framework of Hungarian participation has been clearly established. Since 1999, the Hungarian contribution to the EU Fifth Framework Programme on R&D has continuously increased. Hungary has had a 30% "success rate" in the EU Fifth Framework Programme on R&D, "Thematic Programme 4: Energy, Environment and Sustainable Development – Part B. Energy" (113 submitted projects with Hungarian applicants for 35 projects funded with 45 Hungarian participants).

In the National R&D Programme established in the Széchenyi Plan in 2000, a total of US$ 136.4 million has been earmarked for R&D in energy, environment and sustainable development between 2000 and 2002. The funds will be allocated through tenders for general R&D, information diffusion, co-operative research and personnel training. The government structure for research funding is 100% support for fundamental research, 50% for applied research and 35% for demonstration.

In its 2002 call for proposals, the National Technology Development Fund established by Government Decree 98/1996 (VII.10) includes targets for applied research for product quality improvement, energy efficiency and environmental aspects, biotechnology, information technologies and applications, and environmental research activities. The range of support is HUF 5 to HUF 75 million (approximately US$ 22 000 to US$ 300 000) for project periods of one to three years. The structure of funding is 100% for basic research, 60% (maximum 75%) for applied research and 35% (maximum 50%) for experimental development.

More than half of Hungary's total RD&D expenditure is provided by the state budget; the private sector's share in total RD&D expenditure amounts to 38%. Research institutes, such as the Institute for Electric Power Research (VEIKI) which is owned by the Hungarian State, are an important part of the national innovation system. A significant share of energy R&D has been and still is dedicated to nuclear. Hungary is actively improving the technology used to operate the Paks plant, which was purchased from the former Soviet Union.

CRITIQUE

The Ministry of Economy and Transport and the Ministry of Education co-ordinate the organisation and prioritisation of government R&D requirements. However, there is no single institution co-ordinating energy R&D efforts in

Hungary. This may be needed, particularly at a time when the structure of the Hungarian economy is gradually shifting towards being more knowledge-based. Similarly, one of the difficulties in the Hungarian innovation system is the lack of institutions facilitating technology transfer between public research institutions and the industry. In the last few years, there were several attempts to establish special research and technology centres at universities in order to promote the flow of knowledge.

The government structure for funding energy research – 100% final support is provided for basic research, 50% for applied research and 35% for demonstration – is commendable. It provides an appropriate framework for the market to take increasing responsibility for commercial research.

Hungarian research institutes involved in energy R&D recognise that companies acting in the competitive gas and electricity markets may have fewer R&D requirements, preferring to focus on boosting their competitiveness.

Continuing emphasis on nuclear research issues, including safety, is welcome given the important role of nuclear electricity in Hungary.

Despite being a member of the IEA since 1997, Hungary has not yet taken advantage of the existing international framework for energy R&D provided by the IEA Implementing Agreements.

RECOMMENDATIONS

The government of Hungary should:

- *Design and implement a comprehensive energy RD&D strategy integrating the existing fragmented programmes and clearly setting priorities.*
- *Consider joining IEA Implementing Agreements.*

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit: Mtoe

SUPPLY

		1973	1990	1999	2000	2005	2010	2020
TOTAL PRODUCTION		**12.84**	**14.22**	**11.45**	**11.09**	**9.81**	**9.74**	**8.92**
Coal[1]		6.05	4.14	3.00	2.89	1.90	2.20	2.00
Oil		2.02	2.27	1.78	1.68	1.20	0.90	0.70
Gas		4.03	3.81	2.62	2.48	2.22	1.91	1.50
Comb. Renewables & Wastes[2]		0.73	0.40	0.35	0.38	0.61	0.84	0.84
Nuclear		–	3.58	3.67	3.64	3.78	3.78	3.75
Hydro		0.01	0.02	0.02	0.02	0.02	0.02	0.02
Geothermal		–	–	0.00	0.01	0.08	0.10	0.11
Solar/Wind/Other		–	–	–	–	0.00	0.00	0.00
TOTAL NET IMPORTS[3]		**8.66**	**14.17**	**13.69**	**13.90**	**16.01**	**17.39**	**20.35**
Coal[1]	Exports	0.11	–	0.11	0.13	0.13	–	–
	Imports	1.74	1.63	1.14	1.21	1.86	1.11	1.20
	Net Imports	1.63	1.63	1.02	1.08	1.73	1.11	1.20
Oil	Exports	0.92	1.52	1.95	1.73	1.60	1.60	1.71
	Imports	7.39	7.96	7.20	7.01	7.93	8.58	10.00
	Bunkers	–	–	–	–	–	–	–
	Net Imports	6.48	6.44	5.26	5.27	6.33	6.98	8.29
Gas	Exports	0.01	0.02	0.00	0.06	–	–	–
	Imports	0.17	5.19	7.32	7.31	7.78	9.15	10.55
	Net Imports	0.15	5.17	7.31	7.25	7.78	9.15	10.55
Electricity	Exports	0.09	0.19	0.28	0.52	0.16	0.16	0.16
	Imports	0.49	1.14	0.37	0.82	0.32	0.31	0.47
	Net Imports	0.40	0.96	0.09	0.30	0.16	0.16	0.31
TOTAL STOCK CHANGES		**–0.02**	**0.06**	**0.06**	**–0.20**	**–**	**–**	**–**
TOTAL SUPPLY (TPES)		**21.47**	**28.44**	**25.20**	**24.78**	**25.82**	**27.13**	**29.27**
Coal[1]		7.91	6.12	4.16	3.96	3.63	3.31	3.20
Oil		8.21	8.51	7.00	6.87	7.53	7.88	8.99
Gas		4.17	8.91	9.90	9.62	10.01	11.06	12.05
Comb. Renewables & Wastes[2]		0.78	0.35	0.35	0.38	0.61	0.84	0.84
Nuclear		–	3.58	3.67	3.64	3.78	3.78	3.75
Hydro		0.01	0.02	0.02	0.02	0.02	0.02	0.02
Geothermal		–	–	0.00	0.01	0.08	0.10	0.11
Solar/Wind/Other		–	–	–	–	0.00	0.00	0.00
Electricity Trade[4]		0.40	0.96	0.09	0.30	0.16	0.16	0.31
Shares (%)								
Coal		*36.8*	*21.5*	*16.5*	*16.0*	*14.1*	*12.2*	*10.9*
Oil		*38.2*	*29.9*	*27.8*	*27.7*	*29.2*	*29.0*	*30.7*
Gas		*19.4*	*31.3*	*39.3*	*38.8*	*38.8*	*40.8*	*41.2*
Comb. Renewables & Wastes		*3.6*	*1.2*	*1.4*	*1.5*	*2.4*	*3.1*	*2.9*
Nuclear		–	*12.6*	*14.6*	*14.7*	*14.6*	*13.9*	*12.8*
Hydro		–	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*
Geothermal		–	–	–	–	*0.3*	*0.4*	*0.4*
Solar/Wind/Other		–	–	–	–	–	–	–
Electricity Trade		*1.9*	*3.4*	*0.4*	*1.2*	*0.6*	*0.6*	*1.1*

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

Unit: Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	1999	2000	2005	2010	2020
TFC	**17.28**	**20.93**	**17.09**	**17.35**	**18.22**	**19.54**	**21.68**
Coal[1]	4.17	2.68	0.70	0.70	0.75	0.76	0.75
Oil	6.71	7.41	5.38	5.54	5.81	6.10	7.00
Gas	3.08	6.20	6.71	6.82	6.73	7.46	8.20
Comb. Renewables & Wastes[2]	0.76	0.34	0.32	0.35	0.77	0.89	0.89
Geothermal	–	–	0.00	0.01	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
Electricity	1.51	2.72	2.49	2.53	2.62	2.78	3.20
Heat	1.06	1.59	1.49	1.41	1.55	1.55	1.64
Shares (%)							
Coal	*24.1*	*12.8*	*4.1*	*4.0*	*4.1*	*3.9*	*3.5*
Oil	*38.8*	*35.4*	*31.5*	*31.9*	*31.9*	*31.2*	*32.3*
Gas	*17.8*	*29.6*	*39.2*	*39.3*	*36.9*	*38.2*	*37.8*
Comb. Renewables & Wastes	*4.4*	*1.6*	*1.9*	*2.0*	*4.2*	*4.5*	*4.1*
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
Electricity	*8.7*	*13.0*	*14.6*	*14.6*	*14.4*	*14.2*	*14.8*
Heat	*6.1*	*7.6*	*8.7*	*8.1*	*8.5*	*7.9*	*7.5*
TOTAL INDUSTRY[5]	**7.90**	**8.06**	**4.66**	**4.94**	**5.21**	**5.33**	**5.73**
Coal[1]	1.87	0.80	0.43	0.46	0.50	0.50	0.50
Oil	2.34	2.11	1.37	1.54	1.62	1.50	1.80
Gas	2.29	3.76	1.68	1.70	1.80	2.00	2.00
Comb. Renewables & Wastes[2]	0.02	0.00	–	–	0.11	0.11	0.10
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
Electricity	0.92	1.18	0.73	0.76	0.78	0.82	0.90
Heat	0.46	0.21	0.45	0.47	0.40	0.40	0.43
Shares (%)							
Coal	*23.6*	*9.9*	*9.2*	*9.4*	*9.6*	*9.4*	*8.7*
Oil	*29.6*	*26.2*	*29.4*	*31.3*	*31.1*	*28.2*	*31.4*
Gas	*29.0*	*46.6*	*35.9*	*34.5*	*34.6*	*37.6*	*34.9*
Comb. Renewables & Wastes	*0.2*	–	–	–	*2.0*	*2.0*	*1.8*
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
Electricity	*11.7*	*14.7*	*15.7*	*15.3*	*15.0*	*15.4*	*15.7*
Heat	*5.9*	*2.6*	*9.7*	*9.6*	*7.7*	*7.5*	*7.5*
TRANSPORT[6]	**2.37**	**3.15**	**3.33**	**3.32**	**3.56**	**4.18**	**4.30**
TOTAL OTHER SECTORS[7]	**7.02**	**9.72**	**9.10**	**9.09**	**9.45**	**10.03**	**11.64**
Coal[1]	1.93	1.88	0.27	0.23	0.25	0.26	0.25
Oil	2.45	2.25	0.76	0.76	0.71	0.50	1.00
Gas	0.78	2.44	5.03	5.11	4.93	5.46	6.20
Comb. Renewables & Wastes[2]	0.74	0.34	0.32	0.35	0.66	0.78	0.79
Geothermal	–	–	0.00	0.01	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
Electricity	0.52	1.43	1.67	1.69	1.75	1.88	2.20
Heat	0.60	1.38	1.04	0.93	1.15	1.15	1.21
Shares (%)							
Coal	*27.5*	*19.4*	*3.0*	*2.6*	*2.6*	*2.6*	*2.1*
Oil	*34.9*	*23.1*	*8.4*	*8.4*	*7.5*	*5.0*	*8.6*
Gas	*11.2*	*25.1*	*55.3*	*56.2*	*52.1*	*54.4*	*53.3*
Comb. Renewables & Wastes	*10.5*	*3.5*	*3.5*	*3.9*	*7.0*	*7.8*	*6.7*
Geothermal	–	–	–	*0.1*	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
Electricity	*7.4*	*14.7*	*18.4*	*18.6*	*18.5*	*18.7*	*18.9*
Heat	*8.5*	*14.2*	*11.4*	*10.3*	*12.2*	*11.5*	*10.4*

Unit: Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	1999	2000	2005	2010	2020
ELECTRICITY GENERATION[8]							
INPUT (Mtoe)	**6.37**	**10.21**	**11.49**	**10.03**	**10.69**	**11.26**	**11.76**
OUTPUT (Mtoe)	**1.52**	**2.45**	**3.25**	**3.01**	**3.26**	**3.46**	**3.73**
(TWh gross)	17.64	28.44	37.83	34.99	37.85	40.27	43.37
Output Shares (%)							
Coal	*66.0*	*30.5*	*27.2*	*27.7*	*22.2*	*20.9*	*18.4*
Oil	*17.2*	*4.8*	*14.0*	*12.6*	*16.4*	*16.1*	*19.6*
Gas	*16.2*	*15.8*	*20.7*	*18.9*	*21.9*	*25.8*	*27.7*
Comb. Renewables & Wastes	–	–	*0.3*	*0.3*	*0.5*	*0.5*	*0.5*
Nuclear	–	*48.3*	*37.3*	*40.0*	*38.3*	*36.0*	*33.2*
Hydro	*0.6*	*0.6*	*0.5*	*0.5*	*0.6*	*0.6*	*0.5*
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	*0.0*	*0.1*	*0.1*
TOTAL LOSSES	**4.87**	**7.97**	**8.76**	**7.45**	**7.60**	**7.59**	**7.59**
of which:							
Electricity and Heat Generation[9]	3.67	6.00	6.54	5.39	5.72	6.08	6.24
Other Transformation	0.21	–0.05	0.04	0.17	0.16	–0.24	–0.39
Own Use and Losses[10]	0.99	2.02	2.18	1.89	1.72	1.75	1.74
Statistical Differences	**–0.68**	**–0.45**	**–0.65**	**–0.02**	**–**	**–**	**–**

INDICATORS

	1973	1990	1999	2000	2005	2010	2020
GDP (billion 1995 US$)	34.03	50.35	51.71	54.41	66.82	83.27	129.32
Population (millions)	10.43	10.37	10.07	10.02	9.82	9.62	9.26
TPES/GDP[11]	0.63	0.56	0.49	0.46	0.39	0.33	0.23
Energy Production/TPES	0.60	0.50	0.45	0.45	0.38	0.36	0.30
Per Capita TPES[12]	2.06	2.74	2.50	2.47	2.63	2.82	3.16
Oil Supply/GDP[11]	0.24	0.17	0.14	0.13	0.11	0.09	0.07
TFC/GDP[11]	0.51	0.42	0.33	0.32	0.27	0.23	0.17
Per Capita TFC[12]	1.66	2.02	1.70	1.73	1.86	2.03	2.34
Energy-related CO_2 Emissions (Mt CO_2)[13]	69.1	70.5	60.7	55.2	54.9	58.5	63.6
CO_2 Emissions from Bunkers (Mt CO_2)	0.2	0.5	0.6	0.7	0.7	0.7	0.7

GROWTH RATES (% per year)

	73–79	79–90	90–99	99–00	00–05	05–10	10–20
TPES	4.9	-0.1	–1.3	–1.6	0.8	1.0	0.8
Coal	1.2	-3.0	-4.2	-4.9	–1.7	–1.8	-0.3
Oil	5.6	-2.6	-2.1	–1.9	1.9	0.9	1.3
Gas	10.0	1.7	1.2	–2.8	0.8	2.0	0.9
Comb. Renewables & Wastes	0.9	-7.4	-0.1	7.1	10.2	6.5	–
Nuclear	–	–	0.3	-0.8	0.7	–	-0.1
Hydro	6.3	1.3	0.7	-6.3	5.9	–	–
Geothermal	–	–	–	25.0	75.8	2.7	1.1
Solar/Wind/Other	–	–	–	–	–	8.4	–
TFC	4.6	–0.7	–2.2	1.5	1.0	1.4	1.0
Electricity Consumption	6.0	2.2	–1.0	1.7	0.6	1.3	1.4
Energy Production	2.6	–0.4	–2.4	–3.2	–2.4	–0.2	–0.9
Net Oil Imports	7.1	–3.8	–2.2	0.3	3.7	2.0	1.7
GDP	4.3	1.3	0.3	5.2	4.2	4.5	4.5
Growth in the TPES/GDP Ratio	0.6	–1.3	–1.6	–6.5	–3.2	–3.4	–3.6
Growth in the TFC/GDP Ratio	0.3	–2.0	–2.5	–3.5	–3.1	–3.0	–3.3

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

FOOTNOTES TO ENERGY BALANCES AND KEY STATISTICAL DATA

1. Includes lignite and peat.
2. Comprises solid biomass, industrial waste and municipal waste. Data are often based on partial surveys and may not be comparable between countries.
3. Total net imports include combustible renewables and waste.
4. Total supply of electricity represents net trade.
5. Includes non-energy use.
6. Includes less than 1% non-oil fuels.
7. Includes residential, commercial, public service and agricultural sectors.
8. Inputs to electricity generation include inputs to electricity, CHP and heat plants. Output refers only to electricity generation.
9. Losses arising in the production of electricity and heat at public utilities and autoproducers. For non-fossil-fuel electricity generation, theoretical losses are shown based on plant efficiencies of 33% for nuclear and 100% for hydro.
10. Data on "losses" for forecast years often include large statistical differences covering differences between expected supply and demand and mostly do not reflect real expectations on transformation gains and losses.
11. Toe per thousand US$ at 1995 prices and exchange rates.
12. Toe per person.
13. "Energy-related CO_2 emissions" have been estimated using the Intergovernmental Panel on Climate Change (IPCC) Tier I Sectoral Approach. In accordance with the IPCC methodology, emissions from international marine and aviation bunkers are not included in national totals. Projected emissions for oil and gas are derived by calculating the ratio of emissions to energy use for 2000 and applying this factor to forecast energy supply. Future coal emissions are based on product-specific supply projections and are calculated using the IPCC/OECD emission factors and methodology.

INTERNATIONAL ENERGY AGENCY "SHARED GOALS"

Member countries* of the IEA seek to create the conditions in which the energy sectors of their economies can make the fullest possible contribution to sustainable economic development and the well-being of their people and of the environment. In formulating energy policies, the establishment of free and open markets is a fundamental point of departure, though energy security and environmental protection need to be given particular emphasis by governments. IEA countries recognise the significance of increasing global interdependence in energy. They therefore seek to promote the effective operation of international energy markets and encourage dialogue with all participants.

In order to secure their objectives they therefore aim to create a policy framework consistent with the following goals:

1. **Diversity, efficiency and flexibility within the energy sector** are basic conditions for longer-term energy security: the fuels used within and across sectors and the sources of those fuels should be as diverse as practicable. Non-fossil fuels, particularly nuclear and hydro power, make a substantial contribution to the energy supply diversity of IEA countries as a group.

2. Energy systems should have **the ability to respond promptly and flexibly to energy emergencies.** In some cases this requires collective mechanisms and action: IEA countries co-operate through the Agency in responding jointly to oil supply emergencies.

3. **The environmentally sustainable provision and use of energy** is central to the achieve-ment of these shared goals. Decision-makers should seek to minimise the adverse environmental impacts of energy activities, just as environmental decisions should take account of the energy consequences. Government interventions should where practicable have regard to the Polluter Pays Principle.

4. **More environmentally acceptable energy sources** need to be encouraged and developed. Clean and efficient use of fossil fuels is essential. The development of economic non-fossil sources is also a priority. A number of IEA members wish to retain and improve the nuclear

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

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

5. **Improved energy efficiency** can promote both environmental protection and energy security in a cost-effective manner. There are significant opportunities for greater energy efficiency at all stages of the energy cycle from production to consumption. Strong efforts by governments and all energy users are needed to realise these opportunities.

6. Continued **research, development and market deployment of new and improved energy technologies** make a critical contribution to achieving the objectives outlined above. Energy technology policies should complement broader energy policies. International co-operation in the development and dissemination of energy technologies, including industry participation and co-operation with non-member countries, should be encouraged.

7. **Undistorted energy prices** enable markets to work efficiently. Energy prices should not be held artificially below the costs of supply to promote social or industrial goals. To the extent necessary and practicable, the environmental costs of energy production and use should be reflected in prices.

8. **Free and open trade** and a secure framework for investment contribute to efficient energy markets and energy security. Distortions to energy trade and investment should be avoided.

9. **Co-operation among all energy market participants** helps to improve information and understanding, and encourage the development of efficient, environmentally acceptable and flexible energy systems and markets worldwide. These are needed to help promote the investment, trade and confidence necessary to achieve global energy security and environmental objectives.

(The Shared Goals were adopted by IEA Ministers at their 4 June 1993 meeting in Paris.)

GLOSSARY AND LIST OF ABBREVIATIONS

AC	alternating current
ÁPV	Hungarian State Privatisation and Holding Corporation
bcm	billion cubic metres
CCGT	combined-cycle gas turbine
CENTREL	association for the co-ordination of Polish, Czech, Slovak and Hungarian electric power companies
CHP	combined production of heat and power
CO	carbon monoxide
CO_2	carbon dioxide
COMECON	Council of Mutual Economic Assistance
DC	direct current
DH	district heating
EIA	environmental impact assessment
ELI	Efficient Lighting Initiative
EMU	Economic and Monetary Union
ESCO	Energy Service Company
ESCP	Energy Savings Credit Programme
EU	European Union
Euro	European currency
GCARF	German Coal Aid Revolving Fund
GDP	gross domestic product
GEF	Global Environmental Facility
GHG	greenhouse gas
GJ	gigajoule, or one joule $\times 10^9$
GW	gigawatt, or one watt $\times 10^9$
HAEA	Hungarian Atomic Energy Authority
HAG	Hungary-Austria gas pipeline

HEECP	Hungarian Energy Efficiency Co-financing Programme
HUF	Hungarian forint
IAEA	International Atomic Energy Agency
IEA	International Energy Agency
IEC	International Electrotechnical Commission
IFC	International Finance Corporation
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
ISO	independent system operator
J	joule
JI	Joint Implementation
kbd	thousand barrels per day
KKKSZ	Crude Oil and Oil Product Stockholding Association
kV	kilovolt, or one volt $\times 10^3$
kWh	kilowatt-hour, or one kilowatt x one hour, or one watt $\times$ one hour $\times 10^3$
LNG	liquefied natural gas
MATÁZSZ	Hungarian District Heating Association
MAVIR	Hungarian Power System Operator Company
mcm	million cubic metres
MOL	Hungarian Oil and Gas Company
Mt	million tonnes
MTBE	methyl tertiary-butyl ether
Mtce	million tonnes of coal equivalent
Mtoe	million tonnes of oil equivalent
MVM	Hungarian Electricity Companies
MW	megawatt of electricity, or one watt $\times 10^6$
MWh	megawatt-hour, or one megawatt $\times$ one hour, or one watt $\times$ one hour $\times 10^6$
NATO	North Atlantic Treaty Organisation
NEA	Nuclear Energy Agency of the OECD
NEP	National Environment Programme
NO_x	nitrogen oxides

OECD	Organisation for Economic Co-operation and Development
OKGT	Hungarian Oil and Gas Industry Board
PJ	petajoule, or one joule $\times 10^{15}$
ppm	parts per million
PPP	purchasing power parity
PRF	PHARE Revolving Fund
PURAM	Public Agency for Radioactive Waste Management
R&D	research and development [may include the demonstration and dissemination phases as well (RD&D)]
SCORE	Supporting the Co-operative Organisation of Rational Energy Use Programme
SO_2	sulphur dioxide
SZÉSZEK	Hungarian Coal Mining Restructuring Centre
TFC	total final consumption of energy
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 one watt $\times 10^{12}$
TWh	terawatt $\times$ one hour, or one watt $\times$ one hour $\times 10^{12}$
UCTE	Union for the Co-ordination of Transmission of Electricity
UN	United Nations
UNDP	United Nations Development Programme
UPS/IPS	United Power System/Integrated Power System, the integrated electricity transmission grid of the former Soviet Union
US	United States
VAT	value-added tax
VOCs	volatile organic compounds
VVER	Vodiano Vodianoi Energuyeticheski Reaktor, Russian-design pressurised water reactor
WANO	World Association of Nuclear Operators

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