INTERNATIONAL ENERGY AGENCY

Energy Policies of IEA Countries

Czech Republic 2001 Review

OECD

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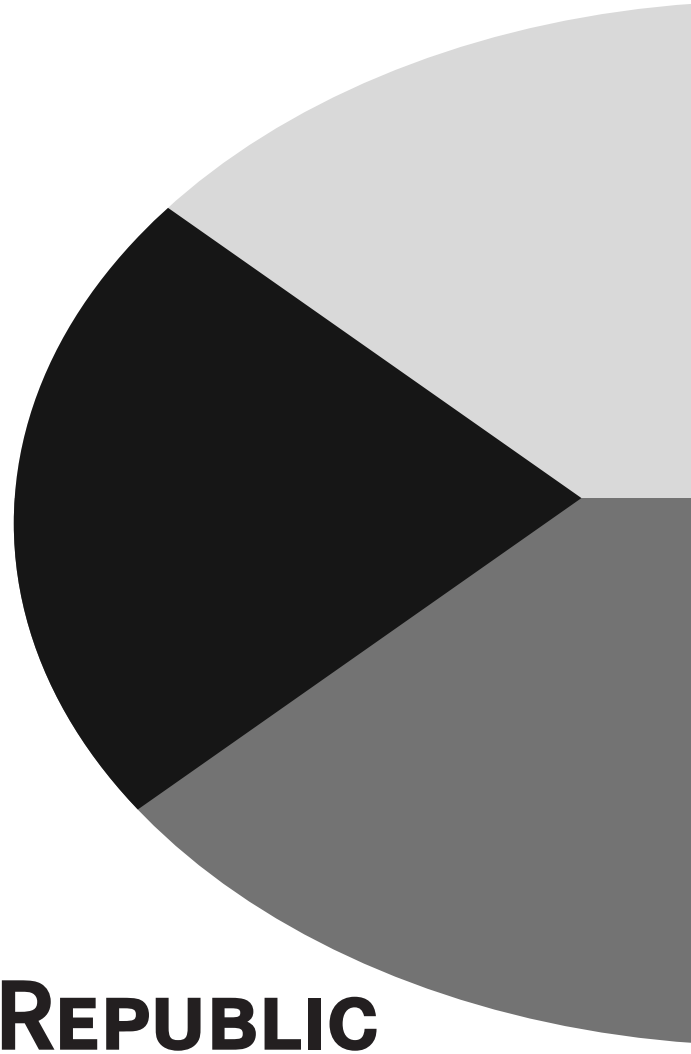

CZECH REPUBLIC 2001 REVIEW

INTERNATIONAL ENERGY AGENCY
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-five* 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, 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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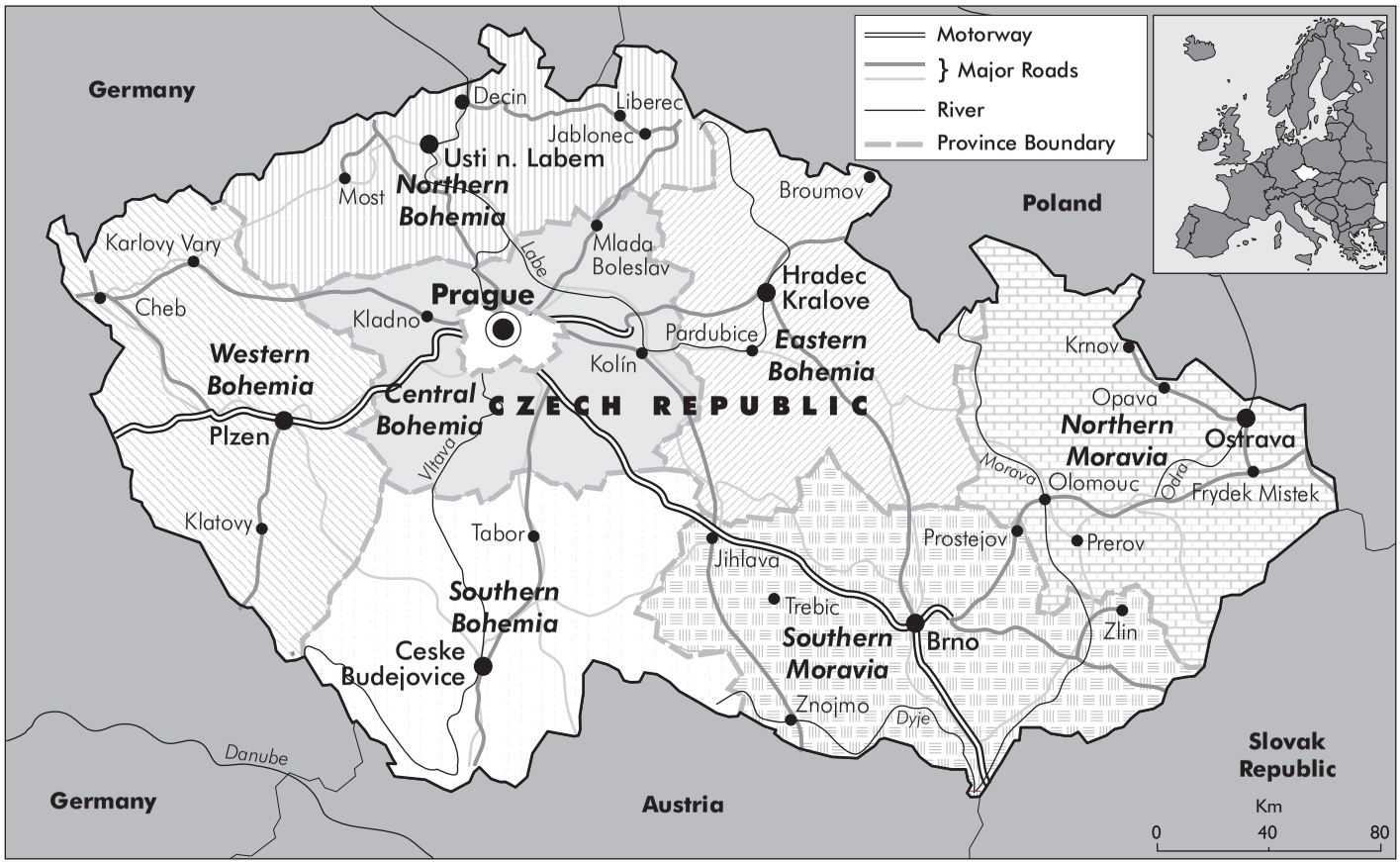

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SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

The Czech Republic is the size of Ireland. It is bordered by two EU member countries – Germany and Austria – and by Poland and Slovakia. In 1998 the population was 10.3 million located in eight administrative regions. Until 1993, the Czech Republic was part of the Czech and Slovak Federal Republic.

A decade of reforms after 1989 made remarkable progress in establishing a market-oriented economy. The Czech Republic will be among the first group of countries to join the European Union in the near future.

On 5 February 2001, the Czech Republic became the twenty-fifth Member of the IEA and the second in Central Europe.

This occurred after the approval in January 2000 of a new Energy Policy and the implementation of a new Energy Act in January 2001, establishing a new regulatory regime and providing for the liberalisation of the electricity and natural gas markets. In addition, the government plans to sell off the dominant energy companies by 2002. The effective establishment of competitive electricity and gas markets is a major task for the new energy regulator.

These recent developments are the continuation of a process initiated in the early 1990s with the restructuring and partial privatisation of the former energy monopolies, the liberalisation of the prices of liquid and solid fuels, and the adjustment of electricity and natural gas prices.

Security of energy supply is an important objective of Czech energy policy. Hydrocarbon imports have been diversified since 1996. Oil stocks and emergency measures now comply with IEA standards, and gas storage capacity has been increased. In order to preserve the security and reliability of energy supply, the reforms should be sequenced to ensure a stable, transparent and effective regulatory framework *before* the opening of the markets and privatisation of the major companies.

The growing share of natural gas in direct applications and district heating has reduced the importance of brown coal, which still dominates in power generation. The commissioning of a new nuclear plant will add to the existing baseload overcapacity. It will reduce the use of coal plants and lower the price of electricity exports.

Energy transformation and consumption under the centrally-planned system exerted considerable stress on the environment. Thanks to dedicated policies and investment, performance has improved in terms of greenhouse gas emissions and

pollutants which, however, remain much higher than the average in OECD Europe. Similarly, energy efficiency has improved but remains significantly lower than the average in OECD Europe. Ambitious policies on energy efficiency and the environment are still required.

Despite the remaining problems in the energy sector, the country is firmly engaged in positive reforms similar to those in other OECD countries.

RECOMMENDATIONS

The government should:

Energy Policy

- ☐ Maintain its efforts to increase energy security through the diversification of its oil and natural gas supply.
- ☐ Clearly separate regulatory functions from operational activities in the energy sector and ensure that relations between the government and the state-owned energy companies are strictly commercial.
- ☐ Establish a transparent, effective, non-discriminatory and competitive regulatory framework.
- ☐ Clarify the Energy Regulatory Office's responsibility for energy market monitoring and competition enforcement, particularly the relationship between ERO and the competition authority.
- ☐ Consider increasing ERO's effectiveness by adding a number of independent commissioners to assist the chair.
- ☐ Consider alternative funding for ERO.
- ☐ Continue efforts to suppress price distortions and establish non-discriminatory pricing by the end of 2002.
- ☐ Closely monitor the non-payment problem.
- ☐ Make energy efficiency in the various consuming sectors a policy priority.
- ☐ Continue to give high priority to safety and to reducing the environmental impact of energy transformation and consumption.

☐ Continue joint efforts by the Ministry of Industry and Trade and the Czech Statistical Office to ensure that relevant and reliable statistical indicators are available for all energy players.

Energy Efficiency

☐ Ensure that energy efficiency be given priority among energy policy objectives.

☐ Adapt the current energy efficiency strategy to market liberalisation and to growing demand in the energy-consuming sectors, especially transport.

☐ Strengthen current insulation standards for buildings, as well as labelling and energy efficiency standards for appliances in line with European Union legislation and progressively make them compulsory.

☐ Strengthen the information, education and motivation campaign of the Czech Energy Agency for energy savings by all end-users.

☐ Involve all economic players (municipalities, utilities, industries, building developers) in energy efficiency information, dissemination and project development.

☐ Strengthen fiscal and financial incentives for energy efficiency projects.

☐ Encourage third-party financing.

☐ Provide adequate funding to the Czech Energy Agency for its energy efficiency programmes and co-ordinate it with other initiatives, especially those of the State Environmental Fund.

☐ Carefully monitor the development of energy efficiency programmes and their cost-effectiveness.

Environment

☐ Intensify efforts to develop a comprehensive multi-sectoral climate change strategy, giving priority to enhancing energy efficiency.

☐ Exploit the Kyoto flexibility mechanisms (Joint Implementation, Tradable Permits, etc.) and start preparing appropriate legislation.

☐ Develop renewable energy projects on a cost-effective basis with dual energy and environmental targets.

☐ Ensure coherence of renewable energy policies within state bodies and consider the creation of a single organisation in charge of implementing environmental and energy policies.

☐ Ensure total compliance of the Clean Air Act and related legislation with EU emission standards, and effective enforcement of the act.

☐ Carefully monitor measures to improve cost-effectiveness.

Electricity

☐ Ensure that the Energy Regulatory Office has sufficient power and resources to carry out its functions while operating in a transparent manner.

☐ Ensure cost-reflective pricing for regulated electricity tariffs, particularly for ancillary services. Eliminate cross-subsidies between customer groups, uses (e.g. space heating) and distribution companies, and make sure that use of the networks reflects costs according to time of use.

☐ Encourage the use of incentive regulation for setting network tariffs.

☐ Ensure that transmission and distribution businesses remain unbundled as separate corporate entities, distinct from the competitive businesses of generation and supply.

☐ Monitor prices for captive consumers to ensure that they are fair market prices.

☐ Independently monitor the wholesale electricity market to detect and discourage possible abuses of market power, and require that contracts between CEZ, a.s. (the power generation company) and the distribution companies be non-exclusive.

☐ Reconsider the obligation for electricity distribution companies to purchase electricity generated from combined production of heat and power (CHP) and from renewable sources.

☐ Avoid restrictions on free access to electricity imports.

☐ Investigate the possibility of expanding international interconnection capacities.

Nuclear

☐ Ensure the completion of the Environmental Impact Assessment and the international safety check for the Temelín plant according to EU standards.

- ☐ Make sure that, within the liberalised market and under private ownership, nuclear safety remains high, and that funds for future waste management and decommissioning remain adequate and guaranteed.

- ☐ Pursue the radioactive waste management programme aimed at creating a repository for high-level waste.

- ☐ Pursue the clean-up of the closed uranium mine sites.

- ☐ Continue to ensure and, if necessary, improve the independence and authority of the State Office for Nuclear Safety.

- ☐ Ensure that government research and development in the nuclear energy field is appropriate in size and content for the country's nuclear energy programme.

District Heating

- ☐ Eliminate distortions between natural gas and electricity tariffs.

- ☐ Lift the current price control of household tariffs while maintaining an established ceiling (price cap per square metre) to ensure that energy saving investments benefit both operators and customers.

- ☐ Promote cost-effective co-generation and metering at building level.

- ☐ Reconsider the obligation for electricity distribution companies to purchase electricity from CHP.

Natural Gas

- ☐ Ensure that gas prices for all users are cost-reflective by the end of 2002, by including the cost of all services in customer tariffs and by eliminating cross-subsidies between customer groups and distribution companies.

- ☐ Continue diversification of Transgas's supply purchases on an economic basis.

- ☐ Unbundle Transgas's transmission and storage by creating separate structures before ownership separation.

- ☐ Ensure sufficient storage and transport capacities to cover peak demand consistent with future gas pricing.

- ☐ Establish a transparent and independent pricing system for wholesale and final consumers under the supervision of the Energy Regulatory Office.

☐ Ensure fair and effective competition among distributors, including the establishment of non-exclusive contracts between Transgas and the distributors.

☐ Ensure continuous operation of transit activities under fair contractual conditions.

Oil

☐ Maintain supply through the Ingolstadt-Kralupy-Litvínov (IKL) pipeline.

☐ Maintain high safety and environmental standards in the oil sector, including transport, refining, retailing and final products.

☐ Ensure that conditions for fair and effective competition in the whole sector are guaranteed by the Office for the Protection of Economic Competition.

☐ Make sure that operating companies have non-discriminatory access to transport and storage facilities.

Coal

☐ Continue with current plans to restructure the coal sector, including the closure of uneconomic mines and restoration of closed sites.

☐ Ensure compliance of coal mining and coal utilisation with EU environmental standards.

☐ Consider integrating ownership of brown coal mines that exclusively supply a single power plant with ownership of that plant.

Energy Research and Development

☐ Review the structure of government R&D and select a limited number of projects identified as effective in meeting national energy policy objectives, and concentrate resources on them.

☐ Investigate the advantages of participating in relevant IEA Implementing Agreements.

2

ORGANISATION OF THE REVIEW

REVIEW TEAM

This in-depth review of the energy policies of the Czech Republic was undertaken by a team of energy policy specialists who visited the country in November 2000 for discussions with government officials, energy suppliers and energy consumers. The report is based on information provided before, during and after the visit by the Czech Ministry of Industry and Trade and the Ministry of the Environment and supplemented by published sources and IEA statistical data.

Emmanuel Bergasse directed the review and drafted most of the report. Special thanks are due to Peter Fraser, Evelyne Bertel (of the OECD Nuclear Energy Agency) and Alain Bilot, who respectively drafted the electricity, nuclear and energy efficiency and R&D chapters. Sylvie Cornot provided critical inputs to the natural gas chapter and Shige Seki contributed to the overall review of the draft. Lisa Guarrera was responsible for energy balances and statistics. Monica Petit and Bertrand Sadin prepared the figures.

The review team was composed of:

Peter Scholten
(Team Leader)
Ministry of Economic Affairs
The Netherlands

Miklos Poos
(Policy Expert)
Ministry of Economic Affairs
Hungary

Helen Gratsia
(Policy Expert)
Ministry of Development
Greece

Olivier Appert
(IEA Secretariat)
Head, Long-Term Co-operation and Policy Analysis Office

Peter Fraser
(IEA Secretariat)
Energy Diversification Division

Evelyne Bertel
Nuclear Energy Agency (OECD)
Nuclear Development Division

Alain Bilot
(IEA Secretariat)
Energy Efficiency and Policy Analysis Division

Emmanuel Bergasse
(IEA Secretariat)
Country Studies Division

The team held discussions with the following organisations:

- Ministry of Industry and Trade, Energy Section
- Ministry of the Environment
- Ministry of Finance
- National Property Fund
- Office for the Protection of Economic Competition
- Czech Energy Agency
- Czech Environmental Fund
- Czech Environmental Institute
- CEZ, a.s. (Electricity generation)
- CEPS a.s. (Electricity transmission)
- UED (Electricity dispatching)
- Association of Regional Power Distribution Utilities (CSRES)
- EOP-National Power (IPP, District Heating)
- Prazska teplarenska (Prague District Heating)
- Dalkia (IPP, District Heating)
- SEVEn
- Transgas
- Administration of State Material Reserves
- Unipetrol
- Ceska Rafinerska (CRC)
- Czech Association of Petroleum Industry and Trade (CAPPO)
- OKD (hard coal mining)
- Government Council for R&D

The assistance and co-operation of all participants in the review are gratefully acknowledged. The team is particularly grateful to the Ministry of Industry and Trade for its help during the entire review process and to the Ministry of Foreign Affairs.

REVIEW CRITERIA

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

3

ENERGY MARKET AND ENERGY POLICY

ENERGY MARKET

Energy Supply

A decade of transition has modified both the energy supply and the fuel mix. The Czech Republic has limited domestic energy resources, mainly solid fuels which make up more than half of total primary energy supply (TPES). It is strongly dependent on hydrocarbon imports (40% of TPES). Since the start of the transition in 1990, the total energy production of the Czech Republic has decreased by 27%, TPES has fallen by 19% and final consumption by 30%. Imports have increased by 27%.

TPES reached 38.6 Mtoe in 1999, 90% of it from fossil fuels (Figure 2). Between 1990 and 1999, the Czech Republic became less dependent on solid fuels (minus 15 percentage points), which fell to 48% of the 1999 total because of the switch from brown coal to other fuels and the closure of coal power plants. The share of oil in TPES increased slightly, to 21.4% of the 1999 total, followed by natural gas at 20% (plus 10 percentage points) and nuclear power at 9% (plus 2 points).

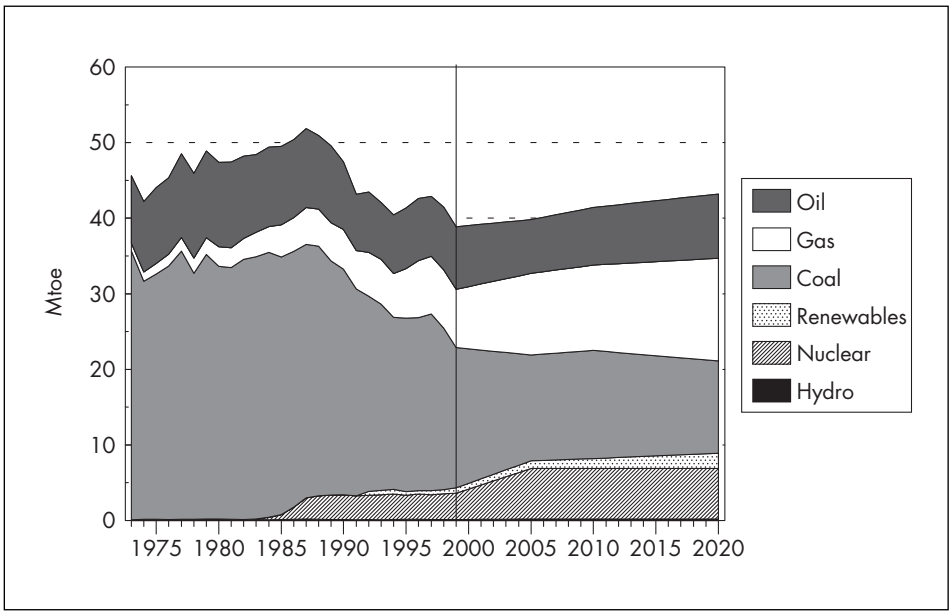
In 1999, domestic energy production covered 51% of TPES. Figure 3 illustrates coal's continuing dominance in domestic production (85% in 1999) despite a one-third decrease in absolute terms between 1990 and 1999. Nuclear output remained stable during the same period, reaching 12% of total production in 1999.

In 1999, imports covered the remainder, of which 45% was oil and 50% natural gas. Efforts have been made to reduce the country's dependence on hydrocarbon imports from Russia, which represented 33% of TPES in 1998. The cost of energy imports represented 5% of GDP in 1998, a figure expected to remain stable over the next decade.

New pipelines have been commissioned to link the Czech Republic with Western European oil and gas markets. In 1996, the new crude oil pipeline Mero IKL (Ingolstadt-Kralupy-Litvínov) was commissioned by the Czech Republic as a strategic connection to non-CIS countries. In 1999, it carried 20% of total oil supplies. Oil stocks and emergency preparedness were brought in line with IEA and EU requirements by a legislative act in 1999 and implemented by the Administration of State Material Reserves (ASMR). A long-term supply contract was signed with Norway in 1997 for deliveries of gas through Germany. In 1999, gas from Norway covered 15% of the total natural gas supply and is expected to reach 25% by 2002.

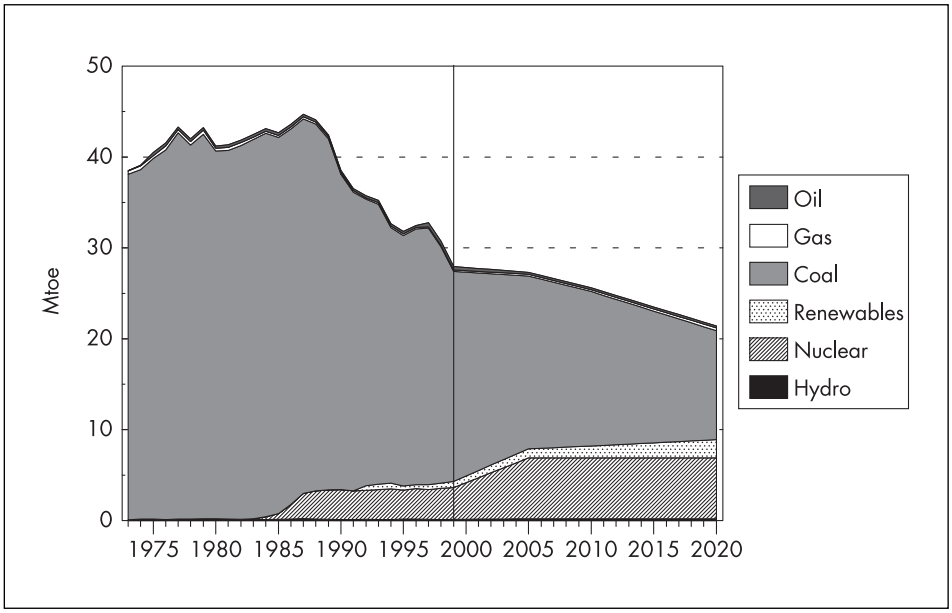
Electricity is still generated mostly by coal (70% in 1999) and nuclear power (20.8%). The share of natural gas has increased but remains limited to 4.7% of total generation, just above hydropower (2.6%). The interconnection of the electric grids of CENTREL countries (Czech Republic, Hungary, Poland and Slovakia) to the

Figure 2
Primary Energy Supply, 1973 to 2020



Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2000, and country submission.

Figure 3
Energy Production by Fuel, 1973 to 2020



Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2000, and country submission.

UCTE network in Western Europe was completed in 1996, allowing exchanges and trade with the whole of Europe.

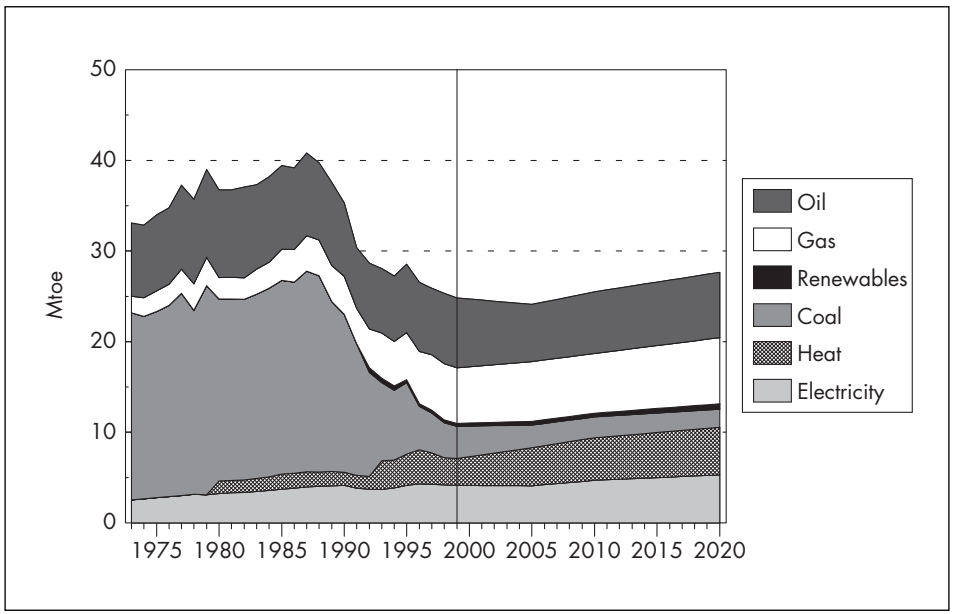
Hard coal is the main energy export (6.2 Mtoe in 1999) but these exports are in steady decline owing to lower demand and greater competition in the international market. In 1999, net electricity exports amounted to 3.3 TWh (0.3 Mtoe).

Energy Consumption

Total final energy consumption (TFC) was 24.8 Mtoe in 1999 (Figure 4), a decrease of 10.5 Mtoe, or 30%, from 1990. Between 1990 and 1998, GDP decreased by 3.4%; therefore, energy intensity decreased significantly during the period. Coal, which accounted for 49.4% of final consumption in 1990, fell to 14.4% in 1999. Gas increased from 11.9% in 1990 to 24.7% in 1999, and oil increased from 22.9% to 31.1% in the same period.

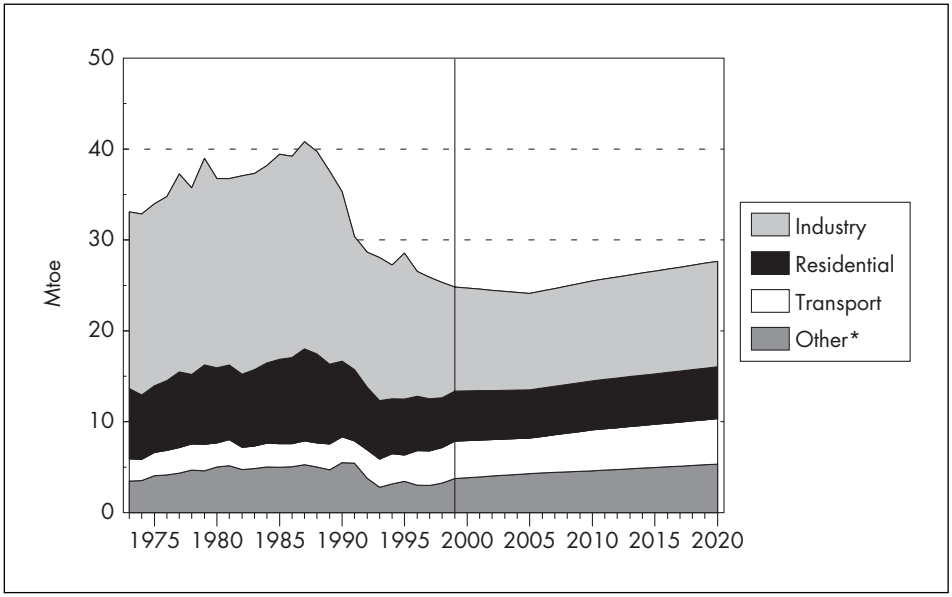
In 1999, industry accounted for 46.2% of final energy consumption compared with 52.8% in 1990 (Figure 5). This share is higher than the average for OECD Europe (30%). Since 1990, energy demand in the transport sector has increased by 44% and its share in energy consumption from 8.1% in 1990 to 16.5% in 1999. The share of the residential and commercial sector has decreased only slightly, to 34%, because of poor energy efficiency in the housing sector.

Figure 4
Total Final Consumption by Fuel, 1973 to 2020



Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2000, and country submission.

Figure 5
Total Final Consumption by Sector, 1973 to 2020



* includes commercial, public service and agricultural sectors.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2000, and country submission.

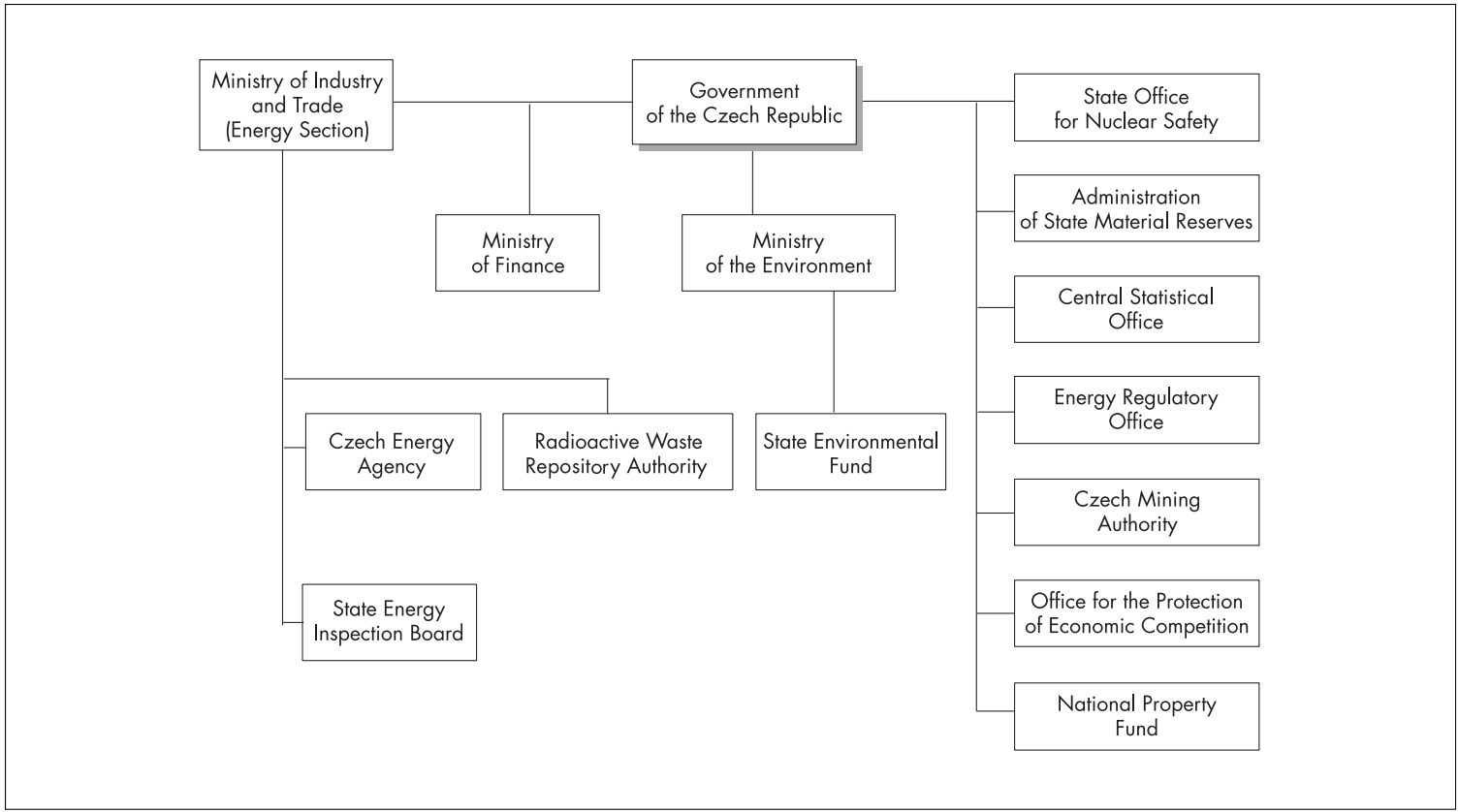
GOVERNMENT STRUCTURE FOR ENERGY POLICY

Figure 6 shows the main governmental bodies involved in energy policy-making. The Ministry of Industry and Trade (MIT) has the principal responsibility for overall energy policy. It is supported by the Czech Energy Agency (CEA) for energy efficiency and renewable energy, and the State Energy Inspection Board for the supervision of energy facilities in the public sector and state-owned companies. Since January 2001, the Energy Regulatory Office (ERO) has performed the main regulatory functions.

Through the National Property Fund (NPF), the Ministry of Finance (MOF) acts as government shareholder in state-owned energy companies, except Transgas which is owned by MIT. The MOF also manages state aid to the coal sector and the fund created for managing nuclear wastes. The Ministry of the Environment (MOE) portfolio includes regulation, air pollution and climate change policy. On behalf of the MOE, the State Environmental Fund (SEF) provides financial support for the installation of equipment to prevent air pollution, for the extension of the natural gas network and for the use of renewable energy.

The Administration of State Material Reserves (ASMR) has responsibility for oil stockholding and emergency preparedness. The Czech Statistical Office (CSO) produces most energy statistics, and the MIT has a large role in supply statistics.

Figure 6
Government Institutions Involved in Energy Policy-Making



Sources: Ministry of Industry and Trade; IEA.

ENERGY SECTOR STRUCTURE: RESTRUCTURING AND PRIVATISATION

The energy sector has been largely restructured and partially privatised. Major efforts have been made to adapt integrated state-owned monopolies to the new economic environment. However, the leading energy companies remain predominantly state-owned.

The former oil monopoly has been reorganised and divided into oil transport (Mero), oil products transport and storage (Cepro), refining (Ceska Rafinerska and Paramo) and distribution (Benzina a.s., Benzina s.p. and Paramo). The Unipetrol holding company manages the state-owned oil and petrochemical companies. In 1996, a consortium of foreign investors formed by Agip, Conoco and Shell acquired 49% of shares in Ceska Rafinerska (CRC), the dominant refiner. Domestic and other foreign companies have invested in the retail network, notably BP, Esso, TotalFinaElf, OMV of Austria, Slovnaft of Slovakia.

The state electric utility was unbundled in 1992 to create CEZ, a.s., which is responsible for generation, transmission and the operation of the system. In 1990, eight regional distribution companies were established, and they were partially opened to foreign investors in 1994. In addition, 32% of CEZ's capital was floated on the Prague stock exchange. Reorganisation of the natural gas sector took a similar path, with the creation of Transgas in 1994 as a state-controlled company in charge of purchasing, transmission, storage and sale to direct clients. Eight regional gas distributors were created in 1994 and were partially sold to foreign companies. The district heating companies have been restructured and privatised, as regional Independent Power Producers (IPPs).

The Czech government is committed to continuing the privatisation process and envisages the privatisation of CEZ, a.s. and Transgas s.p, together with most of the electricity and natural gas distribution companies[1]. Unipetrol will also be privatised, including its refinery sector, retail network and petrochemical activities.

ENERGY POLICY

The energy situation inherited from half a century of central planning was characterised by isolation from the international market, high energy intensity, heavy dependence on solid fuels and dependence on hydrocarbon imports from COMECON countries at politically-controlled prices. Energy was sold to individual consumers at artificially low prices. The energy sector's performance was evaluated solely according to output and not to efficiency.

1. The state-owned electricity and gas companies are expected to be privatised by 2002, together with 12 of the 16 electricity and natural gas distribution companies to create two large vertically-integrated groups.

The Czech Republic has gradually reformed its energy markets and opened them to international trade and competition without experiencing supply disruptions. The government's energy policy was embodied in the 1994 Energy Act, which was largely consistent with the "Shared Goals" of the IEA and basic policy objectives of the European Union. It aims at diversification of energy supply through the development of nuclear energy and new hydrocarbon imports. Uncompetitive units have been phased out, and distribution has been unbundled from generation. Achievements include reduction of environmental damage caused by the energy sector. This has been accomplished notably by significant voluntary measures.

In January 2000, a new "Energy Policy" paper was issued by the MIT and approved by the government. It contained new objectives up to 2020, including the acquisition of reliable, safe and environmentally-acceptable energy supplies to support economic competitiveness.

Using the Energy Policy paper as a basis, the government proposed a new Energy Act, which was adopted by the parliament in December 2000 and came into effect in January 2001. The Energy Act, designed in view of accession to the European Union, includes provisions to:

- Create a transparent business environment for the energy sector.
- Define the functions, rights and obligations of the independent regulator.
- Develop competition in the generation and retail-supply segments of the electricity and natural gas markets.

The New Regulatory Framework[2]

The Czech Republic's new Energy Act includes provisions to transpose the EU electricity and natural gas directives into Czech law. The government is committed to ensure fair access to market participants. Third party access to the electricity and gas system facilities will be established, and transmission will be unbundled from generation. As of 2002, major electricity consumers will be allowed to choose their suppliers, and in 2006 all consumers will become eligible. For natural gas, only major consumers will be able to choose their supplier, starting in 2005[3]. There is no plan to liberalise the gas market further.

Until 2001, responsibility for regulatory enforcement was shared between the Energy Regulatory Administration (ERA) of the Ministry of Industry and Trade, and the Ministry of Finance. As of January 2001, the new Energy Act established a

2. See also the OECD publications *Review of Regulatory Reform in the Czech Republic* (Paris, 2001) and the *Economic Survey: the Czech Republic* (Paris, 2001).
3. Details in Chapters 6 and 9.

separate body, the Energy Regulatory Office (ERO). The government aims to make ERO an independent body, which will enhance the transparency of energy markets and support competition. ERO is expected to pass complementary rules to the Energy Act before the opening of the electricity market in 2002.

The construction of new transmission facilities and generation units above 30 MW capacity has to be approved by the MIT. Units below 30 MW are approved by regional authorities.

The New Regulator: Energy Regulatory Office (ERO)

Statute

ERO is a separate state body reporting each year to the government and the parliament. Its operating costs are covered by the state budget approved every year by parliament.

Staff and Structure

The government appoints the chair for a five-year period. He or she can only be removed for serious cause. ERO includes the following sections: licensing, regulation and legislation. The staff is 60 and will expand to 80 after 2002.

Responsibilities

The general mission of ERO is to "support economic competition and protect the consumer's interest in energy sector areas". ERO regulates the grid-based energy industries. Its responsibilities include:

- Concession and revocation of licences to energy market participants for generation, transmission, distribution and trading.
- Establishment of tariffs (wholesale, consumer and ancillary services) for electricity, natural gas and heat for protected customers, such as households and services.
- Regulation of connection conditions, trading rules and the quality of supplies;
- Protection of captive customers.
- Application of sanctions and penalties for violations of regulations.
- Settlement of disputes, including those over third party access.

Decisions taken by ERO are published in the ERO bulletin. Appeals can only be made to the chair or to an administrative court, and they can be based on administrative issues only.

Inspections are carried out by the State Energy Inspection Board. The board has the power to fine licensees for licence violations, at the recommendation of ERO.

Regulation Competition

The Office for the Protection of Economic Competition is responsible for enforcing the Competition Act, including in the energy sector. It investigates the activities of operators in issues arising from dominant positions or cartels. It also vets companies before merger operations. Recent actions in the energy sector included fining CEZ, a.s. for breaking a contract with a coal supplier, and issuing recommendations on restructuring the oil sector.

ENERGY PRICES, TAXES AND SUBSIDIES

In the Czech Republic, the prices of liquid fuels are no longer set by the government but decided by the markets. Solid fuel prices are, in principle, market prices as agreed upon in contracts between producers and consumers. But there are still quotas on coal imports. The price of heat supplied by private district heating companies is no longer subsidised, but the price for households remains subject to the approval of ERO. The system of fixed prices for heat for industry was abolished in 1994 but pricing rules remain.

Carrier tariffs for electricity and natural gas are still set by decree. Until recently, these were issued by the MOF and since January 2001 by ERO. Even after several successive price increases for households[4], cross-subsidies and tariff distortions still exist for electricity and natural gas, since industries pay more than the economic costs. It is estimated that in 1998 household electricity prices were 60% of commercial prices[5] and approximately 40% of the rate in OECD Europe. Direct subsidies, indirect support and cross-subsidies amounted to an estimated CZK 206.7 billion[6] during the period 1994-1998. Since then, subsidies, and particularly cross-subsidies, have fallen considerably owing to the application of full VAT, price adjustment efforts and the phasing-out of direct subsidies on heat. These customer cross-subsidies have also had an impact on electricity and gas distributors, who do not have the same customer structure, but are nevertheless obliged to apply the same national tariff. Some subsidies, such as those for investments to mitigate pollution in power generation, have contributed to maintaining the existing fuel mix based on coal. Table 1 indicates the subsidies by category and fuel.

The government has decided to adjust household electricity and natural gas tariffs progressively until the end of 2002. Eliminating cross-subsidies is a prerequisite for opening markets and for the privatisation of energy companies.

4. From January 1995 to May 2000, fuel and electricity prices increased by 106.7% (the highest of all categories) while the price index of all goods and services increased by 37.5%. In 2001, household prices for electricity were higher than industrial prices (see Figure 17).
5. Source: World Bank.
6. SEVEn (Energy Efficiency Centre) carried out a comprehensive review of energy subsidies for the period 1994-1998. (On average in 2000, CZK 1 = US$ 0.026 or € 0.0281).

Table 1
Subsidies in the Energy Sector, 1994 to 1998
(billion CZK)

	Fossil fuels	*Nuclear power*	*Renewable energy*	*Energy efficiency*	*Total*
Direct subsidies	55.5	10.1	1.7	2.2	**69.5**
Indirect subsidies	24.9	4.6	0.7	–	**30.2**
Cross-subsidies	84.3	19.7	3.0	–	**107.0**
Total	**164.7**	**34.4**	**5.4**	**2.2**	**206.7**

Notes:
Direct subsidies include state financial contributions for investment in the desulphurisation of power plants and restoration of closed mines.
Indirect subsidies: a reduced VAT rate of 5% on consumer prices of electricity and gas until 1998.
Cross-subsidies are distortions in electricity and natural gas prices between industries and households.
Source: SEVEn (Energy Efficiency Centre).

Table 2
Comparison of Energy Prices in the Czech Republic, Hungary, Germany and France

	Czech Republic 2000		*Hungary 1999*		*Germany 1999*		*France 1999*	
	Price	*of which tax (%)*	*Price*	*of which tax (%)*	*Price*	*of which tax (%)*	*Price*	*of which tax (%)*
Electricity, industry $/kWh	0.04	–	0.05	–	0.06	–	0.047*	–
Electricity, household $/kWh	0.05	20.0	0.07	14.3	0.15	13.3	0.129*	23.4
Gas, industry $/107 kcal	147.62	–	134.89	–	178.17*	13.4	135.33	–
Gas, household $/107 kcal	214.10	18.0	149.87*	10.7	404.48*	19.3	384.28	17.1
Steam coal, industry $/tonne	14.44	–	44.8	0	..	..	99.9	–
Unleaded gasoline (95 RON) $/litre	0.74	55.4	0.78	66.7	0.93	74.2	1.01	79.2
Automotive diesel $/litre	0.64	51.6	0.7	65.7	0.68	67.6	0.73	72.6
Light fuel oil, industry $/1,000 litres	298.81	–	561.09	56.4	236.73	25.3	244.43	34.9

* 1998.
Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2000.

The transition period has been accompanied by several price increases, which have brought social and economic changes and resulted in an increase in non-payment. But this has improved in the last few years and is now limited to a number of large heavy industry companies in economic difficulty, especially steel.

Energy Taxation

All energy for end use is subject to VAT at 22% except for heat supply and biomass fuel, for which the reduced rate of 5% will apply until July 2007. For electricity and natural gas, the reduced VAT rate was applied from 1993 to 1997 but the full rate of 22% went into force in January 1998.

An excise tax on liquid fuels was introduced in 1992, and its rates are determined each year by parliament. This tax has been progressively increased and is now similar to other OECD European countries. It represents around 40% of the total price of motor gasoline. In total, CZK 45 billion in excise taxes was collected in 1999, accounting for 12% of total state revenues (2.4% of GDP). Motor fuel represented 60% of the total excise collected on automotive fuels, and diesel oil 40%. The newly created State Fund for Transport should receive some of the excise tax revenues to pay for public transport infrastructure.

EU membership will oblige the Czech Republic to impose the full VAT rate on heat for households and to levy higher taxes on the most polluting fuels, such as high-sulphur fuel oil and brown coal.

Unlike other IEA countries, the Czech Republic imposes the same excise rate on leaded and unleaded gasoline as well as on light oil and diesel. The reason is to prevent tax fraud[7]. Harmonisation with EU legislation will require different rates for these products. Until April 2000, biofuels were exempt from excise tax. Since then, excise tax has been fully applicable. Direct support to crop producers replaced the tax exemption for biofuels, which are more expensive than petroleum products.

There are two mining taxes for coal. The first is the annual fee for mining space at CZK 10,000 per km^2. This is paid to the municipality where the coal mine is located. The other coal tax is imposed on "extracted reserve material". It is a royalty based on the volumes extracted. Its revenues are shared between the municipalities and the State and are used for the restoration of sites. The revenues for municipalities and the State were CZK 17 million and 385 million respectively in 1997. There is also a tax applying on uranium extraction.

The Atomic Act of 1997 introduced a levy on nuclear electricity to cover expenses for nuclear waste management and decommissioning of nuclear facilities. The rate is CZK 50 per MWh of nuclear electricity delivered to the grid, for a total amount of CZK 637 million in 1999.

The Clean Air Act includes emission standards for facilities with a unit capacity above 0.2 MW and emission taxes[8] as follows (Table 3):

7. Excise tax and VAT are refunded when light oil is used for space heating.
8. In 1999, the total amount collected by the State Environmental Fund (SEF) was CZK 1.1 billion.

Table 3
Emission Taxes

Pollutants	*Emission taxes (CZK/tonne)*
SO_2	1,000
NO_x	800
Particulates	3,000
CO	600
Hydrocarbons	2,000

Source: Ministry of the Environment.

The MOE envisages the introduction of a carbon/energy tax and a levy on electricity sales at a rate of 0.6% of the final energy prices, to be used to support investment in renewable energy.

CRITIQUE

In less than a decade, the Czech Republic has made considerable progress in the energy field, by establishing new institutions and a market-oriented regulatory framework and by diversifying its supply sources. Achievements in the reform and liberalisation of the energy markets also include the restructuring and partial privatisation of the energy sector, making foreign investment possible and reducing environmental damage from the energy sector.

The general objectives of Czech energy policy are largely consistent with the IEA's Shared Goals. It is encouraging that the New Energy Act is expected to align policy measures more closely with those of other IEA countries.

The Czech government and the energy sector can be commended for their past achievements and continuous efforts to improve the security of the country's hydrocarbon supply. These efforts should be continued, as the demand for hydrocarbons is expected to grow, especially for oil products for transport, and as risks for supply may increase.

Serious efforts have been made to switch fuels, with the gradual replacement of coal by natural gas. The switch is well advanced, especially in households, industry and district heating. But the share of solid fuels in power generation remains stable at 70%. The problem of air pollution has been effectively addressed, through environmental investment, building of new facilities and phasing-out of obsolete ones. The commissioning of the Temelín nuclear plant will contribute to a substantial overcapacity of supply, and will lead to a 25% reduction in output of brown coal power plants and further reduce air emissions from the power sector.

There has been progress in regulatory reform, too. Like many other OECD countries, the Czech Republic has gradually privatised its energy sector. It has

passed legislation to phase in full liberalisation of the electricity market and partial liberalisation of the gas market.

Much, however, remains to be done before competition is effective. As it approaches accession to the EU, the Czech Republic will have to take into account the accelerating liberalisation of electricity and natural gas markets in Europe generally. This acceleration could include requirements for more effective unbundling and a stronger regulator to ensure full competition for businesses and residential customers.

A conflict may well arise between two government objectives: the wish to sell state-owned companies at high prices and the wish to foster competition in the liberalised economy. The government believes that state-owned companies should be sold to a single private company in order to be large and influential enough to prosper in the European market. But these one-package sales will lead to a re-integration of activities in contrast to the trend in other IEA/OECD countries. This could revive the concern that a single energy market player might control the whole supply chain. The government appears to acknowledge this risk in the electricity sector. It has announced plans to separate the ownership of CEPS, the Czech Electricity Transmission System, within one year after the privatisation of the electricity utility CEZ, a.s. But natural gas transmission and storage entities will remain controlled by Transgas.

The establishment of an independent regulator (ERO) is welcome. But, given the concentrated nature of the Czech electricity and gas sectors, there is a worry that the regulating body may not be powerful enough to stand up to the dominant integrated players. ERO's powers of monitoring and enforcing competition in these sectors appear to be ill-defined. Its specific responsibilities for competition oversight are limited to approving rules for energy transmission and distribution and resolving disputes among licence holders. Details are not given about how the electricity and gas markets are to be monitored and what is to be done if abuse of market dominance occurs. Nor is ERO's relationship with the Office for the Protection of Economic Competition described in the legislation. The two bodies have prepared a memorandum of co-operation to this effect.

Investors in the Czech electricity, gas and district heating sectors will be concerned about ERO's independence from government and industry. The fact that ERO's personnel, including the chair, were transferred from government service may affect its image of independence. Moreover, full responsibility for decision and appeal is vested in a single individual, the chair. To improve ERO's image, the decision process could be shared within a college of commissioners, as is already the case in numerous regulatory bodies in OECD countries.

The recruitment of highly-qualified and independent individuals with expertise in energy and competition issues will be needed to ensure that ERO's mandate is carried out effectively. However, the current civil servant status of the staff[9] and

9. The plan to provide ERO's staff with civil service status but at relatively low salaries compared to the private sector would not enhance the regulator's independence. It would reduce its ability to recruit highly-qualified experts.

tight budget constraints are likely to make such recruitment difficult. Covering regulatory costs through licensing fees, as opposed to direct funding from government, would be one way to ensure that the regulator is adequately funded.

Without additional measures, ERO's ability to ensure non-discriminatory third party access to energy networks and to oversee the introduction of competition in electricity and gas will remain in doubt. A clearer definition of its responsibilities, an effective chair supported by independent commissioners, and an adequately financed regulatory body would increase ERO's effectiveness.

The government has made clear progress in improving corporate governance through the creation of joint stock companies (JSC) with more independent managements. Further improvements are expected with the scheduled transformation of Transgas into a JSC and the transfer of its property from the MIT to the National Property Fund (NPF).

Czech energy consumption declined sharply in the past decade owing to the stagnant economy in transition. That decline, coupled with the Clean Air Act, greatly helped to reduce the environmental problems. But the CO_2 emissions ratio per unit of GDP remains much higher in the Czech Republic than the average for OECD Europe, and emissions from transport are growing rapidly. The authorities have made efforts to mitigate the damage of past and current extraction of coal and uranium. Safety regulations for energy transformation and consumption have been progressively improved and are approaching Western European standards.

The Czech government has been working to rectify energy prices, which have not reflected costs. Oil product prices are no longer subject to administrative control and are now determined by the market. The fixed price of heat for industrial consumers has been abolished, but the price for households remains administratively controlled, reducing incentives for operators to undertake energy efficiency actions.

Adjustment of natural gas and electricity tariffs began in 1996 and should have been completed by 1998/2000. This has not happened however and is delaying the implementation of other reforms, such as privatisation and market liberalisation. ERO has the responsibility to establish an independent and non-discriminatory pricing system for grid-based energy, to finalise the price adjustments according to cost variations and to phase out cross-subsidies by the end of 2002. Although energy efficiency does not appear to have received priority in the country's energy policy, since energy intensity remains among the highest in IEA European countries, the price adjustments resulting from the elimination of cross-subsidies are expected to improve efficiency. With price adjustments, the problem of non-payment may increase, however.

The sequencing of the various actions to achieve coherent and effective reform is crucial. A stable, transparent and effective regulatory framework (including non-distorted prices) monitored by an independent regulator should be established before the opening of energy markets to competition and privatisation. ERO has a one-year period to establish its authority before the gradual opening to competition and privatisation.

Accurate statistics on energy prices and the markets are essential for energy policy-makers as well as for the regulator, market operators and customers. Despite notable co-ordination efforts, overlap in data collection still exists between the Czech Statistical Office (CSO) and the MIT. The government should continue harmonising standards with other IEA countries and enhance co-operation between the CSO and the MIT.

RECOMMENDATIONS

The government should:

- ☐ Maintain its efforts to increase energy security through the diversification of its oil and natural gas supply.
- ☐ Clearly separate regulatory functions from operational activities in the energy sector and ensure that relations between the government and the state-owned energy companies are strictly commercial.
- ☐ Establish a transparent, effective, non-discriminatory and competitive regulatory framework.
- ☐ Clarify the Energy Regulatory Office's responsibility for energy market monitoring and competition enforcement, particularly the relationship between ERO and the competition authority.
- ☐ Consider increasing ERO's effectiveness by adding a number of independent commissioners to assist the chair.
- ☐ Consider alternative funding for ERO.
- ☐ Continue efforts to suppress price distortions and establish non-discriminatory pricing by the end of 2002.
- ☐ Closely monitor the non-payment problem.
- ☐ Make energy efficiency in the various consuming sectors a policy priority.
- ☐ Continue to give high priority to safety and to reducing the environmental impact of energy transformation and consumption.
- ☐ Continue joint efforts by the Ministry of Industry and Trade and the Czech Statistical Office to ensure that relevant and reliable statistical indicators are available for all energy players.

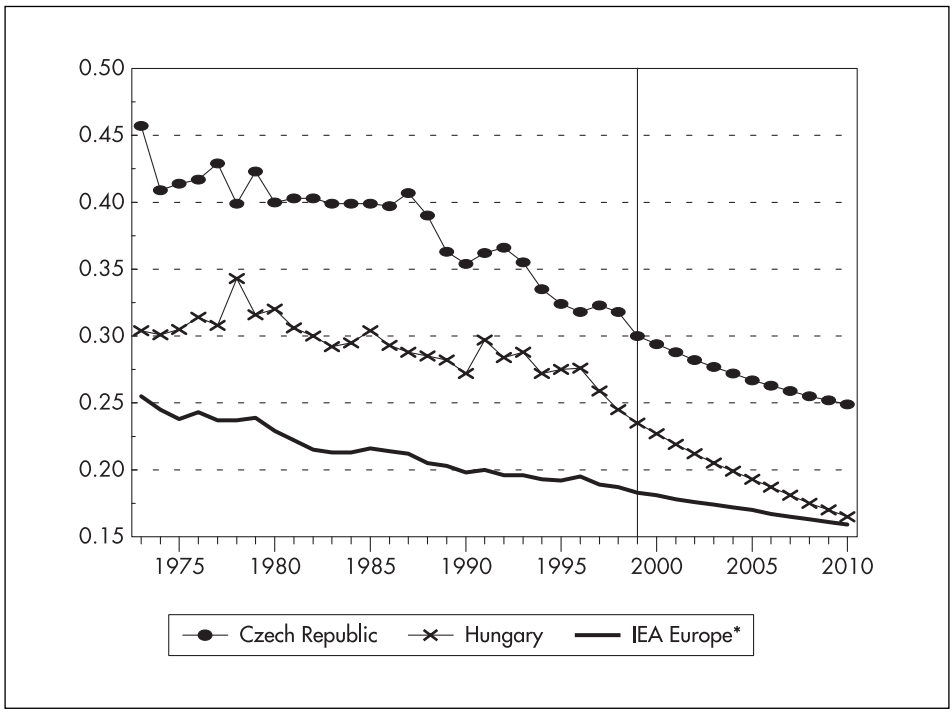
4

ENERGY EFFICIENCY

BACKGROUND

Figure 7 shows energy intensity in the Czech Republic compared to IEA Europe and Hungary. The Czech Republic's energy intensity in 1999, calculated as total primary energy supply (TPES) per unit of gross domestic product (GDP) converted on the basis of purchasing power parities (PPP), is about 1.6 times higher than the corresponding figure for IEA Europe. Hungary's energy demand per unit of GDP is slightly lower.

Figure 7
Energy Intensity in the Czech Republic and in Other Selected IEA Countries, 1973 to 2010
(Toe per thousand US$ at 1995 prices and purchasing power parities)



* excluding Norway from 2000 onwards.
Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2000; and *National Accounts of OECD Countries*, OECD Paris, 2000; and country submissions.

The main reasons for Czech Republic's high energy demand compared with the industrialised countries of IEA Europe are: a much lower GDP; higher reliance on solid fuels and a high share of energy-intensive production processes (metallurgy,

production of building materials, etc.); lower building and appliance standards; and low energy prices along with a lack of energy saving incentives.

Energy intensity decreased at an annual average rate of 1.5% between 1973 and 1990, and the decrease accelerated to 2.4% per year between 1990 and 1999. Energy intensity decreased both in the residential/commercial sector and in industry between 1973 and 1999 (Figure 8). However, from 1990 to 1999, energy intensity in the transport sector increased progressively, mainly because of the development of road transport.

GENERAL POLICY AND STRATEGY

As in all centrally-planned economies, energy efficiency played a small part in the overall energy policy of the Czech Republic. Now, the country must design and implement a comprehensive energy efficiency policy for every end-use energy sector.

The *Energy Efficiency Action Plan*[10] estimates the different potentials for end-use energy conservation in the period 1999-2010. The energy saving market potential is significant and has been estimated at 18% of total final consumption (TFC) with an investment payback time of six years, or 13% with a restricted payback period of three years.

Background Documents on Energy Efficiency

The government has a number of legal and information tools in the field of energy efficiency policy[11]. The main documents are:

- The *National Energy Policy* approved by the government in January 2000 gives targets for energy management according to needs, including environmental protection. Long-term targets include a gradual reduction of energy use to the level of advanced industrial countries. The government intends to give priority to realistic and economic utilisation of the best technologies available, to energy savings and to strict compliance with environmental laws.

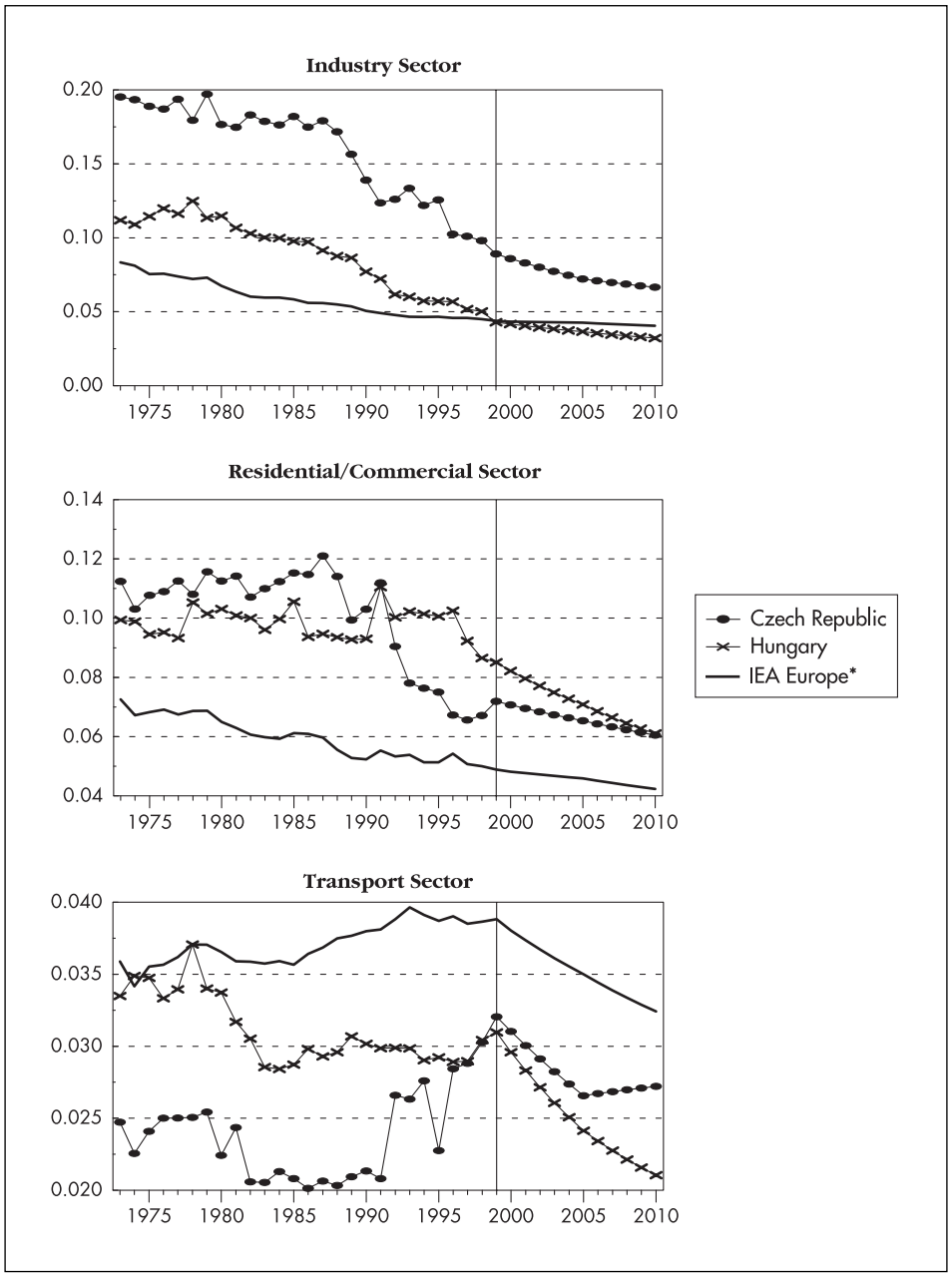
- The *Energy Management Act* adopted by parliament on 25 October 2000 and implemented on 1 January 2001. This framework law includes Chapter III entitled "National Programme for Economical Energy Management and Use of

10. The Policy Action Plan for Promotion of End-Use Energy Efficiency in the Czech Republic to 2010 was elaborated in 1999 on the basis of a World Bank initiative co-financed by the Czech Republic. The final report was submitted to the World Bank, the Ministry of Industry and Trade, and the Ministry of the Environment in August 1999; various Czech and Dutch institutes were involved.
11. Further information can be found on the IEA web site at http://www.iea.org/pubs/newslett/eneeff/table.htm

Figure 8

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

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



* excluding Norway from 1999 onwards.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2000; *National Accounts of OECD Countries*, OECD Paris, 2000; and country submissions.

Renewable and Secondary Energy Resources", which, *inter alia*, deals with the various types of subsidies from the state budget for relevant programmes. Chapter IV entitled "Measures to Enhance Economical Use of Energy "deals specifically with the ways to promote energy efficiency such as minimum energy efficiency requirements, energy efficiency labelling, energy audits, and co-generation of heat and power (CHP).

- The *State Programme to Support Energy Savings and Use of Renewable Sources of Energy* is a one-year programme set up by the MIT which has been undertaken every year since 1991. It includes energy-saving measures in production, distribution and consumption of energy; wider use of renewable and secondary sources of energy, and development of co-generation of heat and electricity; counselling; implementation of new low-energy technologies; public education and promotional activities leading to more economic use of energy. To execute the state programme, the MIT established the Czech Energy Agency (see below).

- The Ministry of the Environment (MOE) has its own programme and provides financing through the State Environmental Fund (established in 1991) mostly for the utilisation of renewable and secondary energy sources. The MOE's programme includes energy efficiency measures aimed at reducing emissions and pollutants, the conversion of fossil fuels, mitigation of greenhouse gases, etc.

The State Programme to Support Energy Savings for the year 2000 consists of four parts: Part A is the MIT programme to be developed by the CEA. Its main objectives are to implement energy-saving measures in the fields of production, distribution and consumption of energy, to support greater use of renewable energy sources aimed at reducing energy demand and minimising the negative impacts of polluting emissions. Part B represents the MOE programme; Part C is the responsibility of the Ministry of Agriculture and Part D comes under the Ministry of Regional Development.

Part A, destined for the public at large, emphasises guidance, education, training and promotion of energy savings and the use of renewable energy sources, and individual energy audits (see below).

The *Energy Efficiency Action Plan* provides policy-makers with essential information on potential, proposed targets and estimated budgets, and recommended policy instruments. It features a list of concrete policy actions to develop energy efficiency policies and measures. The Czech government has endorsed this document and recommended adopting its policies and measures when suitable.

Bodies in Charge of Promoting Energy Efficiency

The Czech Energy Agency (CEA) founded by the Ministry of Industry and Trade in 1995 is a publicly-funded government organisation which replaced the former

Federal Energy Agency. The CEA's main mission is to encourage and carry out activities aimed at energy savings in all end-use sectors and to mitigate negative environmental impacts caused by the consumption and conversion of energy. The CEA is in charge of implementing the State Programme to Support Energy Savings.

A total budget of CZK 1,523 million was allocated to MIT energy programmes from 1991 to 1995. From 1996 to 1999, when the CEA became operational, the budget amounted to CZK 1,226 million. In 2000, the budget was CZK 224.5 million and the staff at the CEA's headquarters numbered 19.

SEVEn

SEVEn, the Energy Efficiency Centre, is an independent organisation unaffiliated with any domestic or foreign company. SEVEn covers the costs of its activities through contract work, proceeds from consulting and a limited number of grants. SEVEn focuses on overcoming barriers to the use of cost-effective and practical energy-saving measures in the residential, industrial and commercial sectors.

The State Environmental Fund (SEF) was established in 1991 to finance the preservation and improvement of the environment (see Chapter 5). In implementing its programme for air protection in 1999, SEF also achieved energy savings. The SEF programmes for air protection after 2000 contain incentives for energy saving.

SECTORS

Residential/Commercial Sector

There are about 3.7 million dwellings in the country: 40% are houses and 60% are flats. In the residential/commercial sector, natural gas accounts for 41% of total consumption (7.85 Mtoe in 1998, including the public sector), followed by electricity with 27%, heat 18% and coal 9%. Space heating accounts for about 71% of final energy consumption, domestic hot water about 17% and cooking 6%. According to the Energy Efficiency Action Plan, a large gap exists between the huge technical savings potential (65%) and the market potential at current energy price levels in households (15%). This gap is due mainly to the low cost-effectiveness of thermal insulation measures and of more efficient appliances. There is currently not much incentive for improvement because of the low energy prices charged to households. The removal of price distortions for electricity and gas by the end of 2002 would stimulate investments by households and changes in behavioural patterns with a potential energy saving of as much as 24%.

Energy Labelling and Energy Efficiency Standards

The Environment-Friendly Product Labelling Programme, launched by the MOE in 1994, covers about 200 products, identifying those which emit only limited greenhouse gases. At present, no energy efficiency standards or labelling exist for

electric appliances and boilers. The Energy Management Act implemented on 1 January 2001 will introduce energy labels for those appliances for which the European Union has introduced labels: refrigerators, washing machines, tumble dryers, combined washer-dryers, dishwashers and lamps.

Energy efficiency standards for the following are being prepared in the Czech Republic in harmonisation with EU directives already implemented or under discussion: hot-water boilers, refrigerators, freezers, fluorescent lighting ballasts, washing machines and dryers.

Labelling and standards for household appliances in the Czech Republic are being developed by SEVEn under the European Union SAVE II project. Corresponding laws, regulations and implementing documentation, based on existing legislation in co-operating EU countries (Austria, France, Greece), will be drawn up for the Czech Republic. An action plan for enforcing this legislation will be prepared, and measures and procedures for consumers and appliance suppliers proposed.

Building Codes

Stricter insulation standards for new and renovated buildings have been in effect since 1994. They are not mandatory, except when state funds are involved. The monitoring and enforcement of building codes are insufficient.

A programme for the retrofitting of existing buildings only applies to a small number of buildings and does not include houses owned by individuals.

Using the CEA's experience, a programme for energy savings in individual homes (modernisation of apartment buildings) is being designed by the Ministry of Regional Development. It includes both building insulation and heating systems and is based mainly on a soft loan scheme.

Financial Incentives

The CEA is preparing for the MIT a proposed allocation of state subsidies to support several energy efficiency measures for apartment buildings and houses.

Under Part A of the State Programme for 1999, a total of CZK 81.54 million was allocated through the CEA to 87 energy efficiency projects in residential buildings, resulting in energy savings of about 107,000 GJ/year (CZK 762/GJ). In 2000, 76 projects were approved, with subsidies amounting to CZK 61.6 million and energy savings of 84,000 GJ/year.

The PHARE Energy Saving Fund (see below) allocates loans for energy-saving projects in buildings, including the introduction of regulation of heating systems, double-glazed windows, reduction of heating losses through walls and roofs, improvements in lighting, etc.

Energy Audits

The CEA believes energy audits are a basic tool to promote energy efficiency in all end-use sectors and has developed audit methodology for residential as well as for public and industrial buildings. There are currently about 300 energy auditors.

Since 1997, the CEA has required energy audits before subsidies are given for energy efficiency measures. A total of 132 audits were performed in 2000. Subsidies for these amounted to CZK 4.56 million.

Measurement of Energy Consumption

Since 2001, the measurement of heat consumption in houses using heat from a central source has been mandatory.

According to the Energy Management Act, house owners/occupiers must not exceed the standards for energy consumption for heating. If residents overheat, they risk financial sanctions by the State Energy Inspection Board.

Education and Public Awareness

One of the core activities of the CEA is to organise seminars and training sessions and to publish materials for energy consumers. Private energy consumers are targeted through a network of 60 Energy Advice and Information Centres (EKIS) established by the CEA. The network operates nationwide, offering free brochures, guidebooks, software and practical advice.

Most of the EKIS centres are operated by private energy consultants selected by the CEA. SEVEn also provides free basic consulting on energy savings in households and issues a quarterly information letter *News at SEVEn*. No countrywide information campaign on energy conservation has been carried out since 1990.

The IFC/GEF Efficient Lighting Initiative

The IFC/GEF Efficient Lighting Initiative (ELI) is a $15-million programme funded by the Global Environment Facility (GEF) and designed by the International Finance Corporation (IFC) and by local counterparts in each participating country. ELI's goal is to reduce greenhouse gas emissions by accelerating the penetration of energy-efficient lighting technologies in emerging markets. ELI will lower market barriers to efficient lighting technologies in the Czech Republic and six other countries, either developing or in transition. The ELI budget for the Czech Republic is $1.25 million. Implementation of ELI began in spring 2000, with SEVEn as the Czech project manager. ELI will focus on the public sector, with special emphasis on streetlighting, and will run for approximately two years.

Industry

The manufacturing industry – the largest energy-consuming sector in the country – includes about 7,000 companies, two-thirds of which have fewer than 100 employees. Large industrial companies with more than 2,000 employees account for more than half of total industrial energy consumption. The fuel mix is dominated by coal and natural gas, each with a 25% share. According to the Energy Efficiency Action Plan, the economic and market saving potentials in industry are substantial: 27% and 11% respectively. Efficiency improvements in heating systems, electricity consumption and measures to save process heat are already cost-effective.

Energy Auditing

Energy audits are mandatory for industrial companies consuming more than 35,000 GJ/year (or 835 toe).

State Subsidy Programme

The State Subsidy Programme has been developed by the CEA since 1996 to support measures to cut energy intensity, increase the efficiency of processes, and introduce modern energy-saving technologies and materials. Introduction of new technology is approved only after it has been implemented successfully in a pilot project and after a series of verifications.

A total of ten energy-saving measures in the manufacturing industry were selected in 1997, representing a total investment of CZK 74.8 million and a state subsidy of CZK 13.5 million. Annual savings are 181.8TJ representing 0.05% of total manufacturing industry consumption. In 1999, 24 projects received CZK 31.5 million in grants and a total investment of CZK 420.6 million, providing energy savings of 417.1 TJ/year. For the period 1997-1999, the average unit investment cost increased from CZK 412/GJ in 1997 to CZK 1,010/GJ in 1999.

The PHARE Energy Saving Fund

Financing for energy-saving projects is difficult to obtain, the reason for this being lack of commercial financial resources and lack of interest of private investors. The European Commission has allocated ECU 4.5 million to the Czech Republic to establish an Energy Saving Fund (ESF) that will provide preferential loans for energy efficiency investments meeting specific criteria. The MIT has contracted a bank, the Ceskoslovenska Obchodni Banka a.s (CSOB), to operate and manage this fund. The CSOB has the funds at its disposal for ten years to extend loans at preferential rates for small and medium-sized energy-saving investments, in accordance with agreed criteria, using its own resources on a 50/50 co-financing basis with PHARE funds.

To be eligible for funding, projects must generate savings by reducing energy consumption by at least 40%. The minimum project size is CZK 2 million; the

maximum is CZK 50 million. The duration of loans and repayment terms are four years or longer, with a maximum of ten years. Applicant companies are required to pay at least 40% of the total project cost. The PHARE Energy Saving Fund awarded 13 loans for energy efficiency projects in industry in 1998, amounting to CZK 200 million (two-thirds of the available funds).

Public Sector

Energy Audits in the Public Sector

The new Energy Management Act includes mandatory audits for public and private facilities (with consumption above 1,500 GJ and 35,000 GJ respectively) and the obligation to implement low-cost audit recommendations. However, the audits as well as the implementation of the recommended measures face the problem of limited financial resources.

Energy Performance Contracting and ESCos

The basis for implementing Energy Performance Contracting (EPC) in the public sector is Act No.199/1994. Energy Services Companies (ESCos) have been created for upgrading heating and hot water systems in hospitals, schools and elsewhere (see Chapter 8 on district heating).

Model Energy Concepts

SEVEn, which is involved in the preparation of feasibility studies and business plans on supplying and using energy for towns and municipalities, offers guidance to the CEA on model energy concepts. These planning documents, covering a 20-year period, include practical approaches for economical use of energy and renewable energy sources and environmental impact evaluations. The Energy Management Act makes model energy concepts mandatory for regions, the city of Prague and main towns. A commune is allowed to develop its own model energy concept and make it mandatory.

According to the State Programme in the year 2000, grants for designing model energy concepts for towns and municipalities may amount to 50% of overall investment expenses with a maximum subsidy of about CZK 500,000 per project. In the year 2000, 24 projects were selected for a total subsidy of CZK 4 .9 million.

Transport

The structure of the transport sector has changed considerably since 1990. A shift from rail to road transport for long distances has occurred. While the volume of freight rail transport fell by 25%, road transport increased by nearly 50% in the period 1993-1998, with an increase in both private and corporate car ownership. As a result, total final energy consumption of transport increased from 2.86 Mtoe in 1990 to 4.12 Mtoe in 1999 (16.5% of the 1999 total) and is expected to reach 5.0 Mtoe in 2020.

Under the programme to stabilise and reduce emissions of pollutants, the following measures have been implemented and/or supported by the government:

- Funding for public transport companies and to Ceske Drahy (Czech Railways) provided by government decision in 1998 to enterprises which carry out municipal services.

- Continued development of integrated public transport systems in cities through state, municipal and district subsidies and tax breaks.

- Implementation of the Highway Development Programme, including the development of ring roads and bypasses around cities as well as access roads to highways.

- Support for the development of combined transport through measures such as favourable taxation, adequate infrastructure, special railways, etc.

- Speed limits of 90 and 130 km/h for cars and 80 km/h for lorries.

- Taxation restricted on lorries.

- Progressive charges on engine capacity.

MONITORING AND EVALUATION

The energy efficiency programme of the Czech Energy Agency is independently evaluated each year by SEVEn. This led to improvements in project results and administration of the state support programme.

The Energy Management Act stipulates that the MIT, in accordance with the MOE, must prepare and regularly assess the four-year state programmes for energy efficiency and renewable energy sources at least once every two years. If necessary, the MIT proposes changes in the state programme and submits them to the government.

CRITIQUE

Despite a significant drop during the 1990-1999 period, energy intensity in the Czech Republic is still twice the average level of IEA Europe. The Energy Efficiency Action Plan states that the government should give high priority to energy efficiency. Improving energy efficiency can raise the country's industrial competitiveness and improve living standards by cutting energy bills. It would also contribute to environmental protection and fulfilment of the country's Kyoto Protocol commitment.

The Czech Republic is aware of the need to implement an overall energy efficiency strategy, and the elimination of energy price distortions initiated recently is essential. However, introducing energy efficiency is a major task since it was not a priority in the centrally-planned economy and involves a completely new approach to the energy demand side. The country has a unique opportunity to design an entirely new energy efficiency policy supported by the best, economically viable energy-efficient technology available.

A basic requirement for the government now and in the future is to show that energy efficiency is a priority. The public and the private sectors should co-operate closely in designing and implementing effective energy efficiency programmes.

The government has various legal and information instruments at its disposal to promote energy efficiency. Implementation of the measures proposed or included in these acts and documents is important.

However, these documents do not define long-term objectives or a clear government strategy for energy efficiency, with specific details regarding sectors and measures. Although they identify the different types of measures envisaged, they do not set clear priorities for action concerning end-use sectors. Since energy consumption is expected to increase strongly in the transport sector, it should be a high priority, which is not the case now.

The Czech Energy Agency (CEA) has already implemented a range of commendable actions in energy audits in households and in the public sector, the allocation of subsidies for the residential and industrial sectors, the adoption of model energy concepts, and also in the field of information, education and motivation. The government should rapidly strengthen the current building code in line with European Union standards, implement the new standards progressively and monitor their enforcement.

Although the CEA plays a key role in implementation of the country's energy efficiency policy, the agency lacks resources. The sharp fall in its budget from 1997 to 1999 and a further cut in 2000 prevented the CEA from achieving its wide range of tasks.

The annual State Programmes announced by the MIT, but implemented and financed by the CEA, receive relatively low government funding. The average yearly contribution to these programmes should be around CZK 2 billion or about six times higher than the current allocation.

Furthermore, with its limited resources, the CEA appears to focus too much on administrative programmes in the public sector and audits rather than on developing sectoral and horizontal programmes for the small industry, services and household sectors. Also, the energy-saving projects funded by the CEA have only marginal impacts (e.g. 0.05% of industry's annual consumption in 1997-1999) and limited effects among end-users. Their unit costs are also relatively high (e.g. CZK 815/GJ in industry) compared to energy costs.

Among the different market barriers to improvements in energy efficiency, lack of information and awareness affects every end-use sector. Lack of capital and difficult access to appropriate capital sources have been identified by the Energy Efficiency Action Plan as major obstacles to the implementation of energy efficiency projects. The main causes are scarce in-house capital, the lack of experience of Czech investors in energy efficiency investments, the perceived high risk of such investments and the resulting higher price of capital. The government should provide support in the form of fiscal and financial incentives for energy efficiency projects, e.g. partial funding of feasibility studies.

Third-party financing could ease financial constraints. Energy Performance Contracting (EPC), based on a shared-cost approach and the involvement of ESCos, achieved positive results in a number of public sector buildings. It should be developed and extended to the industrial, district heating (see Chapter 8) and commercial sectors, because limited access to finance and lack of information and in-house expertise hamper the development of energy efficiency projects.

The State Environmental Fund (SEF) supports investments for improving the environment, with some positive results for energy efficiency. To avoid overlapping of responsibilities, closer co-operation should exist between SEF and the CEA, and a gradual integration of energy and energy-related issues in a single organisation should be envisaged.

As many of the energy efficiency measures and programmes have only recently been implemented, some of them may not be well designed or sufficiently adapted to specific situations. The programme of the Czech Energy Agency is evaluated each year. This is commendable as it should allow the CEA to monitor cost-effectiveness of the programmes as well as their impact, multiplier effect and sustainability. In addition, the Energy Management Act recently stressed the importance of monitoring and evaluation so that the government can adapt the energy efficiency programme. This will allow the government to adopt additional measures where increased efforts should be made, notably energy labelling and efficiency standards, programmes for retrofitting buildings, financial/fiscal incentives to promote energy efficiency measures, etc. Higher priority should be given to carefully monitoring the implementation of all programmes, making regular assessments and amending programmes when necessary.

RECOMMENDATIONS

The government should:

- ☐ Ensure that energy efficiency be given priority among energy policy objectives.
- ☐ Adapt the current energy efficiency strategy to market liberalisation and to growing demand in the energy-consuming sectors, especially transport.

- ☐ Strengthen current insulation standards for buildings, as well as labelling and energy efficiency standards for appliances in line with European Union legislation and progressively make them compulsory.

- ☐ Strengthen the information, education and motivation campaign of the Czech Energy Agency for energy savings by all end-users.

- ☐ Involve all economic players (municipalities, utilities, industries, building developers) in energy efficiency information, dissemination and project development.

- ☐ Strengthen fiscal and financial incentives for energy efficiency projects.

- ☐ Encourage third-party financing.

- ☐ Provide adequate funding to the Czech Energy Agency for its energy efficiency programmes and co-ordinate it with other initiatives, especially those of the State Environmental Fund.

- ☐ Carefully monitor the development of energy efficiency programmes and their cost-effectiveness.

5

ENERGY AND THE ENVIRONMENT

CLIMATE CHANGE

Overview

Despite its efforts, the Czech Republic emits more greenhouse gases (GHG) than countries with similar population and industrial development because of its high energy intensity combined with a high use of solid fuels. Total emissions of the Czech Republic in 1999 were 110% higher than in Hungary. The ratio per capita is one of the highest in Europe: 10.7 tonnes of carbon per capita in 1998 compared with 7.5 tonnes for OECD European countries. The gap is even higher for CO_2 emissions intensity calculated with GDP using purchasing power parities – 0.86 kg of carbon per US dollar in the Czech Republic in 1998, 0.54 kg in Hungary and 0.42 kg for OECD Europe – although the Czech Republic cut its total CO_2 equivalent emissions by nearly one-fifth from 188 Mt in 1990 to 152 Mt in 1997[12] following a sharp decline in economic activity and less use of coal by end-users.

As shown in Figure 9, the strongest fall occurred in industry and construction, where the sharp reduction in production and the switch from coal to natural gas cut emissions by 55% between 1990 and 1999. CO_2 emissions in the residential sector dropped by 70%, thanks mainly to the substitution of gas for brown coal. However, the energy sector (including autoproducers) increased its CO_2 emissions by 17%, compared to 1990 and accounted for 56% of total emissions in 1999. Growing heat generation, the high and stable share of coal (71%) in the generation mix and a modest share of natural gas (3%) explain this increase. According to the Ministry of the Environment, emissions from the energy sector alone (excluding auto-producers) decreased by 3.7% between 1994 and 1998. The transport sector contributed less than 10% of CO_2 emissions in 1998, but its CO_2 emissions increased by 63% between 1990 and 1999 with the increase in passenger and freight vehicle fleet and use.

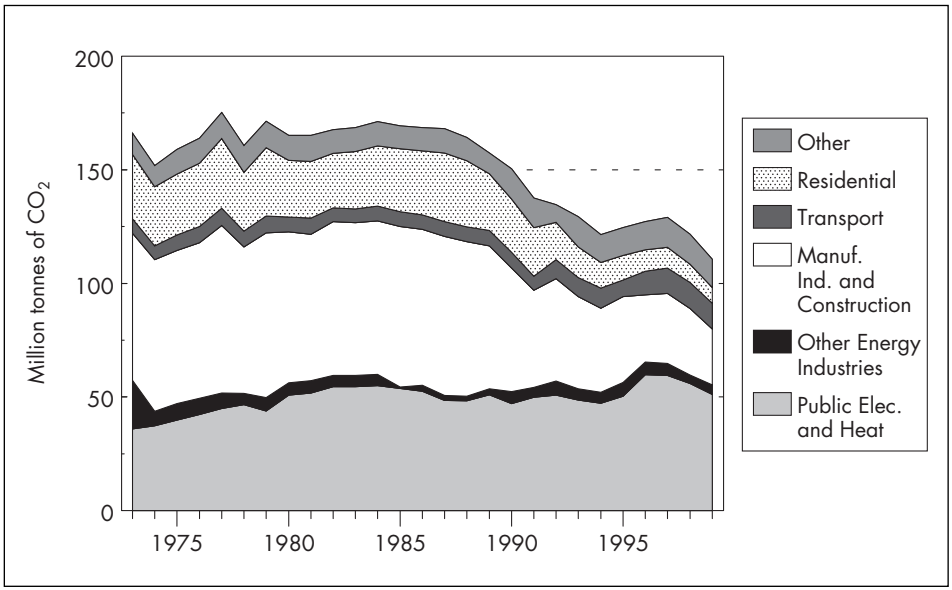
Despite a 30% decline between 1990 and 1998, coal still represents two-thirds of total emissions followed by oil (17%) and natural gas (15%). See Figure 10.

Objectives

Climate change policy was integrated into the State Environmental Policy in 1994 and into the new Energy Policy in 2000 and has been stated in Government Decision n° 480 of May 1999.

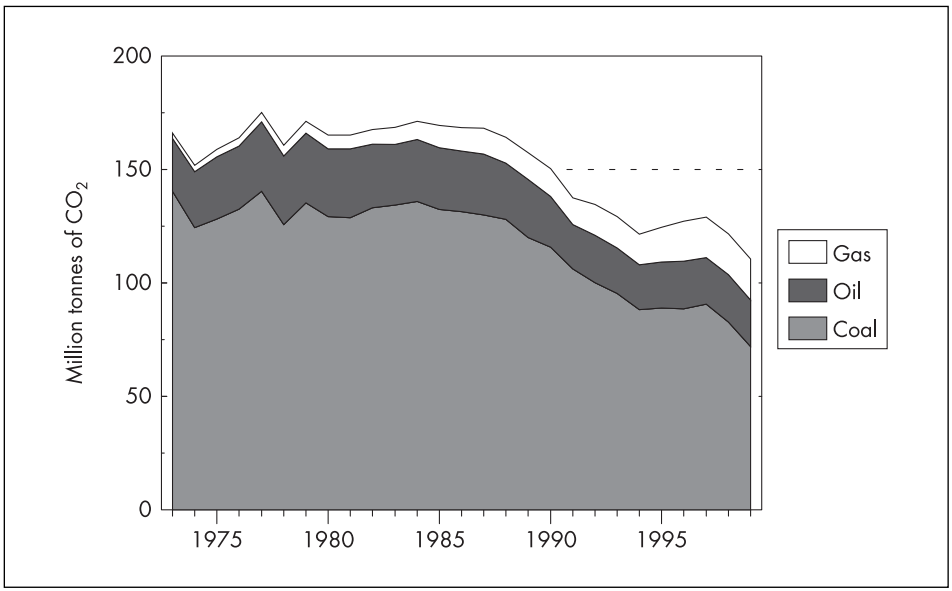
12. Data include fuel combustion emissions: 150.4 Mt CO_2 equivalent in 1990, 110.6 Mt CO_2 in 1999 (reference approach, IEA source, 2000). The Czech Republic's Second Communication to the UNFCCC indicates total emissions were 197 Mt CO_2 for 1990 and 154 Mt CO_2 for 1995.

Figure 9
CO_2 Emissions by Sector, 1973 to 1999
(fuel combustion, reference approach)



Source: *CO_2 Emissions from Fuel Combustion*, IEA/OECD Paris, 2001.

Figure 10
CO_2 Emissions by Fuel, 1973 to 1999



Source: *CO_2 Emissions from Fuel Combustion*, IEA/OECD Paris, 2001.

The Czech Republic joined the United Nations Framework Convention on Climate Change (UNFCCC) in 1993 and signed the Kyoto Protocol in 1998 (not yet ratified). During the 2008-2012 period, the country is committed to reducing total emissions by 8% compared to the 1990 emissions level. Today, total GHG emissions from fuel combustion are 20% below the 1990 baseline. The Czech authorities are harmonising their position and policies with EU policy objectives and associated regulations related to GHG emissions.

The Second Czech Communication to the UNFCCC published in 1997[13] projected total GHG emissions to be 192 million tonnes of carbon equivalent in 2010[14] compared to 188 million tonnes in 1990. Emission projections were updated in 2000 for three different economic growth scenarios. According to these projections, emissions should be 12-32% less in 2008-2012 than in 1990.

Response Policy

The Czech government has developed a specific climate change policy and has assigned responsibilities for its implementation. The Ministry of the Environment is in charge of defining and implementing climate change policies with the support of the State Environmental Fund (SEF) and the Czech Energy Agency (CEA) in co-ordination with the Ministries of Industry and Trade, Finance, Transport, and Agriculture.

The Second Czech Communication to the UNFCCC gave a detailed assessment of the existing situation, forecasts and measures both implemented and planned.

Policy Instruments

Energy Efficiency

Decision n° 480 recognises the importance of energy saving, which is considered to have the largest potential for reducing GHG emissions. A new Energy Management Act was passed by parliament in November 2000 and has strengthened the State's role in improving energy efficiency. The preceding chapter on energy efficiency describes the current situation, measures taken and possible improvements in this field.

Renewable Energy

Current situation

In 1999, fossil fuels and nuclear energy represented 98% of TPES. The Czech government believes that renewable energy can make a valuable contribution to diversification of energy supply and to meeting GHG reduction goals, as well as to local and regional economic development.

13. The Third Communication is expected to be issued at the end of 2001.
14. Includes 166 Mt emissions from fuel combustion in 2010.

In 1998, renewable energy production was estimated at 0.71 Mtoe, of which 70% was biomass and 17% hydropower, together representing 1.7% of TPES.

Biomass fuels include mainly wood waste with a growing share of biofuel (methanol from rape seed). Hydropower has been widely developed with a total installed capacity of 2,153 MW providing 1.7 TWh in 1999 or 2.6% of total generation. Other renewable energy sources make only a marginal contribution.

Since 1991, a specific programme aimed at developing renewable energy production has been implemented. It includes the following incentives:

- Obligation for distribution companies to purchase electricity and heat generated from renewables; the buy-back tariff amounts to CZK 1.2 /kWh and does not include a premium for renewables[15].
- Exemption from excise tax for biodiesel fuel (methanol from rape seed).
- Reduced import duties on renewable energy equipment.
- Five-year tax relief (income and property) for investment in renewable energy (for small hydropower below 1 MW).
- Low VAT rate (5% instead of 22%) for small facilities (hydropower: 0.1 MW, wind: 0.075 MW, all solar and biomass units).
- Exemption from property tax for five years for conversion of building heating systems from solid fuel to renewable energy.
- Reduced VAT rate of 5% paid by final consumer of biomass fuel and heat.
- Direct investment subsidies[16].

Since 2000, the country has participated in Altener, the EU programme fostering initiatives in R&D, dissemination and implementation of efficient renewable energy systems.

Current Policy Objectives

In the energy policy paper adopted in January 2000, the government included the goal of increasing the share of renewable energy to 5-6% of TPES by 2010 and 8-10% by 2020. This objective is coherent with the EU energy policy contained in the Green Paper on Renewable Energy issued in 2000. In order to reach the targets, a State

15. ERO announced for 2002 new purchase tariffs for electricity generated from renewable sources: CZK 1.5/kWh for small hydropower, 2.5 for biomass, 3 for wind energy and 6 for photovoltaic.
16. Between 1991 and 1999 nearly 500 projects were financially supported by CZK 273 million of subsidies (17% of total investment costs) for a total installed capacity of 46 MW_e and 13 MW_t, of which small hydropower accounted for 41 MW_e, biomass 7 MW_t, wind energy 4 MW_e and biogas 2 MW_e and 2 MW_t.

Programme (government resolution 480/1998) has been adopted giving priority to CHP demonstration projects using biomass. The SEF and the CEA have been designated to implement the programme with an annual budget to promote and develop renewable energy. Estimates indicate that for renewable energy sources to reach a 6% share of TPES in 2010 would require an investment of about CZK 242 billion by the year 2010, supported by subsidies of CZK 42 billion (CZK 3,860 /toe).

The Renewable Energy Action Plan[17] prepared by consultants for the World Bank and the Czech government estimated that the technical potential of renewables would be 5.6% of TPES in 2010 while the economic potential would be 3.2%. The payback time for investment would be eight years (16 years for hydropower). Biomass represents nearly 90% of the total potential and consists mainly of agriculture waste (straw) and forest exploitation products (wood and wood waste). Hydropower potential relies on small units but suffers from low profitability. Other sources estimated that the economic potential for wind power (5 TWh, 0.43 Mtoe) should be confirmed by direct measurements on site and economic viability analysis. Biofuel amounted to 7% of all automotive fuels in 1998.

Regulatory Framework

Cost-effective Pricing

The government considers it a priority to adjust energy prices and to include external costs in consumer prices. Cross-subsidies for natural gas and electricity should be fully phased out by the end of 2002. The aim is to promote less polluting fuels and to provide incentives for more rational energy use. However, there is a risk that a number of households might switch back to brown coal if its price does not include external costs, instead of using gas after the price adjustment.

Tax

Taxation is not currently used to address climate change issues. Introduction of a carbon/energy tax is, however, envisaged by the MOE. The MOF provides tax relief on a case-by-case basis for investments and processes that reduce GHG emissions.

Research and Development

The development and dissemination of energy-efficient and low-GHG-emitting technologies have been supported in the context of addressing global climate change. Efforts have focused on clean coal technologies (see Chapter 12).

Market Mechanisms, International Co-operation

In the framework of the UNFCCC, the Czech government has expressed its interest in developing Activities Implemented Jointly (AIJ). The principle is for a foreign government or organisation of an Annex I country to fund an emissions reduction

17. Study carried out by Dutch and Czech companies including the Energy Research Centre (ECN) of the Netherlands and SEVEn, and published in August 1999.

Table 4
Current Use of Renewable Energy and Potential Use in 2010

	Installed capacity (1998)	*1998 production*	*2010 production/ economic potential (a)*	*2010 production (b)*	*Investment cost (c)*
Units	MW	ktoe/year	ktoe/year	ktoe/year	Thousand CZK/kW
Biomass	500	502	1,300	1,800	36-120 (electricity) 10-30 (heat)
Waste	..	35	35		10-30
Hydropower					
Large	1,948	80	80	80	40-140
Small	205	40	80	60	50-120
Solar Water Heaters	..	3	..	6	120-160
Wind Energy	7	2	20[d]	3	45-70
Photovoltaic (PV)	0	0	..	..	200-400
Heat pumps	2	2	50	50	20-70
Geothermal	1.5	1	..	1	..
Other (biogas, biofuel)	..	45	..	60	..
Total	**2,663.5**	**710**	**1,565**	**2,060**	
% of TPES		**1.7**	**3.8**	**5**	

a) Renewable Energy Action Plan 1999 hypothesis, 1998 capacity remains in operation until 2010.

b) MIT estimate.

c) World Energy Assessment, UNDP, 2000 (international cost).

d) Other estimates indicate potential to be 430 ktoe (CSM Associates, UK).

Sources: Renewable Energy Action Plan 1999 (SEVEn), RES Report n°20 (10/2000), country submission, IEA estimates.

project in the Czech Republic in exchange for an emissions credit. The MOE has estimated the volume of emissions credits to be between 3.5 Mt and 15.5 Mt in 2010. A demonstration project has been carried out recently in Hostetin (see box). The MOE is co-operating with the OECD on a detailed study for a domestic emissions trading scheme which might benefit CHP and renewables.

AIR POLLUTION

Thanks largely to voluntary measures (fuel switching, desulphurisation, decommissioning of units) in brown coal-fired power plants and oil refineries, total national emissions of sulphur dioxide and particulates were reduced by 86% and 89% respectively

A Dutch-Czech Joint Implementation (JI) Biomass Project

Background

Hostetin is a village of 1,000 inhabitants, situated in the eastern part of the White Carpathians. Hostetin was not connected to a district heating network or a natural gas network. Consequently, heating needs were met mostly by electric heaters or by burning brown coal in houses. The combustion of brown coal was problematic since it emitted a lot of GHG and generated serious environmental pollution in the form of dust, CO and SO_x.

Project Features

In a Dutch-Czech JI biomass demonstration project, a wood chip boiler supplies heat to a district heating network covering 80% of the dwellings, replacing electric heaters and brown coal stoves in households. Wood residue previously considered as waste by a local wood-processing company is now supplied free to the district heating company. The total cost of the project was $0.85 million, with the Dutch funding the boiler house and the Czechs the grid. The emissions reduction will be equally divided between the two countries.

The Hostetin pilot project is being duplicated in a larger JI project comprising 28 biomass district heating projects for a total capacity of 130 MW_t to be implemented between 2001 and 2003. The project will be financed by SEF (40% loan, 40% grant), the municipalities (10%), and by the Dutch CO_2 reduction scheme ERU-PT (10%).

Sources: IEA Climate Change 2000, IEA/OECD Paris, 2000; BTG Biomass Technology Group B.V.; ERU-PT.

between 1990 and 1999. The Czech Republic reduced its total emissions of pollutants by 55% between 1990 and 1998. On average, the emission intensities of SO_2 per unit area in recent years were: 16.1 tonnes per km^2 in 1993; 8.9 tonnes in 1997 and 3.4 tonnes in 1999[18]. The OECD Europe average is 3.3 tonnes per km^2. However, air remains seriously polluted in cities and industrial areas such as in Northern Bohemia (29.3 tonnes per km^2) and Prague (21.3 tonnes) despite significant improvements (–60 and –65% respectively) between 1994 and 1997.

Clean Air Act

A specific regulation on air pollutant emissions was developed early in the introduction of the new environmental policy. In 1991, the Clean Air Act established emission

18. SO_2 emission ratios per unit of GDP were: 5.8 kg SO_2/$1,000 in 1997 (EU average: 1.9 kg), and per capita: 67.9 kg (EU average: 26 kg). Source: Czech State Environmental Policy.

Table 5
Air Pollutant Emissions, 1990 to 1999

Unit: kt	*1990*	*1993*	*1995*	*1998*	*1999*	*Evolution 1990-1999 (%)*
SO_2	1,876	1,419	1,091	443	269	-86%
NO_x	742	574	412	413	390	-47%
Particulates	631	441	201	86	67	-89%
CO	1,055	967	874	767	686	-35%
Hydrocarbons	225	204	164	172	..	-23%*
NMVOCs**	435	338	286	269	265	-39%

* 1998 data.

** Non-methane volatile organic compounds.

Source: Ministry of the Environment.

standards for combustion facilities with a unit installed capacity higher than 0.2 MW, and financial penalties for non-compliance. The act was revised in 1997 to make the new standards meet EU standards. The energy sector (power generation, district heating and oil refineries) and industries made significant efforts to comply before the 31 December 1998 deadline, focusing on sulphur emissions and particulates, by investing heavily in filter equipment and replacing brown coal and heavy fuel oil with natural gas. The extension of the natural gas network has allowed replacement of heavily-polluting brown coal by end-users in household and service sectors.

Taxation is an important tool in Czech air pollution mitigation policy and emission taxes were included in the Clean Air Act (see Table 3). Their introduction was progressive, starting at 30% of the charge rate between 1992 and 1993 and reaching 100% in 1997. Despite a significant level of tax relief, these taxes represent only a part of investment in cleaner technologies (e.g. the tax per tonne for SO_2 is CZK 1,000 compared with CZK 6,000 for the cost of desulphurisation). The total amount collected by the SEF in 1999 was CZK 1,100 million, of which 85% came from large facilities (above 5 MW). In 1998, these taxes contributed to funding 316 clean air protection projects selected by the SEF, allowing a reduction in total emissions of more than 80.5 kt for a total of nearly 400 kt in the period 1992-1998.

Emissions of pollutants from the combustion of oil products have also been reduced, notably in transport, thanks to higher quality fuels, either imported or refined in the country, after new legislation (see Chapter 10).

CRITIQUE

Climate Change Response Policy

The Czech Republic can be commended for having developed a multi-sector strategy for CO_2 mitigation. The strategy involves a wide range of public and private actors

as well as policy measures in the fields of energy switching, efficiency and renewables. The reduction of CO_2 emissions in the first three or four years of the 1990s was mainly the result of industrial decline and transformation of the economy. However, results of the climate change policy can be seen since 1994. CO_2 emissions have more or less stabilised since then, and 1999 levels are 19.6%[19] lower than in 1990. However, CO_2 emissions remain much higher than in other OECD European countries. The GHG emission projections up to the 2008-2010 commitment period are optimistic. Nevertheless, the Czech government will have to strengthen its policies and measures to mitigate CO_2 emissions effectively in a context of sustained economic growth and increasing emissions from sectors such as transport.

The government gives priority to energy efficiency, which has the largest potential to reduce CO_2 emissions. This objective should lead to the implementation of an ambitious energy efficiency strategy in energy transformation and final energy use and to reinforcement of the catalytic role of state organisations (see Chapter 4). There is room for further co-operation between public and private players to raise awareness of the need to define ambitious but achievable climate change objectives and to implement them. The energy efficiency potential is considerable (energy intensity is twice the average in OECD Europe) and progress in this field should allow substantial CO_2 emissions reductions, largely below the baseline.

In a number of OECD countries, voluntary agreements (VAs) on the reduction of CO_2 emissions have been a valuable tool. VAs to increase energy efficiency in the Czech Republic's energy and industrial sectors would contribute to CO_2 emissions mitigation.

The Czech government acknowledges the importance of cost-reflective energy pricing, which will contribute greatly to enhancing the energy-saving behaviour of final consumers while giving the energy sector the economic means to fund environmental investments.

The existing tax relief for investment in equipment and processes reducing CO_2 emissions is a valuable incentive; its cost-effectiveness should be assessed and monitored.

Implementation of the Kyoto flexibility mechanisms may provide opportunities for Czech companies to receive additional funding to reduce their CO_2 emissions and increase their energy efficiency as well as improve their competitiveness. Thus, the public and private players should evaluate options such as Joint Implementation and Tradable Permits, etc., implement pilot projects that can be duplicated and prepare rules for implementation.

Renewable Energy

The country has only limited renewable energy sources that are economically viable. Thus, the objective of the State Programme for renewables to reach 5-6% of TPES by

19. Fuel combustion only. MOE source: –21.9%.

2010 to meet EU targets appears overly optimistic. Renewable energy sources could reach 3.8% of TPES. Furthermore, given the relatively high price of renewable energy production and the existing overcapacity in electricity generation, which will be reinforced by the commissioning of a new nuclear plant, only a limited market exists for renewable-generated electricity. Therefore, renewable energy development should rely on niche markets and a cost-effective approach. The obligation to purchase electricity generated from renewables without any restrictions will add to overcapacity and increase costs.

Nevertheless, opportunities do exist to develop cost-effective renewable energy consistent with energy and environmental objectives. For example, CHP using biomass, waste recycling and direct use of renewables by households have economic potential. Participation in Altener, the EU programme on renewable energy, will also provide experience in project development, R&D and demonstration projects.

As a consequence, financial support provided by the State should be limited to projects having dual energy and environmental targets and assured markets. This support could take the form of contributions to feasibility studies for such projects. Thus, additional funds could be made available for the priority objective of improving energy efficiency on the energy transformation and demand side.

The current tax incentives apply to very small capacity units (i.e. hydropower lower than 0.1 MW, wind: 0.075 MW). The government should consider extending these measures to higher-capacity equipment in small systems (hydropower: 1 MW, wind: 15 MW).

Air Pollution

The Czech Republic can be commended for creating at an early stage a regulatory framework for addressing emissions mitigation. Indeed, the emission standards and penalties in the Clean Air Act of 1991 have largely contributed to the reduction of CO_2 emissions from the energy sector and industry. Incentives to promote gas in place of solid fuels in households and industries have also contributed to significantly reducing air pollution, particularly in heavily polluted areas. Emissions have been reduced both in levels and in degree of noxiousness.

However, the emission ratios of air pollutants remain high and well above the average of OECD European countries. The perspectives of economic growth and further structural changes indicate that air pollution policies should be strengthened notably in the transport sector, which is already the primary source of CO_2, hydrocarbon and NO_x emissions. Thus, efforts by the government to harmonise legislation, norms and emission standards with the EU, and investments by the energy sector and industries to mitigate emissions as well as to improve energy efficiency, should be continued.

Institutional Organisation

Despite co-ordination efforts between the CEA and SEF, implementation of energy and environment policies by two separate bodies does not appear to be efficient. Synergies between energy and environmental protection are strong and will be reinforced with EU accession. The Czech government should consider the creation of a single organisation in charge of implementing policies related to climate change, environmental protection, energy efficiency and renewable energy.

RECOMMENDATIONS

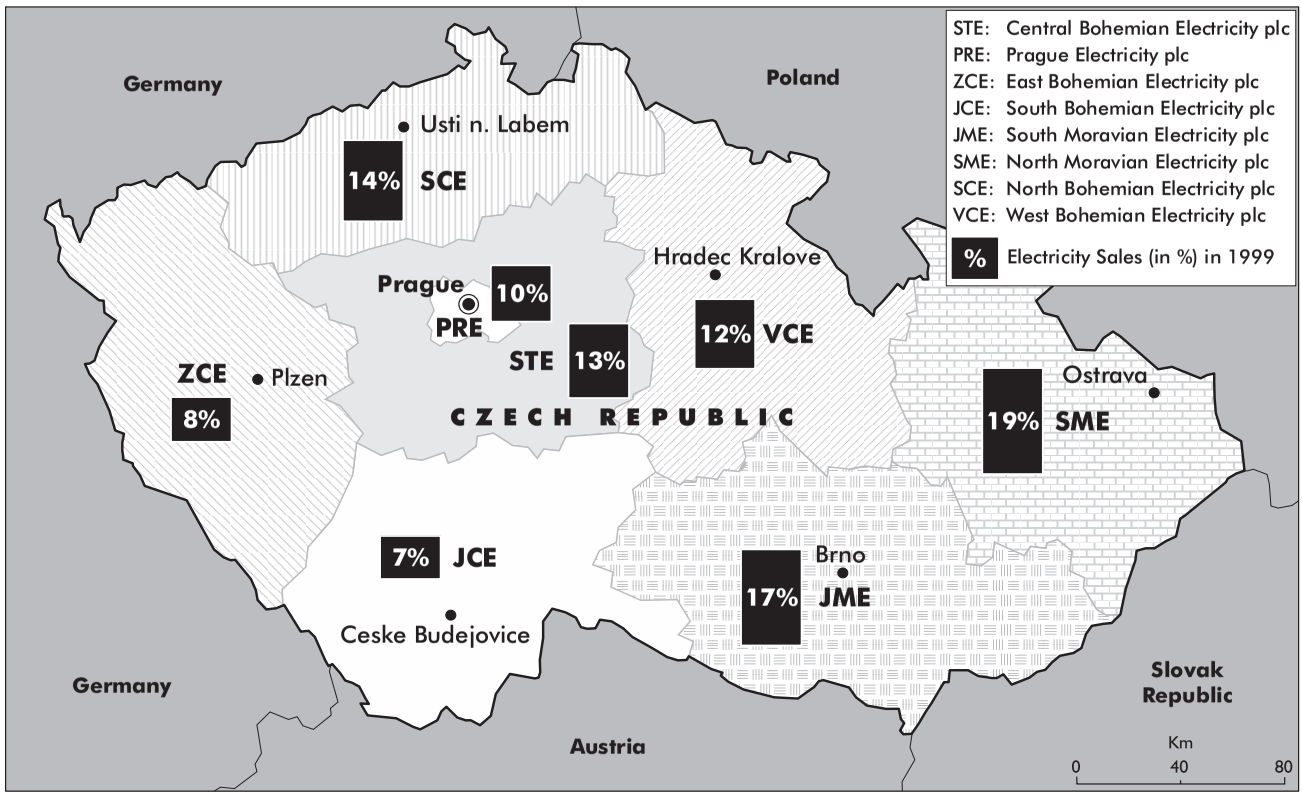
The government should:

- ☐ Intensify efforts to develop a comprehensive multi-sectoral climate change strategy, giving priority to enhancing energy efficiency.
- ☐ Exploit the Kyoto flexibility mechanisms (Joint Implementation, Tradable Permits, etc.) and start preparing appropriate legislation.
- ☐ Develop renewable energy projects on a cost-effective basis with dual energy and environmental targets.
- ☐ Ensure coherence of renewable energy policies within state bodies and consider the creation of a single organisation in charge of implementing environmental and energy policies.
- ☐ Ensure total compliance of the Clean Air Act and related legislation with EU emission standards, and effective enforcement of the act.
- ☐ Carefully monitor measures to improve cost-effectiveness.

Figure 11

Electricity Sales by Distribution Companies

(Total 1999: 44.6 TWh)



Source: ZCE.

6

ELECTRICITY

INTRODUCTION

Electricity is of growing importance in the Czech energy sector since power production has remained roughly stable despite an overall decline in TPES of 19% between 1990 and 1999. The electricity sector is also the main consumer of coal and the only consumer of uranium produced in the Czech Republic.

FEATURES OF THE ELECTRICITY SECTOR

Industry Structure

CEZ, a.s.

CEZ, a.s., the 67% state-owned generating company, owns approximately two-thirds of total Czech generating capacity and produced in 2000 about 69% of all electricity generated. CEZ, a.s. owns the only operating nuclear power plant and is bringing a new one into operation, at Temelín. It also owns the transmission system through its subsidiary, CEPS a.s. and 39% of Severoceske Doly-SD, the largest brown coal mining company.

CEZ, a.s. has been a joint stock company since 1992, with shares traded on the Czech stock exchange. Approximately 25% of its shares are foreign-owned.

IPPs

Independent Power Producers (IPPs) constitute 5.1 GW of capacity and generated nearly 18.6 TWh (29%) in 1999. IPP development has benefited from distribution utilities' diversifying their supply sources away from CEZ, a.s. As a result, IPP capacity and generation have grown by nearly 50% since 1993 while CEZ's share of generation diminished from 79% in 1993 to 69% in 2000. CEZ, a.s. itself purchased nearly 5 TWh of power from independent producers and industrial plants in 1999. IPPs also sell their power to the local distribution companies since third party access to transmission has yet to be established.

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

CEPS

In January 1999, the Czech Electricity Transmission System (CEPS) was set up as a 100% subsidiary of CEZ, a.s. CEPS owns the transmission network and was established as the transmission system operator (TSO) in line with the EU Electricity Directive. CEPS's responsibilities include: controlling flows in the power grid, co-ordinating with foreign networks and assuring that current facilities dispatch electricity efficiently.

UED

The Czech power system is controlled by the Central Dispatch Centre (UED), which was established in 1997. UED is jointly owned by the distributors (40%), CEZ, a.s. (20%), the independent producers (20%) and the MIT (20%).

Distributors

The eight distribution companies (Table 6 and Figure 11), created in 1990, supply nearly all final consumers (except for approximately 6 TWh used by industrial autoproducers and 0.1 TWh sold by CEZ, a.s. directly to consumers). Ownership of the regional companies was originally in the hands of the State Property Fund. For each company, about 34% of the ownership was transferred to municipalities, and another 15% was sold to the private sector through voucher privatisation. Many municipalities have sold their shares to foreign companies. The government decided in 1998 to regain majority control over the companies, through share purchases by CEZ, a.s., before carrying out full privatisation. Today, the government owns between 48% and 58.3% of the shares in six companies: JME, SME, SCE, VCE, STE and ZCE. Two companies, Prazska Energetika (PRE) and Jihoceska Energetika (JCE), representing 17% of sales, are controlled by shareholder coalitions between private investors and municipalities. The German utilities E.ON Energie and RWE have significant holdings in several of the companies. Table 6 ranks the eight companies by number of customers, along with significant shareholders.

Capacity and Generation

Peak demand for electricity fell between 1996 and 1999 to around 10 GW as a result of an economic slowdown, but rose by 1.8% in 2000. Installed capacity has increased 3% since 1996 to 15.2 GW, implying a reserve margin of over 50%, well above domestic demand. Capacity reserve margin is expected to increase more substantially in the next two years, as the Temelín nuclear plant (1.8 GW) comes fully on line.

Electricity Demand

After a sharp decrease in the years 1989 to 1993, total electricity demand increased up to 1997 before falling in 1999 to 50.8 TWh (4.1 Mtoe), 4% below the 1990 level. This was largely caused by the transition to a market economy. Industry reduced its

Table 6
Czech Electricity Distributors

Companies	*Region of operation*	*Customers (thousands)*	*Ownership (November 2000)*
Jihomoravska Energetika (JME)	Southern Moravia	994	NPF (46.7%), E.ON-Germany (44.5%), CEZ, a.s. (2%)
Severomoravska Energetika (SME)	Northern Moravia	922	NPF (49%), E.ON (29%), CEZ, a.s. (10%), JVCD-France (9%)
Severoceska Energetika (SCE)	Northern Bohemia	648	NPF (48%), MEAG-Germany (29%), RWE-Germany (4.4%) E.ON (5.9%), CEZ, a.s. (2.3%)
Vychodoceska Energetika (VCE)	Eastern Bohemia	640	NPF (49.6%), E.ON (41%), Ipower-UK (7%)
Prazska Energetika (PRE)	Prague	666	NPF (48.2%), City of Prague 25.9%, GESO-Germany (17.3%), RWE (7.6%)
Stredoceska Energetika (STE)	Central Bohemia	644	NPF (58.3%), RWE (35%)
Zapadoceska Energetika (ZCE)	Western Bohemia	477	NPF (48.3%), E.ON (36.9%), Energie AG-Austria (11.2%), City of Plzen (2.0%), CEZ, a.s. (0.4%)
Jihoceska Energetika (JCE)	Southern Bohemia	390	NPF (48.1%), E.ON (13.3%), municipalities (33.35%)
TOTAL		**5,382**	

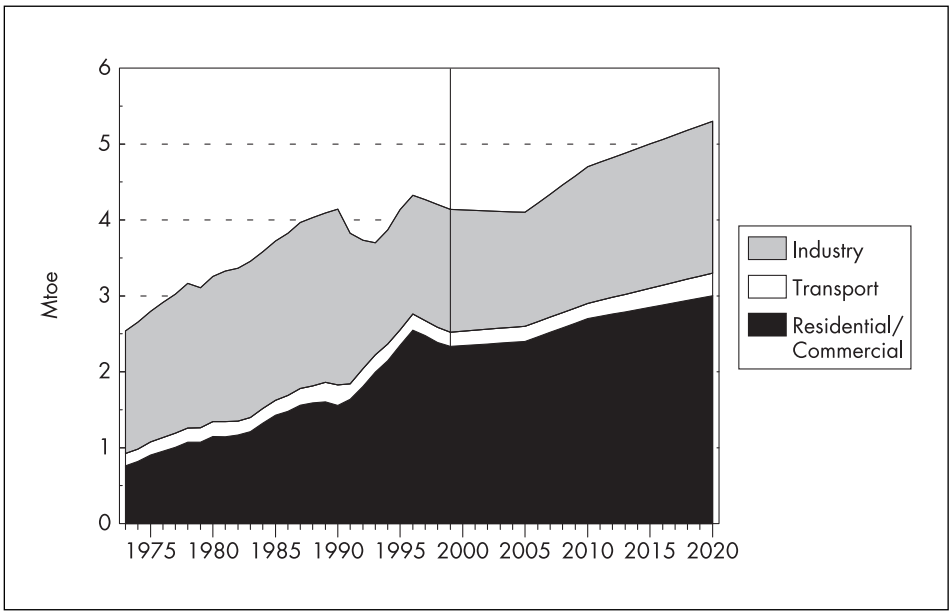
NPF: National Property Fund.
Sources: Annual reports, Ministry of Industry and Trade.

consumption by 30% between 1990 and 1999 and now represents 39% of total consumption, comparable to the OECD average share. Consumption by autoproducers (mostly chemical industries) represented 11.5% of total consumption in 1998. The household sector increased its consumption by 50% to 14.5 TWh in 1998 compared to 1990 and the service sector nearly tripled its consumption to 10.3 TWh.

The MIT forecasts an increase in electricity consumption by nearly 12% to 58.8 TWh (4.7 Mtoe), equivalent to 18.5% of TFC, by 2010.

Coal-fired generation, mostly with indigenous lignite, is relatively cheap and supplies 72% of total production for baseload and midload operation. Variable costs range from as low as CZK 0.32/kWh for brown coal when the mine is next to the power plant, to CZK 0.55/kWh for hard coal. Nuclear power, with relatively low variable costs (around CZK 0.1135/kWh), is used for baseload power generation for 21% of

Figure 12
Electricity Consumption by Sector, 1973 to 2020



Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001, and country submission.

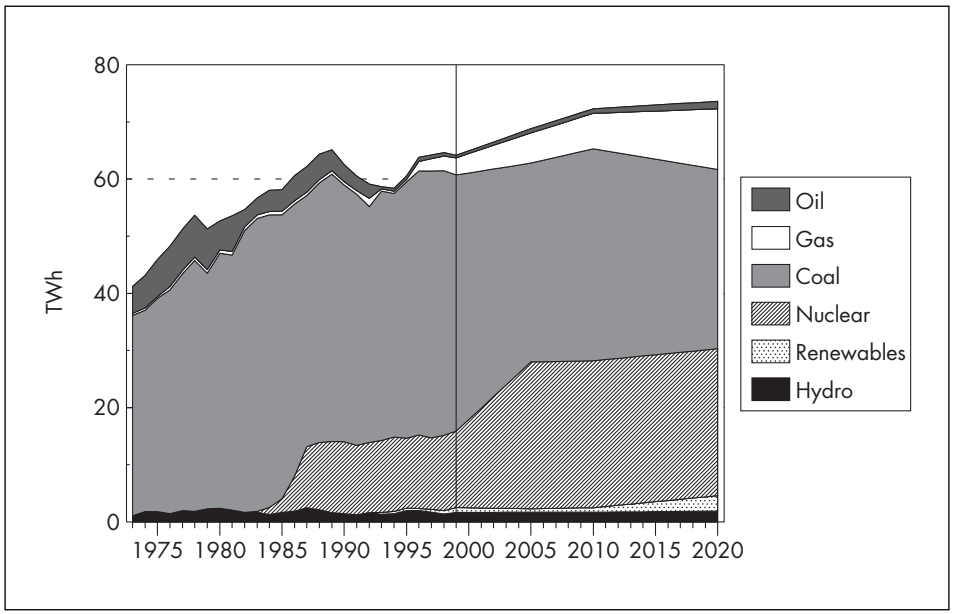
total production. The commissioning of the Temelín plant is expected to double the share of nuclear power at the expense of coal-fired generation, whose output would drop by 20% of the total. Gas generation to date is mainly limited to a few IPPs, generating 4.7% of total production in 1999. Hydropower is used primarily for peak load, including 1.1 GW of pumped storage facilities. Table 7 summarises the total capacity, production and production share for different types of power generation.

Table 7
Generating Capacity and Power Production, 1999

Type	*Capacity (MW)*	*Gross power production (TWh)*	*Production share (%)*
Coal	10,642	44.9	70
Nuclear	1,760	13.4	20.8
Gas	635	3.0	4.7
Oil	25	0.4	0.7
Hydro	1,008	1.2	1.8
Pumped storage hydro	1,145	0.5	0.8
Renewables & waste	1	0.8	1.3
Total	**15,216**	**64.2**	**100**

Sources: *Electricity Information*, IEA/OECD Paris, 2000; and UED.

Figure 13
Electricity Generation by Fuel, 1973 to 2020



Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001, and country submission.

Transmission and International Trade

The high-voltage transmission network is a 400 kV/220 kV system. Transmission and distribution losses of 8.7% of total electricity supplied are higher than the OECD average of 6.6%. There are no significant internal constraints at present.

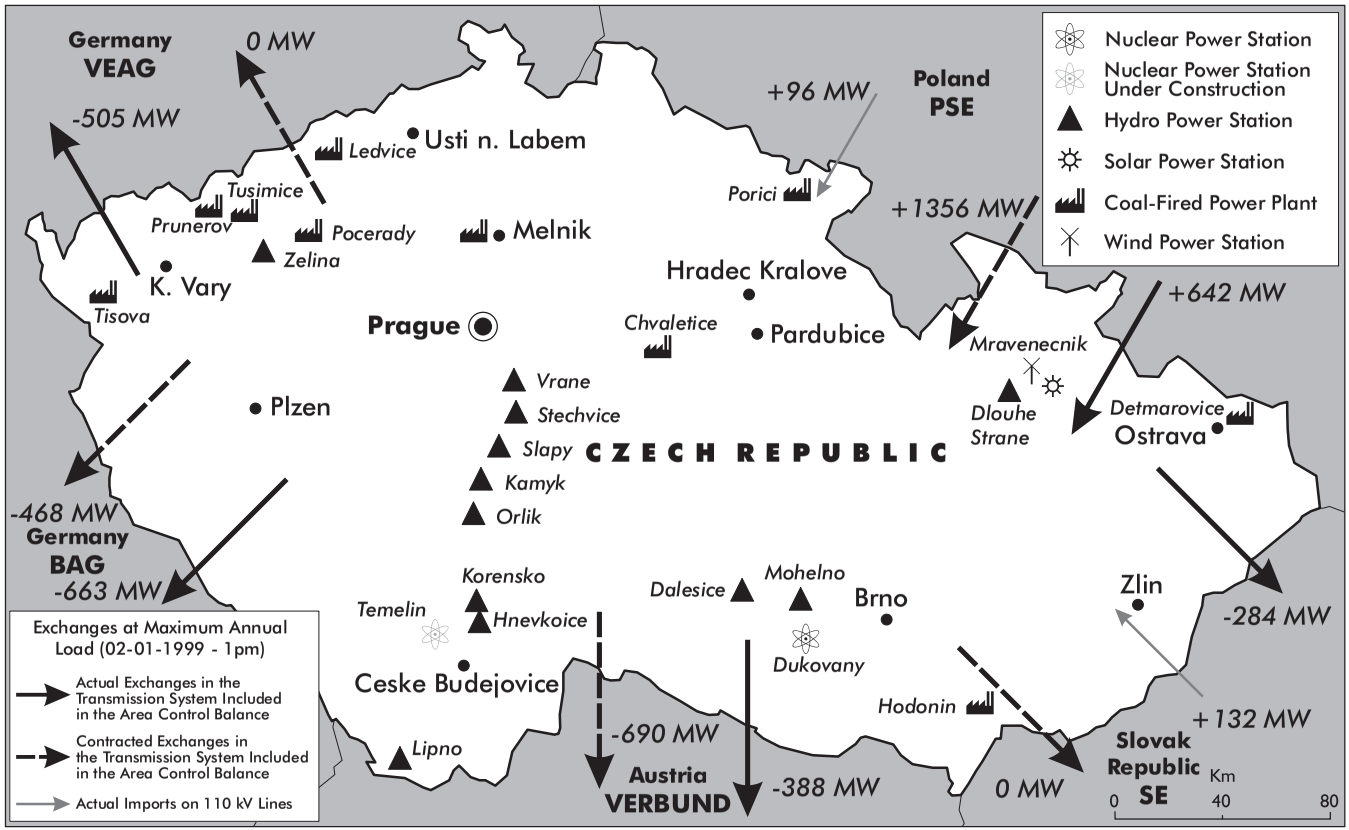
The network has interconnections with Germany, Austria, Slovakia and Poland. The Czech Republic is a member of the Union for the Co-ordination and Transmission of Electricity (UCTE) and of CENTREL, with three other Central European countries. In 2000, Germany was the main client of CEZ, a.s. and bought 7.5 TWh more power than in 1999. CEZ, a.s. sold and purchased power from Switzerland and also sold power to Italy (Table 8).

Although CEZ, a.s. has a monopoly on high-voltage international trade, some of the distribution companies have international interconnections at lower voltage and have used these to import electricity. In 1999, the distribution companies accounted for 1.4 TWh of the 2.4 TWh of imports in an attempt to diversify resources away from CEZ, a.s.

CEZ, a.s. sees the export market as an opportunity to use its surplus capacity. However, surplus capacity in neighbouring markets has led to low market prices.

Figure 14

Main Electricity Generation Units and Electricity Trade



Sources: CEZ, a.s.; CEPS.

Table 8
Electricity Interconnections and Trade, 2000

	Capacity (MW)	*Imports (TWh)*	*Exports (TWh)*	*Net export (TWh)*
Germany	2,100	–	10.8	10.8
Austria	750	–	0.4	0.4
Slovakia	1,500	1	0.3	–0.7
Poland	1,200	0.8	–	–0.8
Switzerland	..	0.6	–	–0.6
Italy	..	–	0.9	0.9
Total	**5,550**	**2.4**	**12.4**	**10**

Note: Annual exports limited to 12-14 TWh (to Germany) because of system security/loop flow considerations.

Sources: UED, CEZ, a.s.

The increase in sales volume in 2000 (+6.7 TWh) was accompanied by a fall in the average export price from CZK 0.75/kWh to CZK 0.57/kWh (still above the variable cost of coal-fired electricity of CZK 0.3-0.5/kWh). Trade is also physically limited by transit of electricity from Poland and by a strong induced "loop" flow of electricity through the Czech system arising from electricity trade between Poland and Germany. As a consequence, there were 6.6 TWh of transit flows across the Czech Republic in 1999, of which only 2 TWh were contracted transit. These loop flows and other factors limit the annual export of electricity to 12-14 TWh. Trade can be further limited by political factors. As a protest against the start-up of the Temelín nuclear power plant, the Austrian government stated that it will not allow new contracts for power imports from the Czech Republic. Also, in June 2001, E.ON Germany announced its intention to cancel a 3 TWh supply contract with CEZ, a.s. following action by distribution companies and customers against Temelín.

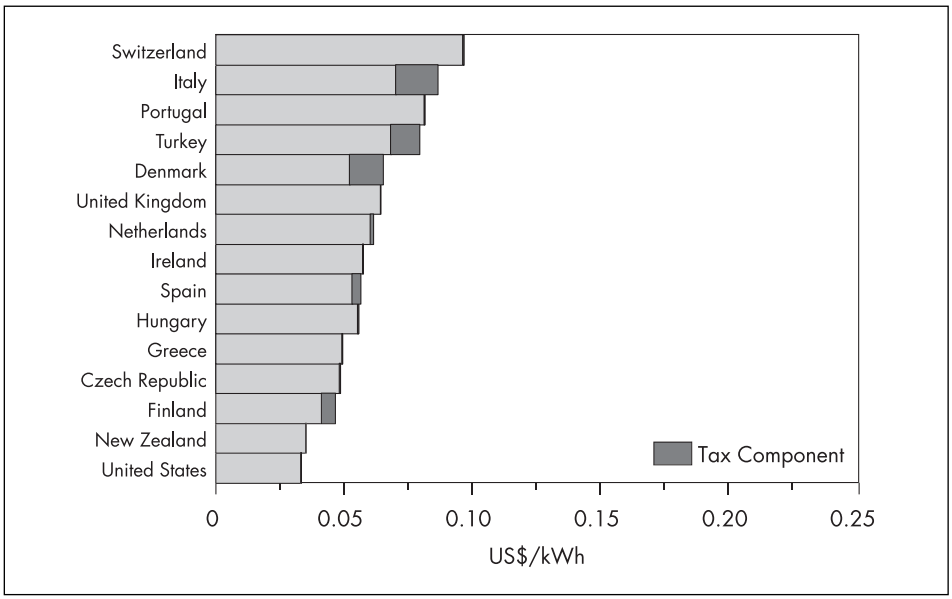
Electricity Prices and Costs

Industrial electricity prices are among the lowest in OECD countries (Figure 15). Household prices are the lowest in the OECD (Figure 16).

Electricity prices have more than trebled over the past decade primarily as a result of rising prices for previously subsidised input fuels. After a very large initial adjustment, industrial sector prices have been rising gradually. Substantial price rises in the household sector have been more recent. VAT on electricity was introduced in 1993 at a reduced rate of 5% and increased to the full rate of 22% in 1998.

Figure 15

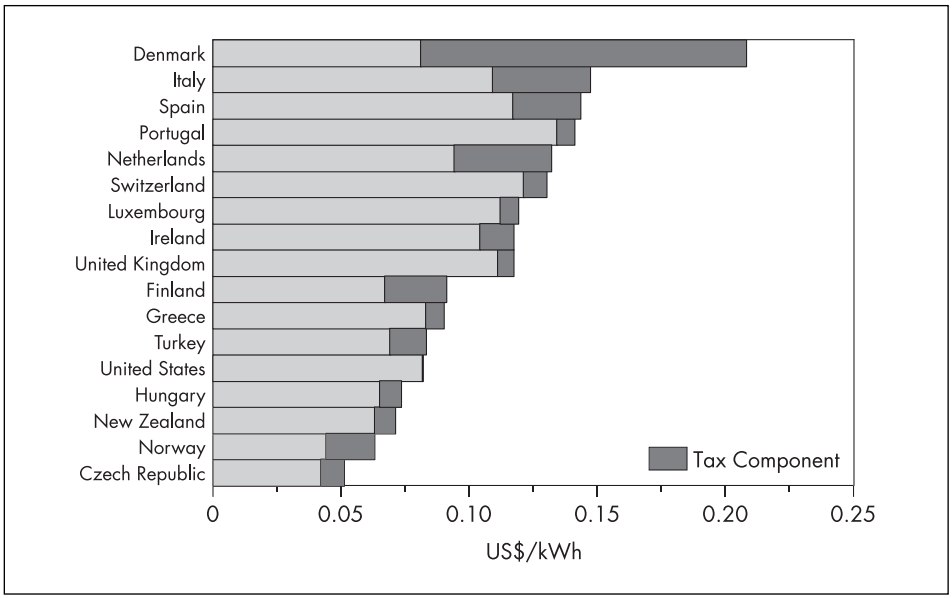
Electricity Prices in the Industrial Sector in IEA Countries, 1999



Note: Ex-tax prices for the United States. Data not available for Australia, Austria, Belgium, Canada, France, Germany, Japan, Luxembourg, Norway and Sweden.

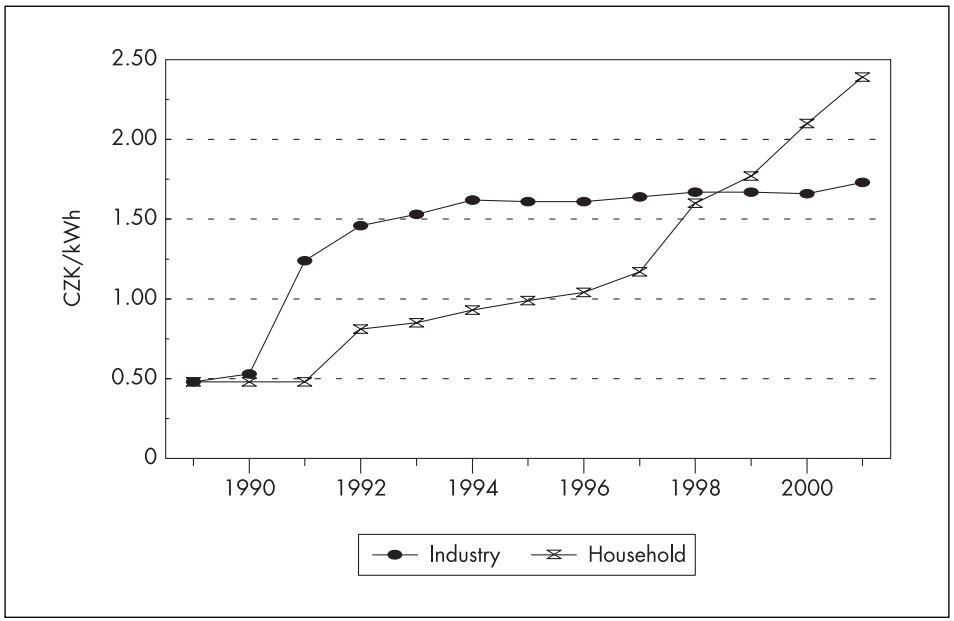
Figure 16

Electricity Prices in the Household Sector in IEA Countries, 1999



Note: Ex-tax prices for the United States. Data not available for Australia, Austria, Belgium, Canada, France, Germany, Japan and Sweden.

Figure 17
Electricity Prices, 1989 to 2001



Source: Ministry of Industry and Trade.

However, the prices for households are still below cost-recovery levels and are cross-subsidised by industrial and commercial customers. According to MIT analysis, pre-tax prices for households in 1997 were 65% lower than costs (Table 9). The tariff structure includes cross-subsidies that benefit customers with electrical space heating. The government consequently implemented a series of tariff increases beginning in 1998 to bring household tariffs fully in line with costs by the end of 2002 (Table 10).

Table 9
Prices vs. Costs for Different Customer Categories, 1997

	Average revenue (CZK/kWh)	*Cost of service (CZK/kWh)*	*Difference (%)*
Large customers (high voltage)	1.205	1.099	–9
Large customers (medium voltage)	1.748	1.268	–27
Small commercial (low voltage)	2.081	1.796	–14
Household (low voltage)	1.086	1.796	+65
Total	**1.487**	**1.487**	**–**

Source: Ministry of Industry and Trade.

Table 10
Projected Tariff Increases by Customer Category, 2000 to 2002
(%)

	2000	*2001*	*2002*	*Cumulative*
Large customers (high voltage)	4.4	4.4	4.4	13.7
Large customers (medium voltage)	–3.3	–3.3	–4.4	–11.1
Small commercial (low voltage)	1.9	1.8	1.8	5.6
Household (low voltage)	15	14	13.1	48.2
Average	**4.2**	**4.2**	**4.2**	**13.1**

Source: Ministry of Industry and Trade.

The same retail tariffs are available throughout the Czech Republic despite differences in the cost structures of the different distribution companies (e.g. for some utilities, industrial load accounts for over half of sales while for others it is roughly a third). This is important as household tariffs do not yet cover costs and industrial tariffs are above cost. In order to redistribute revenue to reflect costs, the prices paid by distributors for wholesale electricity are adjusted through a transfer pricing formula.

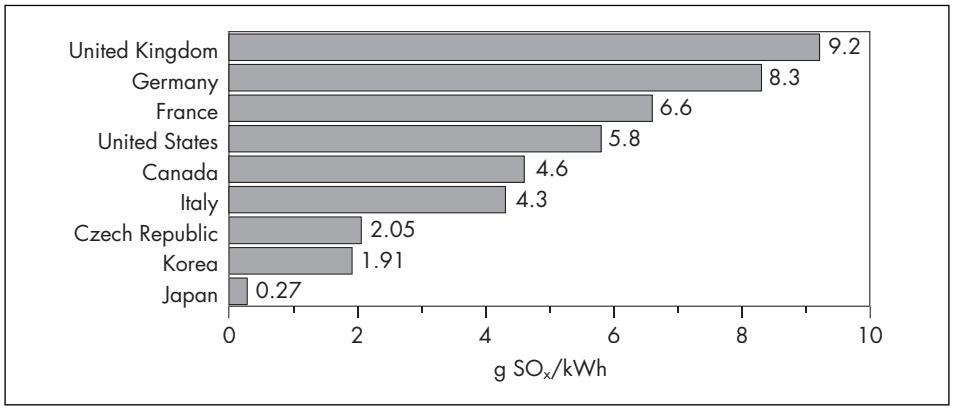
Another unique feature of the tariff system is the way in which ancillary services (including reserve capacity, voltage and frequency control) are charged to consumers. In 2000, ancillary services were included in transmission charges at a rate of CZK 0.149/kWh. By contrast, generation was charged at an average rate of CZK 1.031/kWh. However, with 30% of all electricity purchased from IPPs that did not use the transmission system but did use some ancillary services, there was a need to unbundle the ancillary service charge to better reflect the cost of use of these services by the different distributors. As a consequence, the Energy Regulatory Administration (ERA) has implemented charges for ancillary services for 2001 based on net energy consumed by the distributors and their customers rather than on deliveries from the high-voltage system. The ERA also increased the rate to CZK 0.169/kWh, implying a very large increase in total revenue attributed to ancillary services. This increase in ancillary service revenue is largely offset by a 6% decrease in the tariff for CEZ, a.s. generation to CZK 0.970/kWh.

The result is higher revenue for generation because it provides most of the ancillary services and lower revenue for IPPs, who must reduce their generation prices to match the CEZ, a.s. decrease. IPPs are very concerned about the ancillary service tariffs, which they feel are far higher than the actual costs would be if the savings could be provided competitively. Larger IPP plants can also provide such services and a tender system is to be established by CEPS to attempt to provide these services more cheaply. However, a number of smaller IPPs are not able to provide the system services as ancillary services to their clients and are thus put under pressure by the new pricing regime. ERO, the new energy regulator, is preparing a new scheme for ancillary tariffs which will be proportional to installed capacity.

Acid Gas Emissions

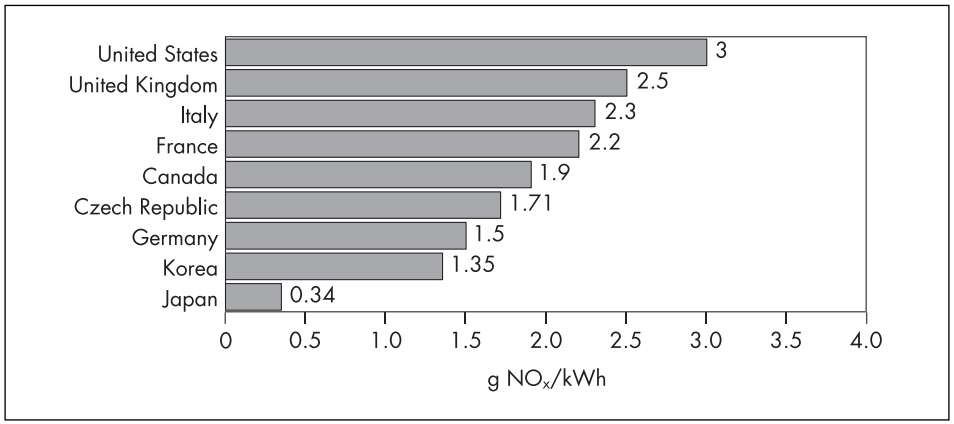
Emissions of SO_x and NO_x per kilowatt-hour of thermal power produced are lower than in many other OECD countries (see Figures 18 and 19). The main reason for this is substantial investment in emissions control equipment (primarily flue gas desulphurisation) as well as the switch to fluidised bed boilers at some power plants to meet greatly tightened emission standards. NO_x performance is better than average.

Figure 18
Average SO_x Emissions per kWh Thermal Power Generation in Selected OECD Countries, 1998/1999*



* 1999 Czech Republic; all other countries 1998.
Source: Ministry of Industry and Trade.

Figure 19
Average NO_x Emissions per kWh Thermal Power Generation in Selected OECD Countries, 1998/1999*



* 1999 Czech Republic; all other countries 1998.
Source: Ministry of Industry and Trade.

Reform of the Czech Electricity Sector

The new Czech Energy Act was signed in December 2000 and came into force in January 2001. It sets out the legal and regulatory framework for liberalisation of the Czech electricity market. The main features of the act, which conforms to EU Directive EC/96/92, and a comparison with the current situation are outlined below and in Table 11.

- A timetable for liberalisation of electricity consumers according to the following schedule:
  - On 1 January 2002, consumers with annual consumption of more than 40 GWh will be eligible (over 30% of the market);
  - On 1 January 2003, the threshold will be lowered to 9 GWh (over 40% of the market);
  - On 1 January 2005, all end-users except those consuming less than 0.1 GWh annually will be eligible (estimated opening is over 50% of the market);
  - On 1 January 2006, all end-users (100% of the market).

- Access to the networks by generators is also liberalised: all generators over 10 MW as of 2002, and all generators as of 2003. Entry into generation is liberalised and the MIT will be responsible for authorisation.

- A licensing system will be introduced for regulating the activities of all electricity market players (except consumers).

- An independent regulator, the Energy Regulatory Office (ERO), established in 2001, regulates prices and terms of access to networks, as well as prices charged to customers not yet liberalised.

- An independent transmission system operator (TSO) and distribution system operators are created to manage the operation of these networks. The TSO is also responsible for developing the grid code and managing the supply of ancillary services.

- An Electricity Market Operator (EMO) will be created, majority-owned by the government, to replace the Central Dispatch Centre (UED). It will be responsible for organising/operating the short-term electricity market, operating a financial settlement system for that market, and providing electricity balances for system operation to the TSO, forecasting demand and supply.

- The remaining responsibilities of the MIT in the electricity sector are:
  - Authorising new generating facilities and transmissions;
  - Restricting electricity imports in certain situations:
    - When the obligations of electricity generators and authorised customers in the country exporting power to the Czech Republic are not comparable to the rights and obligations of generators and customers in the Czech Republic (i.e. reciprocity);

Table 11

Comparison of Czech Electricity Industry Structure and Regulation Before and After 2000 Energy Act

Area	*Before*	*After*
Generation	a) CEZ, a.s., a 67% state-owned company, produces 71%. b) IPPs supply remaining 29%, must sell directly to local distributors based on CEZ, a.s. price (some sell to CEZ, a.s.).	a) Free entry for generators (authorisation procedure). b) Licensed generators free to contract with eligible customers and third parties.
Transmission	a) Transmission owned by a CEZ, a.s. subsidiary CEPS (since 1999). b) No access to high-voltage transmission allowed for IPPs or distributors. c) Ancillary services charged to distributors based on amount of power purchased from CEZ, a.s.	a) CEPS becomes the Transmission System Operator (TSO). To be spun off as separate company from CEZ, a.s. b) Third party access regulated by network regulator through licence. c) Postage stamp pricing will be adopted. d) Ancillary service charges are based on total power consumed. Tender process for services proposed.
Dispatch/Market Operator	a) Dispatch managed by Central Dispatch Centre (UED).	a) UED will be replaced by Electricity Market Operator (EMO) overseen by multi-stakeholder board.
Distribution	a) Distribution and supply bundled in eight distributors created in 1990 as joint stock companies. Approximately 50% state-owned. b) Distributors obliged to purchase IPP generation at prices comparable to prices from CEZ, a.s. c) Wholesale and retail prices are the same for all distributors despite cost differences.	a) Distribution services managed by independent operator. b) Regulated non-discriminatory third party access. c) Distributors will be able to contract with any generator. d) Distribution tariffs expected to reflect differences in costs. e) Distributors will be obliged to purchase electricity generated from CHPs and renewable sources.
Supply and End-User Choice	a) Distributors are also suppliers. b) A small number of wholesale electricity traders. c) Retail tariffs are regulated.	a) Phased implementation of end-user choice according to annual demand: above 40 GWh in 2002, above 9 GWh in 2003, above 0.1 GWh in 2005, all customers in 2006. b) Distributors licensed to act as exclusive, regulated suppliers for captive customers. c) Prices for eligible customers unregulated. d) Tariffs for captive customers expected to reflect cost differences among distribution companies.
Regulator	Energy Regulatory Administration sets prices that are approved by Ministry of Finance.	New sector regulator, Energy Regulatory Office (ERO), sets tariffs for access and use of networks, market operator and captive customers.
International Trade	a) High-voltage grid trade limited to CEZ, a.s. b) Limited MV (110 kV) direct imports by distributors.	a) Open access to export electricity. b) Imports open but subject to reciprocity conditions. c) Temporary limit on imports to protect domestic companies/consumers against adverse financial impact.
Public Service Obligations	Distributors obliged to serve consumers.	Distributors obliged to serve captive customers and provide access for eligible customers. Distributors who have to supply beyond scope of their licence may receive compensation through distributors fund.
Renewables	Distributors obliged to purchase electricity generated from CHPs and renewable sources.	No change.

Source: IEA.

- When the environmental effects of electricity generators in the exporting country are not comparable to the rights and obligations of generators and eligible consumers in the Czech Republic;
- In addition, until 1 January 2005, the act empowers the MIT to limit imports on the basis of "danger that the safety and reliability" of the Czech electricity system may be affected.

- The distributors will have an obligation to serve captive consumers. A separate fund, provided by distributors and administrated by ERO, is available to compensate suppliers required by the regulator to supply electricity to customers whose suppliers are unable to fulfil their obligation.

- Generators of electricity from CHP and from renewable sources will have the right to sell their electricity to the local distributor.

Privatisation

Although the electricity sector had been partially privatised in the early 1990s, the government decided in 1998 to consider a process for selling the rest of its shares in the sector. From the outset, the government made clear that the privatisation would need to meet a number of objectives, including the maximisation of revenues, the assurance of sector stability, and assurance that there would be no adverse impact on competition.

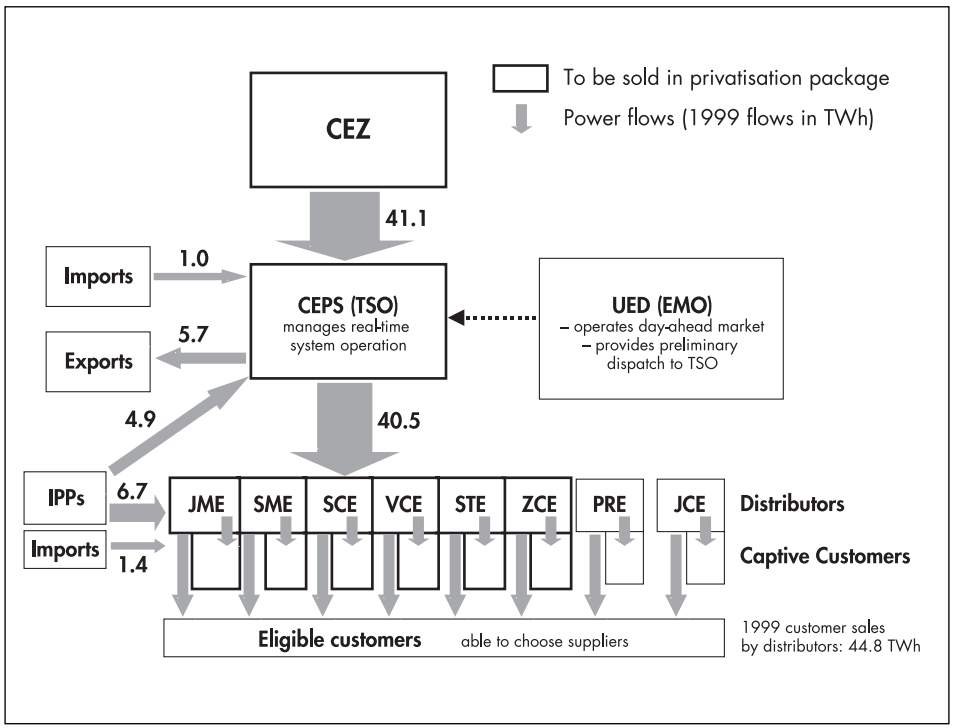
Although the government relinquished majority shareholdings in the distributors, it retained a large minority shareholding of just under 50% through the National Property Fund (NPF). Through CEZ, a.s., the government began to re-acquire shares in the distributors in order to include distribution as part of a privatisation package. Two options for privatisation were actively considered: one in which CEZ, a.s. would be sold separately from the distributor shareholdings, and another whereby CEZ, a.s. and the distributors would be sold as a single package. The Ministry of Finance favoured the former method as maximising revenues, whereas the Ministry of Industry and Trade favoured the latter as it would ensure greater stability in the sector. The Office for the Protection of Economic Competition wanted the sales to guarantee the vertical separation of generation from transmission.

In late 2000, the government decided to sell 64% of its 67% stake in CEZ, a.s. and all shareholdings in six regional electricity distributors (in which it has a majority) to one strategic investor by 2002. The NPF's stakes in the other two regional electricity distributors, Prazska Energetika (PRE) and Jihoceska Energetika (JCE), will be disposed of separately. The new owner will also acquire the transmission subsidiary, CEPS. However, the government has stated that a condition of the package sale is that CEPS be sold off separately within a year of the privatisation. It may also require the new owners to enter into long-term contracts with coal producers to ensure production.

The government believes that selling the assets of CEZ, a.s. and the distributors as a single package would enable it to make substantial proceeds and ensure the stability

of the sector. It also believes that the package sale is consistent with the pattern of other vertically-integrated utilities in Europe which increase in size through mergers and acquisitions, instead of being broken up. The government is also confident that the regulated third party access scheme and a separate transmission subsidiary are sufficient to ensure competition in generation and supply, regardless of the vertical integration and CEZ's large market share. Figure 20 illustrates the market structure showing the companies that will be sold in the privatisation package.

Figure 20
Czech Electricity Market Structure
(partial liberalisation, 1999 power flows in TWh)



TSO: Transmission System Operator.
EMO: Electricity Market Operator.
IPPs: Independent Power Producers.
Source: IEA.

CRITIQUE

Electricity sector performance has substantially improved over the past decade. The government has raised overall electricity prices to cover costs and is now in the process of rebalancing electricity tariffs. Following a substantial investment (CZK 48 billion) by CEZ, a.s. and even larger investments (estimated at

CZK 60 billion) by other power producers and industries, there has been a large reduction in emissions of SO_x and particulates as well as significant reductions in NO_x emissions. New legislation sets out the legal and regulatory framework to liberalise the Czech electricity market and to bring it in line with the EU Electricity Directive. This legislation has a number of positive features, including a plan that anticipates liberalising all customers in steps, opening the transmission system to regulated third party access, and the establishment of an independent regulator. Structural reform of the existing power system will separate transmission from generation and create a transmission system operator and a government-owned market operator.

However, more work is needed to ensure successful implementation of market liberalisation. While the most important cross-subsidies have been addressed, regulated prices must reflect differences in costs by location and by time of use. The decision to privatise CEZ, a.s. and the government's shareholdings in six out of eight distributors as a single package will leave ownership of the Czech electricity sector very concentrated. The plan to require the sale of CEPS will help reduce concerns about vertical integration of the industry. Nevertheless, the dominant position of CEZ, a.s. in generation will require careful monitoring to avoid abuse. Non-discriminatory access by all players to transmission, and particularly to distribution, must be ensured. Access to neighbouring EU markets, which could provide significant competitive pressure on the Czech market, is not completely open to Czech power producers or customers. The new Energy Regulatory Office will face many challenges in further adjusting prices and addressing potential concerns about market power.

The Czech electricity system has substantial excess capacity and the commissioning of the Temelín nuclear power plant will increase this overcapacity by at least 15%. Furthermore, despite low operating costs, amortising Temelín's capital costs (total cost: CZK 99 billion, plus CZK 10 billion of unamortised interest) will create a significant financial burden for CEZ, a.s. This financial burden will no doubt be reflected in the sale price of the company upon privatisation.

Excess capacity and certain clauses of the new Energy Act will also affect the composition of power generation. The relatively low fuel cost of the Temelín plant means that once it is brought into service, it will operate as a baseload electricity generator. As neither domestic demand nor exports are likely to increase rapidly, CEZ, a.s. should reduce the use of its brown coal-fired power plants by 20%, despite recent substantial investments at these plants to cut emissions. In June 2001, CEZ, a.s. announced a proposal to shut down in 2002 three high-cost generating plants amounting to 1,125 MW. Some independent power producers could also be affected by Temelín's operation. However, since the Energy Act requires distributors to purchase electricity produced in combined heat and power facilities, this effect is expected to be quite limited. The Dukovany nuclear plant is being upgraded so that it will be able to follow electricity load in anticipation that it, rather than coal plants (which have higher variable costs), will reduce capacity during low demand periods. Forcing nuclear plants to follow load demonstrates the cost burden imposed by the CHP requirement. It also implies that there is limited flexible

capacity in the Czech electricity system, suggesting that new peak capacity may be needed long before new baseload capacity is required.

The government is committed to cost-reflective pricing and large price increases for consumers through 2002. Rebalancing tariffs in advance of the market opening is essential and should be completed by the end of 2002. Otherwise, liberalised consumers (who currently subsidise households) will have an additional incentive to switch away from the distribution companies. However, cross-subsidies may remain under the current tariff structure, notably for space heating.

Ultimately, distribution tariffs will need to reflect costs. Currently, there is a single set of national retail tariffs even though there are eight distributors with varying cost structures. After realigning tariffs between customer groups, the regulator will need to ensure that the individual distributor tariffs reflect individual costs, both in their load profile and in the costs of distribution. The government/regulator intends to use a modified price cap system to control prices for distribution.

Another step to encourage cost-reflective pricing would be more time-of-use pricing of power. As significant growth in the commercial and residential share of total demand can be expected to continue, much sharper peaks in daily demand will follow. Prices of electricity sold to distributors for their captive customers should reflect differences in electricity prices according to time of use. This would send proper price signals to customers and encourage more economically-efficient demand.

The introduction of new tariffs for ancillary services (reserve, voltage support) for both CEZ, a.s. and IPPs will be a positive step in encouraging cost-reflective pricing. However, there is a lack of transparency concerning the conditions to be enforced, notably price levels. The $4/MWh tariff announced by CEPS appears much higher than in many other countries, especially considering the relatively low cost of generation in the Czech Republic. This tariff will benefit the provider of the services, CEZ, a.s. This compares with the costs of ancillary services in the Australian national market, also a low-cost, coal-based power system, which are in the range of $1.30-$2.30/MWh. A recent survey of European transmission systems reported a similar range, even when a large component of power is delivered from distributed generation. The services tariff for the Dutch system is approximately $1.50/MWh. CEPS tariffs need to be carefully reviewed by ERO to ensure that they reflect costs. Over the medium term, the tendering process proposed by CEPS should help reduce costs.

The government plans to privatise CEZ, a.s. together with six of the eight distribution companies. This leaves open the option of vertical re-integration by the buyer and raises concern that this may hinder competition in the electricity market. The government's intention to require the new owner to sell CEPS as a separate company will help stem concerns about access to transmission, by removing the incentive for the transmission business to favour one generating company over another. However, concerns about non-discriminatory access to distribution still remain. Furthermore, the privatisation plan does not allow for

creating separate generation companies to compete with one another in the Czech market. In the government's view, existing IPPs and electricity imports allow for sufficient competition in generation prices.

Overcapacity and the dominant position of CEZ, a.s. (69% of sales in 2000) may lead to a fall in electricity prices, making some IPP/CHP uneconomic. A strong and effective independent regulator will be required from 2001 onwards and with this in mind, ERO is preparing minimum buy-back electricity tariffs for CHP and renewables. The Energy Act protects IPP/CHP plants by requiring distributors to purchase their energy. However, this could result in electricity generated from relatively high-cost coal-fired plants being dispatched before that generated by nuclear plants with low fuel costs. Under these circumstances, any requirement for CEZ, a.s. to purchase large quantities of coal from producers could be counterproductive. In any event, this protection for CHP can only be a short-term remedy since, once the market is fully liberalised, all customers will be able to enter into their own supply contracts. A system that gives preferential access to IPP/CHP rather than a purchase requirement would be more compatible with the liberalised market.

The new regulator has the power to decide whether to permit the holder of a distribution licence also to hold licences for generation and electricity trading. Given the dominant position of CEZ, a.s. in the generation market, it seems desirable for the regulator to insist that the distribution licensees be forbidden to hold significant generation assets. Also, contracts between CEZ, a.s. and the distribution businesses should be non-exclusive and distribution companies should be able to supply clients outside their geographical area. Beyond these regulatory measures, the regulator will also need to monitor the behaviour of firms to see if they are purchasing electricity competitively for their protected customers. If the government is successful in creating a competitive generation market, market prices for generated electricity will serve as useful indicators for comparing the cost of electricity purchased by the firms. Another technique is to compare the prices obtained by the different distributors and regulate prices according to this "yardstick".

Developments in the Czech wholesale market will also need to be effectively regulated. The current overcapacity means that average prices for power should fall for liberalised customers in the short term and this should eliminate some existing capacity. As load increases, however, pressure for market prices to increase will grow. An effective and independent monitoring system is necessary to assess whether prices being set in the market reflect market conditions.

To ensure non-discriminatory access to the networks, it is important that these networks be unbundled as separate corporate entities from the competitive businesses of generation and supply. Because of CEZ's dominance in generation, the government must carry out its plan to have CEPS sold off as a separate company.

As these retail supply businesses begin to compete for liberalised customers, avoiding discrimination by the distribution businesses in favour of their affiliated supply businesses will become an important regulatory issue. While regulatory

experience relating to the electricity sector is limited, it suggests that operating distribution and supply as completely separate businesses increases confidence in the market and that this benefit outweighs the increased administrative costs of separation.

International electricity trade is a serious concern for the Czech Republic. With the new nuclear plant at Temelín coming on stream, there will be a very large surplus capacity. There is potential for selling the surplus capacity to European Union countries. But, until the Czech Republic becomes a member of the European Union, its access to the European market is not guaranteed and can be adversely affected by policies of EU member states. For example, after the initial start-up of the Temelín plant, the Austrian government announced that it would not permit any new import contracts from the Czech Republic. Uncontracted transit flows through the Czech system also limit opportunities to export electricity commercially. Finally, excess capacity in Central Europe, notably in Germany, means that prices in this major neighbouring market are expected to remain low for some time.

The new Czech Energy Act contains restrictions on imports of electricity. Imports are potentially an important source of competition, given the dominance of CEZ, a.s. generation yet. Provisions to limit electricity imports on environmental grounds are difficult to interpret and enforce, and can adversely affect the development of mutually beneficial trade.

Despite these difficulties, over the medium term both the Czech market and interconnected markets would benefit from stronger links and integration into the European market. Stronger interconnections would provide Czech electricity customers a greater opportunity to import electricity from neighbouring countries. This would act as a further discipline to CEZ, a.s., as it is destined to remain a dominant producer in the Czech energy sector. Integration into the European system should also help address issues related to compensation for uncontracted transit flows.

RECOMMENDATIONS:

The government should:

- ☐ Ensure that the Energy Regulatory Office has sufficient power and resources to carry out its functions while operating in a transparent manner.

- ☐ Ensure cost-reflective pricing for regulated electricity tariffs, particularly for ancillary services. Eliminate cross-subsidies between customer groups, uses (e.g. space heating) and distribution companies, and make sure that use of the networks reflects costs according to time of use.

☐ Encourage the use of incentive regulation for setting network tariffs.

☐ Ensure that transmission and distribution businesses remain unbundled as separate corporate entities, distinct from the competitive businesses of generation and supply.

☐ Monitor prices for captive consumers to ensure that they are fair market prices.

☐ Independently monitor the wholesale electricity market to detect and discourage possible abuses of market power, and require that contracts between CEZ, a.s. and the distribution companies be non-exclusive.

☐ Reconsider the obligation for electricity distribution companies to purchase electricity generated from combined production of heat and power (CHP) and from renewable sources.

☐ Avoid restrictions on free access to electricity imports.

☐ Investigate the possibility of expanding international interconnection capacities.

7

NUCLEAR

INTRODUCTION

Nuclear energy was first introduced in the Czech Republic 15 years ago. It supplied 20% of the country's electricity in 1999. This share is expected to reach 40% in 2002 with the commissioning of the new plant in Temelín.

FEATURES OF THE NUCLEAR SECTOR

Nuclear Power Plants

There are four nuclear units, all VVER/440/213 pressurised water reactors of Soviet design, located at Dukovany in Southern Moravia. The Dukovany nuclear power plant has a total capacity of 1,760 MW. The four units are owned and operated by CEZ, a.s., which is majority state-owned. A large programme to modernise and upgrade the Dukovany plant was begun in 1995 and should be completed by 2010. This programme, which will extend the lifetime of the plant to 2025, will cost an estimated CZK 20 billion for the period up to 2005, of which 6.7 billion has been spent so far. The Dukovany plant generates electricity at a cost of CZK 0.63/kWh, including money set aside for radioactive waste management and decommissioning.

A second nuclear power plant is under construction at Temelín in Southern Bohemia. Originally the government planned to build four Soviet-designed VVER-1000 units. Construction of the first two units started in 1986, in a regulated electricity market and at a time when electricity demand grew by between 2% and 3% per year. In 1990, however, the government decided to complete only two units, a decision that was reaffirmed in 1999 by the present government. The government also decided in 1993 to upgrade the design in order to meet international safety standards. The major design modifications, involving the core and instrumentation and control (I&C), were carried out by Westinghouse. The upgrade delayed completion of the plant and greatly increased its cost. The total cost of Temelín is estimated today at CZK 109 billion (CZK 99 billion, plus 10 billion of unamortised interest), representing almost 70% of total CEZ's investment in recent years. Power generated at the plant is expected to cost around CZK 1/kWh.

The two units have a capacity of 1.8 GW_e net. When they are fully operational, the share of nuclear energy in total electricity generation in the Czech Republic will be over 40%. Fuel loading for the first unit started in July 2000 and start-up tests at 12% of nominal power were completed in the autumn. In addition to a series of routine mandatory safety tests, an Environmental Impact Assessment to comply with EU standards must be completed before connecting the plant to the grid. In response to a request by Austria and Germany, which both opposed the commissioning of the

plant, the Czech government has agreed to allow a safety check to be conducted under the auspices of the EU before commercial operation of the plant is authorised. Previous safety reviews by the Czech safety authority, the International Atomic Energy Agency (IAEA) and the Western European Nuclear Regulators' Association (WENRA) have been satisfactory. But the IAEA and WENRA indicated in their last reports that a few minor safety issues still need to be resolved to reach a safety level comparable to that of currently-operating reactors in Western Europe. GRS, the German nuclear safety office, has also pointed out several outstanding safety issues.

Following a new international review that was to take place in spring 2001, the commissioning of the first unit is now scheduled for early 2002, after a series of technical difficulties. Commissioning procedures for the second unit are set to start at the end of 2001.

The technical and safety performance of the nuclear units in operation at Dukovany is satisfactory according to IAEA and WENRA. The average availability factor of the Dukovany plant exceeds 85%. The second WENRA report on safety in the seven countries applying to join the European Union, published in November 2000, stated that Dukovany would reach a safety level comparable to that of Western European reactors of the same vintage in 2004, upon completion of major steps in the upgrading programme.

The energy policy of the Czech Republic does not exclude the construction of new nuclear units in addition to Temelín, if they are needed. However, in light of the country's large excess of baseload electricity generation capacity, an additional nuclear power plant is unlikely to be built in the foreseeable future.

Uranium, Fuel Cycle, Waste Management

The Czech Republic started producing uranium early in the 20th century and large-scale production began in the 1950s. Uranium production capacity peaked at some 3,000 tU/year in the 1960s but dropped drastically, especially after 1990, because of the progressive exhaustion of economically recoverable resources. Uranium resources recoverable at less than $80/kgU are estimated at around 5,000 tonnes. Since 1990, the Czech authorities have gradually phased out uranium production; 19 of 20 mines were closed, and staff was reduced from 30,000 to less than 3,500. Dolní Rožínka, the only mine still in operation, produced 280 tU in 1999. This facility was supposed to close in 2002 but in November 2000 it was authorised to continue operating until the end of 2003, at the latest. According to the government, the two-year extension will enable faster restoration of mining sites in Northern Bohemia. In 1999, 350 tU were extracted from recovery works at old sites.

All uranium-related activities are carried out by the state-owned company Diamo s.p. The uranium produced is used entirely for fuelling operating nuclear units. The Czech Republic has no domestic industry for producing nuclear fuel or providing other fuel-cycle services such as conversion and enrichment, and there are restrictions on uranium imports. The fuel for Dukovany is imported from

Russia, where it is manufactured with Czech uranium. Its cost has been set off against the Russian debt to the Czech Republic. CEZ, a.s. has signed a contract with Westinghouse to buy five years' worth of fuel from its U.S. plants to supply Temelín.

In conjunction with the reduction of uranium production, a major programme of Diamo s.p. focuses on the decommissioning and restoration of closed mining and milling sites. It aims to mitigate the heavy damage done to the environment by past uranium production activities. The programme covers some 20 sites and is expected to last until 2040. These activities cost CZK 670 million in 1999, complemented by welfare payments of CZK 440 million.

The spent fuel from Dukovany will be stored on site for a period of 65 years, according to the current Czech policy on radioactive waste management. A recent rearrangement of the fuel assemblies has increased the capacity of the cooling ponds by about 90%, and the recent construction of an additional 600-tonne dry storage facility gives Dukovany adequate storage capacity until 2006. A plan to increase the storage capacity for spent fuel until the end of the plant lifetime has successfully passed an Environmental Impact Assessment. A repository for low-level radioactive waste from the power plant is also on the site. The interim storage capacity at Temelín is sufficient for nine years and will be expanded in due course.

The 1997 Atomic Act stipulates that the generator of radioactive waste is financially responsible for its management, from its origin to its disposal, including monitoring after closure of the radioactive waste repository. The Radioactive Waste Repository Authority (RAWRA-Sprava ulozist radioaktivnich odpadu), established in 1997 by the Ministry of Industry and Trade, is responsible for the safe disposal of waste. RAWRA funds its activities through a levy of CZK 50/MWh imposed on nuclear generators and passed on the end-user price. In 1999, a total of CZK 637 million (157 million in 1997, 632 million 1998) was collected from CEZ, a.s. and put into the nuclear fund, which amounted to CZK 1.46 billion in 1999. A programme for developing a spent-fuel and high-level waste repository in the Czech Republic was established in the early 1990s. A preliminary search for a site and repository design studies are being carried out under the auspices of RAWRA. A site is expected to be selected by 2024, with commissioning of the repository after 2065. The total cost of nuclear waste management has not been estimated with any precision up to now. CZK 347 million was allocated for spent fuel storage in 1999.

According to the Atomic Act, the operator of a nuclear facility is required to keep a financial reserve, under the control of the Radioactive Waste Repository Authority, to cover decommissioning expenses. The decommissioning of a nuclear facility requires a licence from the safety authority, which in turn requires a satisfactory Environmental Impact Assessment. The decommissioning costs for Dukovany have been estimated at CZK 12.5 billion (1999 value) and between CZK 11 billion and 12 billion for Temelín. CEZ, a.s. contributes approximately CZK 650 million annually to the financial reserve for decommissioning Dukovany. Levies for waste management and decommissioning are revised every five years. Table 12 indicates the various costs of the nuclear fuel cycle in the country.

Table 12
Nuclear Fuel Cycle, Generation and Waste Management Costs for Existing Units in 1999 (Dukovany NPP)

	Annual cost (1999) in CZK million	*Funded by*
Uranium production	750 (estimated net cost) + 1,110 (subsidies)	State budget
Nuclear fuel	1,465	CEZ, a.s.
Nuclear power plant operation	4,847	CEZ, a.s.
Modernisation and upgrading	1,000*	CEZ, a.s.
Reserve for waste management, decommissioning and storage	637 (RAWRA) 650 (decommissioning) 347 (storage)	CEZ, a.s.
R&D	104	State budget
Total	**10,910**	

* of a total of CZK 20,000 million to be spent up to 2005.
Sources: CEZ, a.s. annual report, country submission.

Regulatory Framework and Laws

Nuclear energy activities are regulated by the Act on Peaceful Uses of Nuclear Energy and Ionising Radiation and on Alteration and Amendments of Related Legislation, usually called the Atomic Act, which was adopted and entered into force in 1997. Additional legislation includes the Act on Environmental Impact Assessment that sets out the procedure to be followed by each nuclear installation before commissioning. Amendments to the Atomic Act have been proposed to harmonise safety regulations further with EU legislation.

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

The Atomic Act established the State Office for Nuclear Safety (SÚJB/SONS) as the competent body for the licensing and inspection of nuclear facilities. SONS issues all technical safety regulations. The management of radioactive waste is also governed by the Atomic Act, which sets out the general responsibilities of waste generators.

The Czech Republic has been a party to the 1994 Convention on Nuclear Safety, since 1995. It approved the Convention on the Safety of Spent Fuel Management in 1997 and the Convention on Safety of Radioactive Waste Management in 1999. The Czech Republic has also acceded to both the 1986 Convention on Early Notification of a Nuclear Accident and the 1986 Convention on Assistance in the Case of Nuclear Accident or Radiological Emergency. The Atomic Act incorporates third-party

liability provisions in accordance with the Vienna Convention on Civil Liability for Nuclear Damage under which the nuclear operator must accept its responsibility for damages caused to any third party. This liability is limited to CZK 6 billion per nuclear installation and CZK 1.5 billion for other facilities, including transport. The nuclear operators must be insured for liability. The State is obliged to compensate for amounts exceeding insurance coverage.

Research and Development

Most nuclear energy-related R&D is carried out by the Nuclear Research Institute Rez, a.s. (NRI), founded in 1955. NRI is 24% owned by the Czech government, with CEZ, a.s. holding 27%. Slovak el. Works (SEP) holds 27%; Škoda, 20%; and others, 2%. NRI deals in particular with materials, reactor physics and fuel chemistry.

The annual government budget for nuclear energy R&D is around CZK 100 million. In addition, the government provides some CZK 4 million per year for R&D on nuclear safety issues, which are carried out under the State Office for Nuclear Safety.

CRITIQUE

The nuclear power programme of the Czech Republic has increased diversity and security of energy supply while promoting the suppression of greenhouse gas emissions. According to international organisations, the safety and technical performance of the country's operating nuclear units have been satisfactory. The planned upgrade of Dukovany is expected to improve its safety. The commissioning of the first reactor at Temelín will come only after completion of an Environmental Impact Assessment and a safety check conducted by the European Union. The 1999 decision of the Czech government to continue construction of the plant was based to some extent on the fact that most of the budget had already been disbursed. The Czech authorities can be commended for their efforts to ensure that appropriate environmental and safety measures apply to existing and future nuclear power plants.

According to CEZ, a.s., the Dukovany plant has the lowest marginal generation costs (CZK 0.113/kWh) among the units connected to the national grid. Its total cost, including provision for nuclear waste management and decommissioning, and upgrading is estimated at CZK 0.78/kWh. The generation cost of Temelín will be higher, at around CZK 1/kWh. The construction of the Temelín plant was decided in the first half of the 1980s in a very different context from today. The country's total generation capacity is starting to grow again after several years of stagnation, and the plant will bring it to 17 GW in 2002. Peak domestic demand is around 10 GW today and growing slowly. Moreover, most of the power plants in operation in the Czech Republic are designed for baseload use. The government may have to cope with the social distress caused by shutting down non-competitive non-nuclear power plants and the closing of some brown coal mines.

The main issue in the short term will be to find a market for the baseload electricity generated by Temelín. Domestic wholesale prices are currently in the range of CZK 1/kWh, and export prices to Western Europe dropped by 25% in 2000 to reach an average of CZK 0.57/kWh as a result of overcapacity. Owing to its low marginal costs, Dukovany can be competitive in both domestic and export markets. Temelín can compete in the domestic market only.

The government has announced its intention to include the two nuclear generation plants in the privatisation of CEZ, a.s. Other countries with more liberalised electricity markets, like the United Kingdom and Hungary, have kept nuclear generation under state control. The Czech authorities should ensure that, within the liberalised market and under private ownership, nuclear safety levels remain adequate, through effective regulation by the State Office for Nuclear Safety.

Dukovany and Temelín will be sold at a price reflecting the market value of nuclear electricity in the Czech and export markets, taking into consideration running costs, future capital requirements, risks and the supply-demand balance. Owing to Temelín's high generation costs and the country's large capacity surplus, investors may find Temelín risky and worth only a fraction of its past investment cost. So, in order to conclude the privatisation, the government will probably have to sell CEZ, a.s. for a lesser amount than it once hoped. Temelín's total cost is likely to be a significant financial burden for CEZ, a.s. or the State.

The Czech government has given priority to the cleaning and restoring of closed uranium mines. These activities need adequate funding to be completed. Uranium recovered from this process contributes 55% of total uranium production. The government has decided to extend the operation of the Dolní Rožínka mine until the end of 2003 at the latest. The cost of the uranium extracted there is estimated at $70 per kgU, which is much higher than the oversupplied market price of $26. The Czech authorities should consider lifting the restrictions on uranium imports. This would save CZK 2 billion, which could be used for the costly and long-term restoration of sites. In a similar situation, in December 2000, Spain closed its open-cast uranium mine, whose production cost was around $60 per kgU, and decided to purchase uranium on the international market. In the former East Germany, the uranium company WISMUT was transformed into a clean-up company at the beginning of the 1990s.

CEZ, a.s. believes that the current levy for waste management as well as financial reserves for decommissioning at Dukovany are sufficient. But the costs for a high-level waste repository are not yet clear and the cost estimate for decommissioning appears to be below international estimates ($150/kW for Temelín vs. $330 to 2,100/kW [20]). Therefore, the government should continuously verify that funds for waste management and decommissioning are adequate.

20. *Nuclear Power in the OECD*, IEA/OECD Paris, 2001. The diversity of technologies and size of nuclear plants, and decommissioning methods largely explain this large spread of costs.

Nuclear power will continue to be a major component of the Czech energy supply. Thus, the government has important responsibilities in the fields of safety, radioactive waste management, decommissioning, legal and educational infrastructure, and basic R&D.

RECOMMENDATIONS

The government should:

- ☐ Ensure the completion of the Environmental Impact Assessment and the international safety check for the Temelín plant according to EU standards.
- ☐ Make sure that, within the liberalised market and under private ownership, nuclear safety remains high, and that funds for future waste management and decommissioning remain adequate and guaranteed.
- ☐ Pursue the radioactive waste management programme aimed at creating a repository for high-level waste.
- ☐ Pursue the clean-up of the closed uranium mine sites.
- ☐ Continue to ensure and, if necessary, improve the independence and authority of the State Office for Nuclear Safety.
- ☐ Ensure that government research and development in the nuclear energy field is appropriate in size and content for the country's nuclear energy programme.

8

DISTRICT HEATING

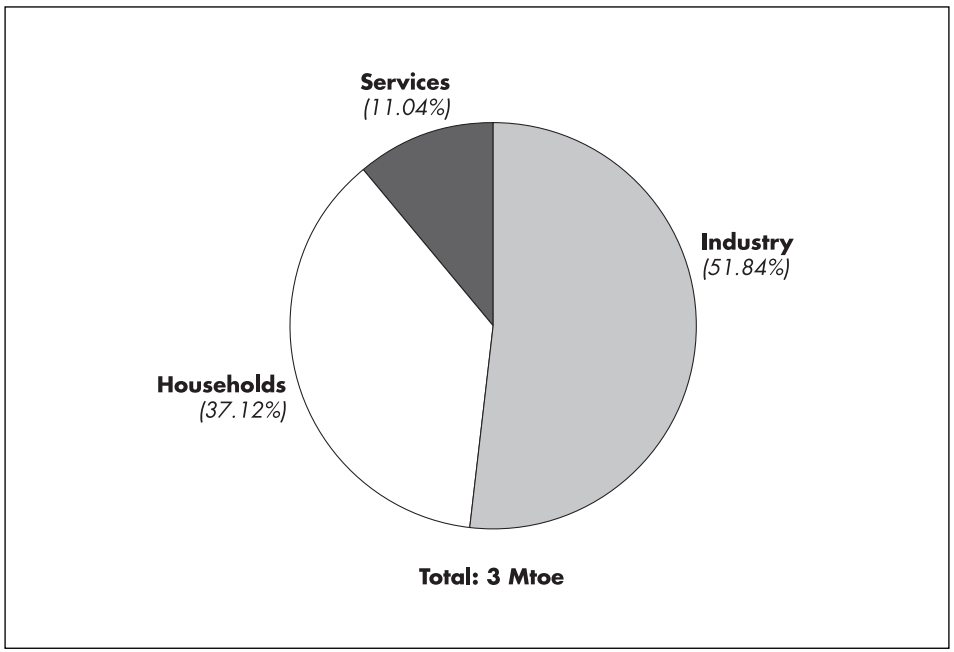
MARKET OVERVIEW

Heat Demand

District heating is an important part of the Czech Republic's energy system, with 30% of the 10 million households connected to a local district heating network providing 20% of the sector's final energy consumption. Heat also accounts for 12% of energy consumption in the service sector and 14% in the industry sector. Household consumption is subject to large seasonal variations and minor daily variations while consumption by industry is more constant. In 1999, total heat consumption amounted to 3 Mtoe or 12% of TFC. The MIT forecasts a rapid growth of heat consumption to 4.7 Mtoe in 2010, up 56% from 1999.

Figure 21 indicates the breakdown of heat consumption by sector. Industry consumes more than half of the total heat produced. The breakdown of heat consumption by sector in OECD countries is 30% for industry, 47% for household and 16% for services.

Figure 21
Heat Consumption by Sector, 1999



Source: *Electricity Information*, IEA/OECD Paris, 2000.

Heat Supply

In 1999, total installed heat capacity was 46,000 MW_t and electric generating capacity 5,100 MW. Heat production amounted to 3.75 Mtoe, of which 45% was for district heating using CHP and 55% for boilers (heat only). Heat originates from various sources:

- Power plants operated by CEZ, a.s. and IPPs (CHP) produced 13.5 TWh of electricity and 2.78 Mtoe in heat recovery.
- District heating plants (heat only) produced 0.97 Mtoe.
- Industrial and commercial CHP produced net 0.2 TWh of electricity[21].

Coal, of which ¾ is brown coal, is the dominant heating fuel with a share of 73% in 1999; natural gas remained stable at 18%, oil dropped to 5% and renewables and waste have increased to 4%. The generation and network systems are generally 30 to 60 years old, which has a negative impact on efficiency, availability and maintenance.

The first co-generation (CHP) unit was installed in 1922 but the first gas-fired CHP unit was commissioned as recently as 1991. CHP units account for 75% of total heat produced.

Because of differences in fuel use, technology, age and condition of installation and the length and state of networks, energy efficiency ranges from 90% in the case of the new gas-fired CHP units to less than 50% in the case of the older heat-only units. The length of the distribution systems is approximately 8,000 km. Steam systems are progressively being replaced by warm water systems.

FEATURES OF THE DISTRICT HEATING SECTOR

Structure and Ownership

District heating systems are organised locally and operate in about 50 cities. Individual heating companies are also power producers (IPPs). The sector was fully privatised in 1992-1994 through voucher privatisation, although few units belonging to the army, schools, state hospitals and other health care facilities remain under state ownership. There have been significant foreign acquisitions of companies, as detailed in table 14.

21. Within the Unipetrol group, Chemopetrol, a.s. sold 0.19 TWh, Kaucuk 0.115 TWh. Another major autoproducer is Sokolovská uhelná, a.s.

Table 13
Fuel Input and Energy Output for CHP and Heat-Only Plants, 1998

	CHP	*Heat-only plants*	*Total*
Fuel input (Mtoe)			
Hard coal	1.40	0.11	1.51
Brown coal	3.25	0.19	3.44
Natural gas	0.73	0.65	1.38
Other gas	0.30	0.14	0.44
Biomass-waste	0.18	0.03	0.21
Others	0.23	0.00	0.23
Total	**6.08**	**1.12**	**7.21**
Energy output			
Electricity (TWh)	13.5	–	13.5
Heat (Mtoe)	2.78	0.97	3.75
Total (Mtoe)	**3.94**	**0.97**	**4.91**
Efficiency ratio (%)	65	86	68

Source: *Electricity Information*, IEA/OECD Paris, 2000.

Regulatory Framework

The new Energy Act has regulated the sector since January 2001. The construction of new heating plants above 30 MW_t capacity must be approved by the MIT and smaller units are approved by regional authorities. Criteria for approval in both cases include the use of domestic and local energy sources, energy efficiency and solvency of the investing company.

There is no compulsory buy-back tariff between heat generators and heat distributors; prices are fixed by contract. Electricity sales comprise up to 80% of district heating revenues. The liberalisation of the electricity market is likely to lower electricity prices and reduce the revenue of CHP operators. In order to mitigate the impact, the new Energy Act includes an obligation for transmission and distribution networks to purchase electricity generated from CHP, so co-generators and buyers will have to negotiate prices. The new act also contains an obligation to purchase heat generated from CHP, industrial processes, renewable energy and environmentally clean incineration.

Fixed prices for heat for industry were eliminated in 1994 but pricing rules with cost formulas remain. Since January 2001, the Energy Regulatory Office has regulated household tariffs using a cost-plus-fees method for each network. Table 15 shows the distribution prices used to calculate the end-user tariff in a selection of towns.

Table 14

Structure and Characteristics of Major District Heating Companies, 1999

Towns (region)	*Company*	*Ownership*	*Capacity*	
			Heat (MW_t)	*Electricity (MW)*
Ostrava, Olomouc and 4 other towns in Northern Moravia	Moravskoslezske Teplarny, TEK, OLTERM	Dalkia (98.2% in MST and TEK), 66% in OLTERM	3,070	360
Prague	Prazska Teplarenska (PT)	EOP (47.4%), city of Prague (25.6%), GESO AG (21.6%), NPF (3.9%)	2,115	138
Pardubice (Eastern Bohemia)	EOP	National Power (95%)	748	362
Plzen, Otrokovice and others	Moravske Teplarny, Plzenska Energetika, Energetika Chropyne, Cinergetika U/L, Teplarna Otrokovice (TO)	Cinergy (100% in all subsidiaries except 11% in TO)	1,000	440
Liberec and others	Teplarna Kromeriz a.s (TK), United Energy a.s-UE, Teplarna Liberec (TL), Jalonecka Teplarenska (JT), Teplo Branany, s.r.o (TB)	Horizon Energy (100% in TK, 85% in UE, 70% in TL, 49% in TB, 66% in JT)	236	1,256
Brno	Teplarny Brno, a.s.	TXU Czech Investments, Ltd. (83,9%), City of Brno (10,4%)	1,016	192
Ceske Budejoovice	Teplárna Ceske Budejovice, a.s.	City of Ceske Budejovice (80%), Energetika Invest (17,5%), others (2,5%)	480	65

Sources: Annual reports.

Table 15

Average Heat Prices per District Heating Network, 1999

Town	*CZK/GJ*
Brno	289-349
Ceské Budejovice	312
Ceský Tešín	305
Decín	350
Hradec Králové	200
Olomouc	297
Ostrava	300
Otrokovice	150
Pardubice	193
Prague	225
Prague 10	328

Source: Ministry of Industry and Trade.

Tariffs for 50% of households not having individual meters and flow regulation are calculated based on size of space and/or number of persons per apartment. This complicated tariff structure does not accurately reflect heat consumption and does not encourage energy saving. Heat subsidies were abolished in 1996 but the VAT rate remains at 5%.

Energy Performance Contracting (EPC) in Heat Supply

Definition

Energy performance contracting is a way of handing over responsibility for a facility's energy performance and equipment upgrades to an energy services company (ESCo), which provides a complete service for a contracted price. The ESCo upgrades equipment such as heat boilers, building controls and lighting, and pays for the upgrading through energy and operating savings over the life of the contract. The savings in energy bills thanks to the more efficient equipment are shared between the facility owner and the ESCo under terms of the agreement.

The following ESCos are present in the Czech Republic: Landis & Staefa ESCo (CZ); EPS CR; Dalkia; and Harpen CR, s.r.o. Most of them benefited from equities from the European Bank for Reconstruction and Development (EBRD). As an example, Energy Performance Services Czech Republic (EPS CR), a subsidiary of a privately-owned ESCo based in the United States, implemented EPC projects in two large hospitals, the Bulovka Teaching Hospital in Prague and the Jilemnice District Hospital in northeastern Bohemia. Both hospitals needed a significant upgrade of their central heating systems but lacked funding. In the case of the Bulovka Hospital, total costs for modernising the central heating system amounted to about $2.7 million. The modernisation produces annual energy savings of about $700,000, corresponding to a four-year payback.

Source: IEA DSM Implementing Agreement, ESCo (Task X).

CRITIQUE

During the last decade, district heating in the Czech Republic achieved notable improvements in energy efficiency, service to customers and reduced environmental impact, thanks to the restructuring and refurbishment of district heating companies led by private operators, the phasing-out of direct subsidies to households and the partial deregulation of industrial heat pricing.

On the demand side, however, the delay in reforming the regulatory framework for households has kept prices distorted in favour of households. Indeed, natural gas and electricity heating tariffs for households are cross-subsidised at the expense of

industry and CHP, and discriminate against the use of heat. The price disadvantage of heat is not eliminated by the reduced VAT rate of 5% compared to the full rate of 22% for electricity and natural gas. The government is committed to abolishing electricity and gas price distortions by 2002, which would allow healthier competition between heat and other energies in the household sector. On the supply side, coal prices for district heating plants are much lower than natural gas prices at a ratio of 1 to 3, as they do not integrate all externality costs. Gas tariffs are also distorted at the expense of large consumers such as district heating units.

A major obstacle to investment in energy efficiency for district heating networks and large energy consumers is control of the household price using the cost-plus-fees method, which gives operators no incentive to be more efficient. Price deregulation, with an appropriate ceiling (i.e. price cap per square metre), would encourage the networks to improve their efficiency using third-party financing, which would allow investments to be paid back by the savings on energy and maintenance. The introduction of metering in buildings provides the opportunity for significant energy savings. During the investment reimbursement period, the increase in the unit price should be balanced by the decrease in energy consumption. At the end of this period, costs savings are generally shared with customers.

The Energy Regulatory Office plans to abolish the current cost-plus-fees method for determining tariffs at the end of 2001. It will be replaced by an incentive-based method similar to that proposed for electricity.

Co-generation in district heating could bring valuable economic and environmental advantages when minimum conditions are met: balanced and stable electricity and heat demand, appropriately developed infrastructure, and a well-designed regulatory environment. Incentives to develop CHP should be established in a cost-effective way and should not include the obligation to use local and domestic resources since that obligation discriminates against natural gas.

Electricity and gas price adjustment as well as liberalisation of the price of heat for households will encourage investment in the modernisation of ageing, inefficient and polluting facilities using brown coal or heavy oil.

The current overcapacity of electricity, which the Temelín plant will increase, would be worsened by the planned obligation to purchase electricity from CHP (without compulsory tariff levels) and would increase the cost of supply.

RECOMMENDATIONS

The government should:

☐ Eliminate distortions between natural gas and electricity tariffs.

☐ Lift the current price control of household tariffs while maintaining an established ceiling (price cap per square metre) to ensure that energy saving investments benefit both operators and customers.

☐ Promote cost-effective co-generation and metering at building level.

☐ Reconsider the obligation for electricity distribution companies to purchase electricity from CHP.

9

NATURAL GAS

MARKET OVERVIEW

Introduction

The country has long experience with gaseous fuels: Prague received its first town gas supplies in 1847. The Czech Republic has very limited natural gas reserves, and domestic production accounted for only 2% of supply in 1999. Deliveries from the then USSR, starting in 1967, were needed to develop the natural gas sector. In 1999, the share of natural gas in the Czech energy supply reached 20%.

Natural Gas Demand

Total annual consumption of natural gas increased by 46% in the Czech Republic during the last decade to reach 9.5 bcm (or 7.7 Mtoe) in 1999. Despite an overall decrease of TPES averaging 10% per year from 1990 to 1998, the primary natural gas supply rose on average by 5% per year. There are four major groups of gas users (Figure 22):

- **Industry:** 9,800 users consumed 3 bcm in 1999 (34% of the total). Demand increased by 0.8 bcm since 1990, mostly from light industry, as the share of heavy industry in total consumption decreased because of restructuring and the closure of uncompetitive units. The need to comply with environmental emission standards for energy facilities above 5 MW capacity fostered a switch from coal and oil to gas in both light and heavy industries.

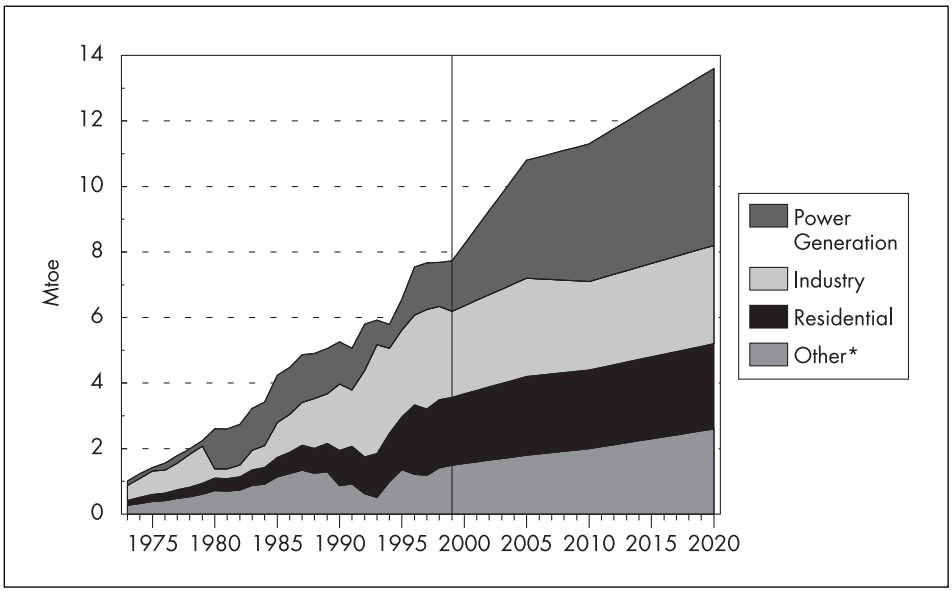
- **Households:** Some 2.38 million households (70% of all Czech households) consumed 2.7 bcm in 1999 (or 27% of the total), mainly for space heating. Consumption increased significantly (plus 12 percentage points or 1.6 bcm) during the period 1990 to 1999 owing to the extension of networks, the replacement of town gas, which was phased out in 1996, and incentives to switch from coal to natural gas.

- **Services:** The consumption of natural gas by the services sector (133,480 customers in 1999) increased by 19.4% (or 0.9 bcm) in the period 1990-1999.

- **Power generation and district heating:** The share of the energy sector in total natural gas consumption declined from 24% to 20% between 1990 and 1999, but remained stable in volume. District heating and CHP account for the largest share of consumption. Power generation has become a marginal user, with only 1.5% of total gas consumption.

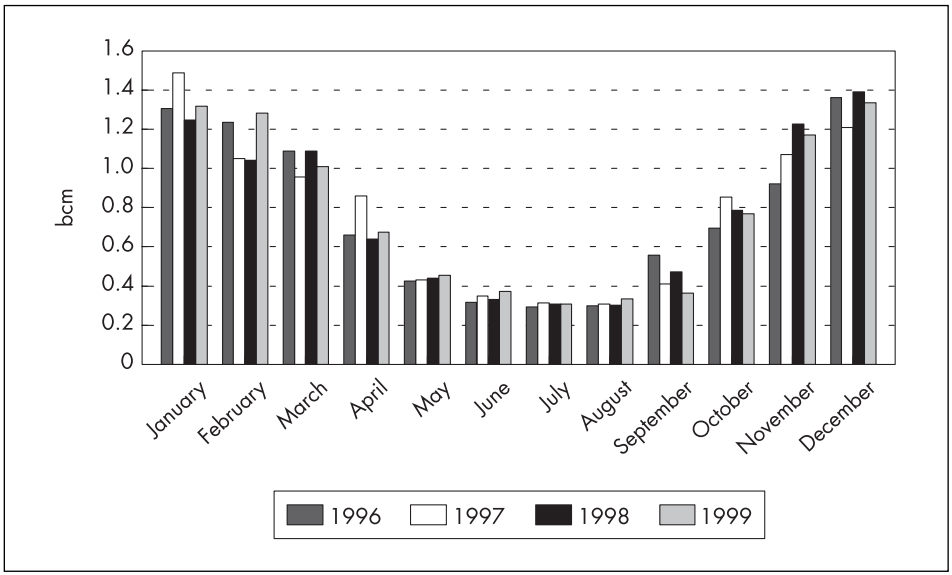
The increase of space heating in the household and services sectors has increased the seasonal character of natural gas demand and heightened the winter peak. In 1998, the ratio between peak demand in December and off-peak in July was 4.6 to 1 (Figure 23).

Figure 22
Natural Gas Demand, 1973 to 2020



* includes transport, commercial, public service and agricultural sectors and other transformation and energy consumption.
Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001, and country submission.

Figure 23
Monthly Natural Gas Consumption, 1996 to 1999



Source: Transgas.

Demand Forecasts

The MIT forecasts natural gas demand will increase by 47% from 1998 to 2010, reaching 13.8 bcm (11.3 Mtoe), or 27.5% of TPES, the figure used in a "high" scenario by the state-owned gas supplier, Transgas. The forecasts are based on economic growth and the structural transformation of the main economic sectors. Total final consumption is expected to remain stable, at 6.6 Mtoe in 2010, while demand from the energy sector is expected to soar from 1.4 Mtoe in 1999 to 4.25 Mtoe in 2010, including 1.4 additional Mtoe from power generation and 1.45 Mtoe from district heating.

Supply and Trade

In 1999, imports covered 98% of total gas supply; 81% from Russia and 16% from Norway. The Czech Republic is a major transit country that plays a strategic role in European gas supply. Deliveries from Russia have increased regularly with a good record of reliability, reaching 52 bcm in 1999, of which 7.5 bcm were for domestic consumption and 44.5 bcm were in transit to Western Europe. Russian gas in transit through the Czech Republic represents nearly 25% of Western European imports (42% for Germany, 38% for Italy and 28% for France). It covers nearly 10% of Western Europe's total consumption. Transgas has signed transit contracts with Gazexport (Russian Federation) for two-thirds of the total gas transit and with the German companies Verbundnetz Gas, for 18%; Wintershall, for 15%; and Ruhrgas for 1%.

The Czech Republic relies heavily on imports. Czechoslovakia received its first deliveries from the USSR through the Brotherhood Pipeline in 1967. Until 1997, 99% of supply came from Russia. In 1999, 7.5 bcm were imported under three types of contracts between Transgas and the Russian natural gas sector (Gazprom, Gazexport and others). The three types of contracts are:

- **Commercial contracts:** Classic "take-or-pay" purchase contracts for payment in hard currency. In 1997, Transgas signed a three-year contract with Gazexport for annual deliveries of 8.4-8.6 bcm. In 1998, a new contract was signed with Gazexport for an annual supply of up to 9 bcm over 15 years. Prices are indexed on international fuel oil prices. This new contract, worth $10 billion, includes the possibility of renegotiation. Commercial contracts accounted for 7.3 bcm of deliveries in 1999.

- **Transit fees:** Transgas receives transit fees for the Russian gas piped through to Western Europe. These fees amounted to CZK 8.9 billion in 1999, and are partly paid in cash and partly deducted from payment under the commercial "take-or-pay" purchase contracts. At international prices, these volumes amounted to 2.5 bcm or one-fourth of total gas imports.

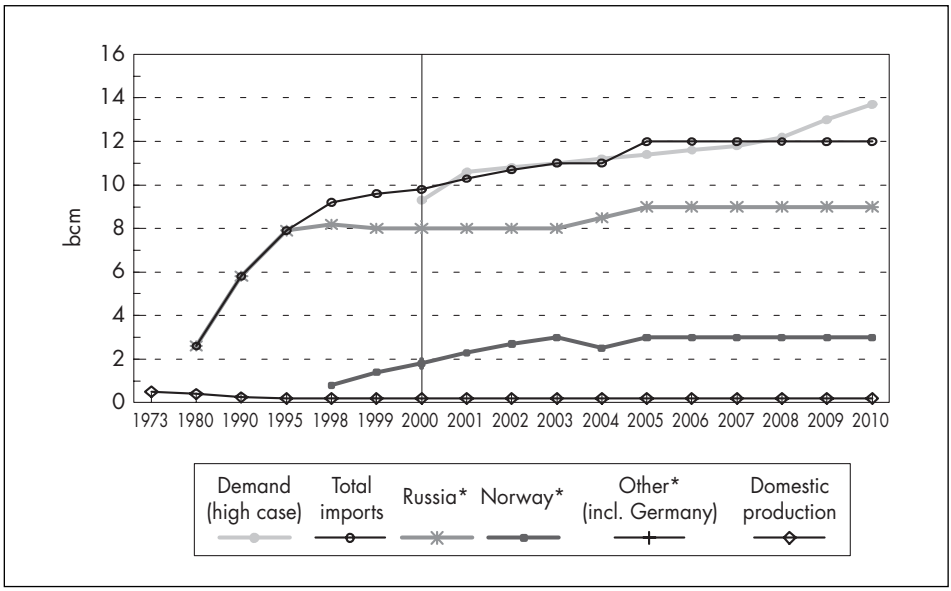
- **Yamburg contracts:** Transgas receives natural gas from Gazprom in exchange for services and the delivery of goods to Russia. This barter agreement was negotiated yearly and was supposed to end by 31 December 2000. The volumes supplied amounted to 0.2 bcm in 1999.

Diversification of supply began in 1997 with the signature of a 20-year supply contract with companies operating in Norway (Statoil, Norsk Hydro, Saga Petroleum and Total Norge) starting at 1.5 bcm and aimed at reaching 3 bcm from 2002 onwards for a total of 53 bcm. This contract will enable the Czech Republic to receive 25% of its gas supply from Norway in 2002 (15.5% in 1999). This amount, combined with 2.9 bcm of existing storage, contributes strongly to increasing security of supply. In addition, short-term supply contracts were signed in 1999 with Ruhrgas and BEB, which is owned by Esso and Shell. The Czech authorities' goal is to stabilise the share of Russian imports in total supply at 65-70% from 2010 onwards.

Domestic production of natural gas amounts to only 2% of total national supply (0.2 bcm in 1999). The company Moravske naftové doly, a.s., owned by SPP Bohemia, a.s. (49.9 %), Southern Moravian Gas (25%), Transgas (21.4%) and other shareholders (3.5 %), operates gas fields in Southern Moravia. The local gas distribution company is the sole client for domestic production.

As shown in Figure 24, current forecasts indicate that the imports of natural gas may well exceed domestic demand beginning in 2005 in the "high" scenario. However, the Russian and Norwegian supply contracts include a certain flexibility on volumes delivered in order to adjust to demand. Penalties can be applied if purchases fall below agreed limits.

Figure 24
Natural Gas Supply and Demand, 1973 to 2010



* imports
Note: the data for "Other" imports are negligible and therefore not apparent.
Sources: *Gas Information*, IEA/OECD Paris, 2000, and country submission.

The commissioning of the new Yamal-Poland-EU pipeline will enable the Czech Republic to receive deliveries at the German border (Saint Catherine Pass) for national use and for transit to Waidhaus (see Figure 25). This option is included in the most recent supply contract signed with Gazexport in 1998. An alternative Russian gas export project is the Poland-Slovakia pipeline by-passing Ukraine, called the "Link". This loop would re-route up to 30 bcm of exports from the pipeline transiting Ukraine to a pipeline connecting with the Brotherhood-Transgas system in Slovakia. A further extension is envisaged to extend the future "Link" pipeline southward to Southern Europe.

The new export routes for Russian gas have also raised the need to redefine transit volumes through Ukraine, Slovakia and the Czech Republic (the Brotherhood-Transgas pipeline). In November 1999, an agreement between Transgas and Gazexport formally guaranteed the following minimum transit volumes: 28 bcm until 2008 and 13 bcm until 2020 (1999 flow: 54.4 bcm).

INFRASTRUCTURE AND ORGANISATION

Infrastructure

Transgas is the sole owner and operator of the Czech transmission networks, including dispatching and international transit, and storage facilities. The two import gates are located at the Czech-Slovak border for Russian deliveries and transit (Brotherhood-Transgas pipeline) and at the Czech-German border (Saint Catherine Pass) for Norwegian imports and recently for Russian imports delivered by the Yamal pipeline. Natural gas for transit is piped to two locations on the Czech-German border. The main one is Waidhaus, which in 1998 sent 28 bcm to Bavaria, Austria, Slovenia, France and Italy. The second is Saint Catherine Pass, which sent 15 bcm to Northern and Eastern Germany. The high-pressure international transmission network is 2,420 km long and powered in the Czech Republic by six compression stations of 351 MW. It is also used for transit and domestic deliveries. The total transit capacity reached 55 bcm in 1999.

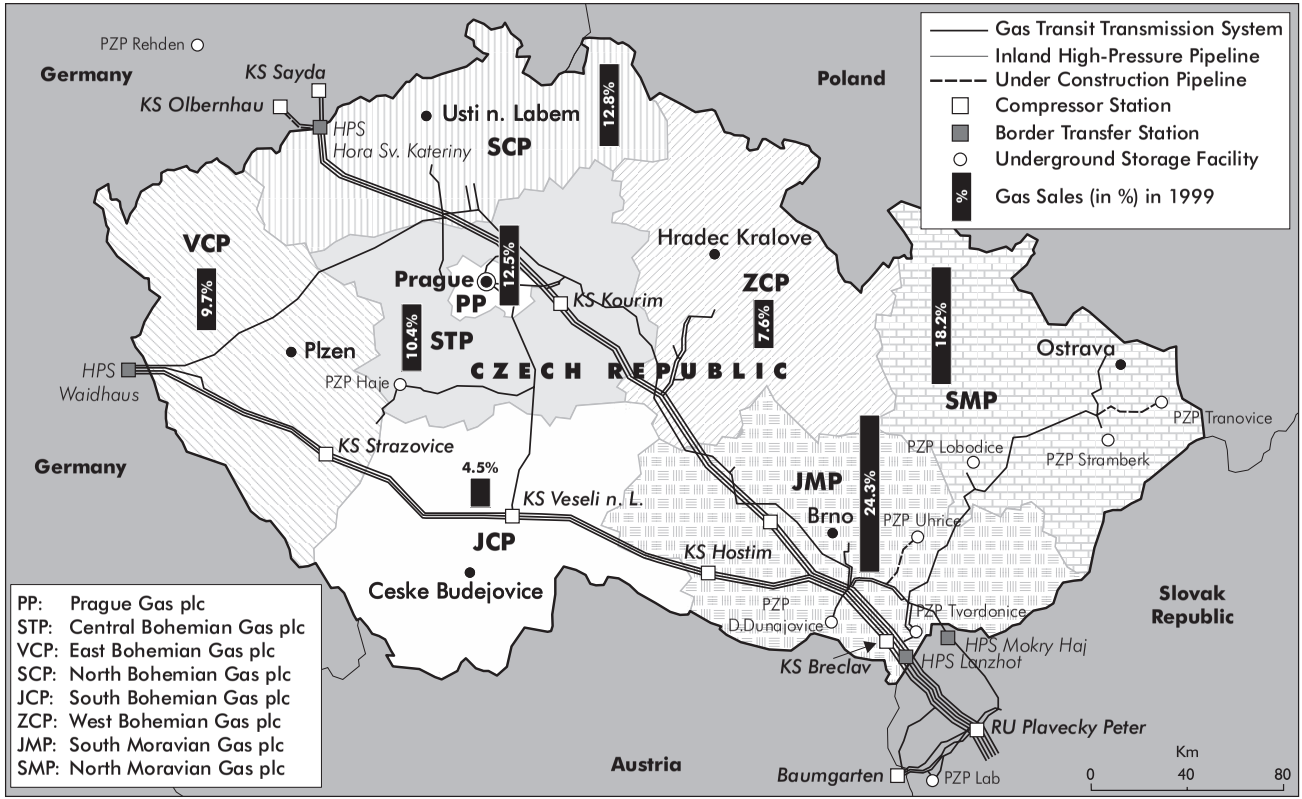
The five existing underground storage facilities (UGS) owned and operated by Transgas have a capacity of 1.8 bcm. They are supplemented, under long-term lease agreements, by one UGS in Slovakia and two in Germany, which together can hold 1.1 bcm. The leasing of facilities abroad was necessary because of insufficient capacity within the country, especially on the Western side. The total storage capacity amounts to nearly one-third of yearly consumption. However, the supply situation has become tense during winter peak load periods, since unloading capacity (41 million cubic metres per day: 30 from domestic sites and 11 from abroad) is not sufficient to cope with peak demand. As a consequence, Transgas had to build and lease additional storage capacity[22].

22. New UGS: Travonice UGS (Northern Moravia) in 2000, Uhrice (0.1 bcm) in 2001 and 1.3 bcm of additional capacity between 2005 and 2010.

Figure 25

Natural Gas Facilities and Sales per Distribution Company

(Total 1999: 9.3 bcm)



Source: Transgas.

The inland transmission network relies on a 1,130 km pipeline connecting to the distribution network through 62 inland transfer stations and 22 pumping stations. Each of the eight distribution companies owns most of its distribution network for pressure under 4 MPa. Transgas owns the 1,085 km distribution network with a pressure over 4 MPa and only 50 km of network under 4 MPa.

Industry Restructuring and Privatisation

The Czech Gas Works (CPP) was established as a state-integrated monopoly in 1989, a few months before the end of the Socialist regime. In 1994, CPP was transformed into a state-owned company. Then CPP was divided into eight distribution companies holding regional monopolies and Transgas, which is a state monopoly for purchase, transmission (including transit), direct sales for large consumers and storage. The supply contracts between distribution companies and Transgas are established annually at prices set by ERO. Transgas prefers stable contracts with the distributors, since it has long-term import contracts with the suppliers.

The MIT is the founder and sole owner of Transgas. The supervisory board of the company, which oversees its strategy and activities, is headed by a deputy minister of Industry and Trade. In 2001, Transgas will become a joint stock company under the supervision of the National Property Fund (NPF).

Transgas has implemented various internal reforms to prepare for future privatisation. The organisational structure of the company has been rationalised, with total staff reduced by nearly 20% between 1995 and 2000, to 1,724 employees. In 1999, Transgas was ranked the second largest company in the country by turnover (CZK 40.3 billion).

The Czech authorities partially privatised distribution through a voucher procedure in three stages beginning in 1994. In the last stage, which began in 1998, the State maintained majority control in six of the eight distribution companies. In a scheme similar to the one applied to Prague's electricity and district heating companies, the city of Prague, together with two foreign investors, obtained majority shares in Prague Gas (PP) at the beginning of 2000. Table 16 shows the shareholding structure of the eight distribution companies, ranked by number of customers.

THE PATH TO REFORM

Regulatory Framework

Until 2001, the 1994 Energy Act regulated the natural gas sector. In 1998, the Energy Regulatory Administration took responsibility for licensing the distribution companies. ERA also prepared pricing proposals submitted to the Ministry of Finance setting the structure and level of wholesale and consumer tariffs. The

Table 16
Key Indicators and Shareholding of Natural Gas Distribution Companies for 2000
(as of June 2000)

Companies	*Customers (thousands)*	*Ownership*
Southern Moravian Gas plc (JMP) (Jihomoravská plynárenská, a. s.)	592	NPF (47.7%), E. ON-Germany (35.7%), Transgas (2.5%), Gaz de France-GDF (2%)
Northern Moravian Gas plc (SMP) (Severomoravská plynárenská, a. s.)	536	NPF (40%), Transgas (18.1%), SPP Bohemia-Slovakia (20.3%), SPP Bratislava- Slovakia (10%), Ruhrgas-Germany (8.5%)
Prague Gas plc (PP) (Pražská plynárenská, a. s.)	433	NPF (49.2%), RWE- Germany (12.6%), Ruhrgas (12.1%)
Northern Bohemian Gas plc (SCP) (Severoèeská plynárenská, a. s.)	298	NPF (49.2%), Wintershall-Germany (20.1%), VNG-Germany (25.5%)
Eastern Bohemian Gas plc (VCP) (Východoceská plynárenská, a. s.)	250	NPF (47.1%), Ruhrgas (16.5%), SPP Bohemia (18.7%), SPP Bratislava (10%), GDF (3.2%), Transgas (3%)
Western Bohemian Gas plc (ZCP) (Západoèeská plynárenská, a. s.)	222	NPF (45.8%), E. ON (16.5%), Ferngas Nordbayern-Germany (27.5%), Ferngas Linz-Austria (3.8%)
Central Bohemian Gas plc (STP) (Stredoceská plynárenská, a. s.)	185	NPF (48.5%), Ruhrgas (14.1%), Wintershall (30.2%), GDF (1.8%)
Southern Bohemian Gas plc (JCP) (Jihoèeská plynárenská, a. s.)	94	NPF (46.7%), Ferngas Linz-Austria (34.5%), E. ON (12.8%)
Total distribution companies	**2,610**	

Sources: Country submission; Transgas; East European Energy reports/*Financial Times*.

prices set by the government were maximum prices (lower ones may be negotiated) and reflect the cost of purchase and transit fees but not the full cost of transmission, storage and distribution.

Despite several successive increases in household tariff, cross-subsidies and tariff distortions still exist. Industries pay a higher price to compensate for household tariffs that are lower than real costs. During the period 1995-2000, the tariff for households rose by a factor of 1.9 while the overall price index rose by 1.37. In

1997, the household tariff (CZK 4.30/cm, excluding VAT) was estimated to be 60% of the real market price. Nevertheless, on the basis of purchasing power parity, gas prices for households are relatively high for most of the Czech population. The price of direct sales by Transgas to major consumers is not regulated, unlike prices for clients supplied by distribution companies.

The same household tariff applies throughout the country, despite differences in the cost structures of the different distribution companies. ERO is in charge of adjusting these differences between companies. In addition, Transgas has allocated some of its transit fees to subsidise household tariffs.

The value-added tax of 5% applied since 1993 was raised to the full 22% in January 1998. There are no other taxes on natural gas.

The government introduced a new pricing system in January 2000. It raised the price for all consumers by 8% on average in January 2000, 7% in 2001 and 5.7% in 2002. In order to abolish subsidies to households, price increases for household customers will be higher than the average: 15%, 10.7% and 7.5%. The government believes this plan will phase out cross-subsidisation by the end of 2002. However, the recent increase in the world price of crude oil and gas has raised the possibility of further adjustment of customer prices. The MOF decided to increase the average natural gas wholesale price by 20%, the average household price by 24% and the industry prices by 10,8-16% as of 1st January 2001. ERO increased prices again as of 1st July 2001 by 9%, 11.7% and 5.9-6.4%, respectively. Table 17 details the increases by type of consumer.

The MIT initiated and the MOF approved a reform of the tariff structure which came into effect as of 1st January 2000. The price for the household sector has two components: a flat monthly charge and a charge based on the volume of gas consumed. Customer groups are subdivided, so that prices better reflect the volume consumed and installed power capacity. Together with the price adjustment, the new tariff structure will allow gas tariffs to include the cost of supply, transportation, storage, distribution and security of supply (e.g.: extra cost of Norwegian supply).

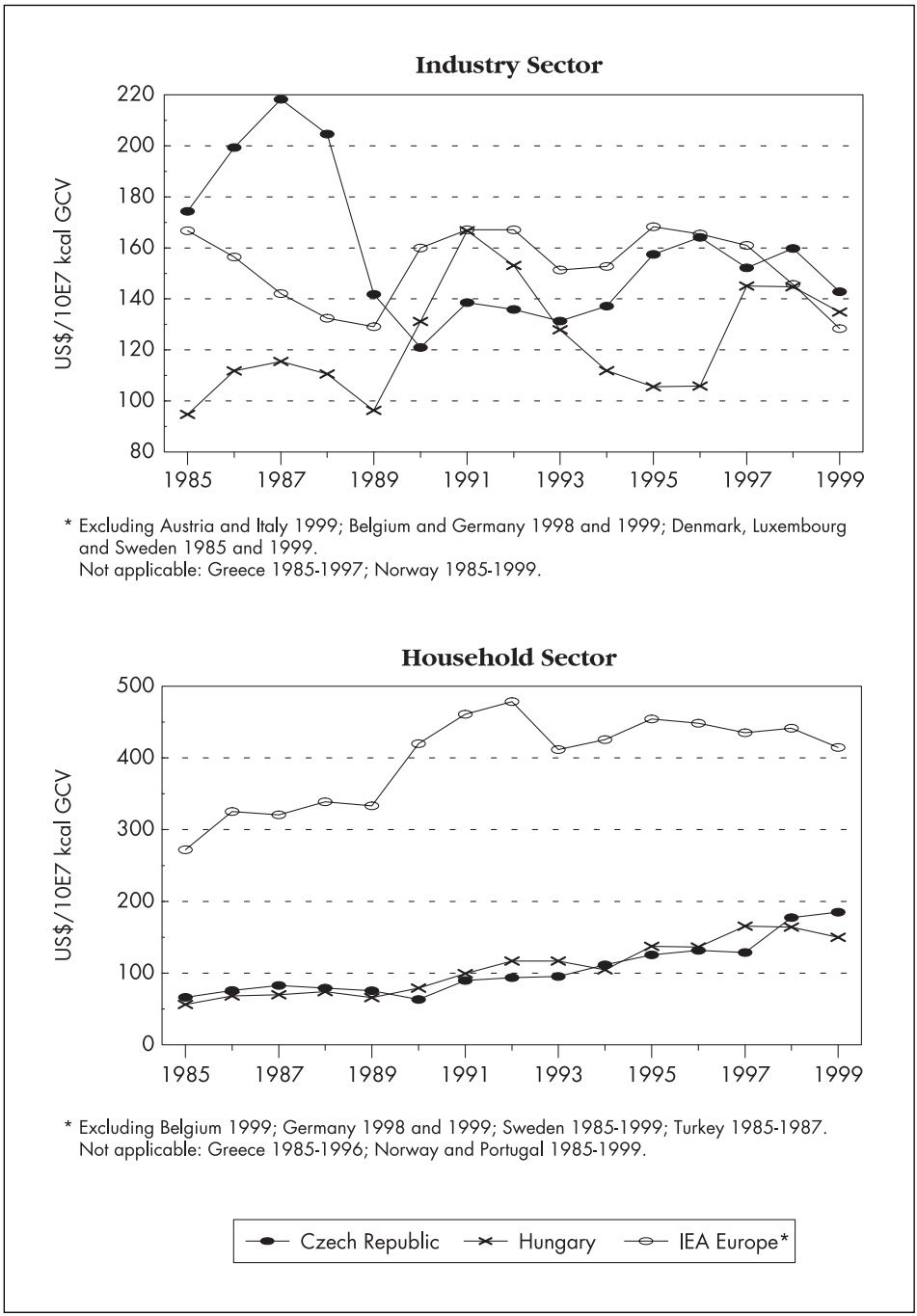
Table 17
Tariff Increases by Consumer Category, 2000 to 2001
(%)

	2000	*2001*	*Cumulative*
Large consumers	18.9	13.9	32.8
Medium size consumers	26.9	18.4	45.3
Small consumers	26.1	17.8	43.9
Households	15.0	30.3	45.3
Total average increase	**18.3**	**20.2**	**38.5**

Note: ERO will make a price adjustment for 2002.
Source: ERO.

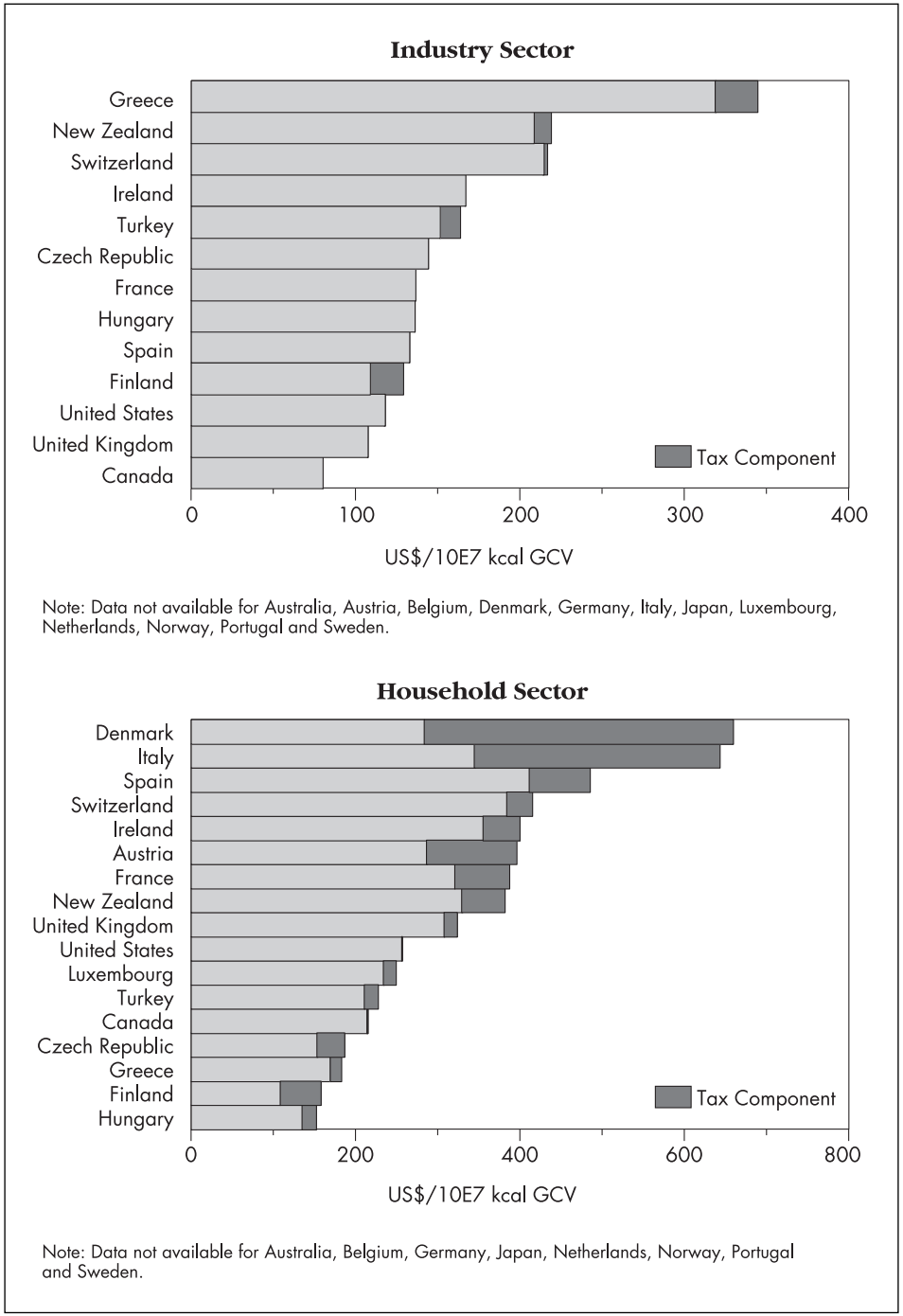
Figure 26

Gas Prices in the Czech Republic and in Other Selected IEA Countries, 1985 to 1999



Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2000.

Figure 27
Gas Prices in IEA Countries, 1999



Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2000.

Table 18

Comparison of Czech Gas Industry Structure and Regulation Before and After 2000 Energy Act

Area	*Before*	*After*
Purchase/ Import	a) Monopoly of Transgas, a 100% state-owned company.	a) Monopoly restriction lifted. Free choice of supplier for distribution companies and eligible customers.
Transmission	a) Transmission and storage facilities owned and operated by Transgas. b) No access to facilities for distribution companies. c) Ancillary services charged to distributors based on amount of gas purchased from Transgas.	a) Unbundling of transmission and storage by account separation. b) Negotiated third party access (TPA) to transmission and storage. c) Transgas entitled to refuse TPA in case of "major economic and financial difficulty" with take-or-pay contracts.
Dispatch/Market Operator	a) Dispatch managed by Transgas.	a) Dispatch ensured by Gas Control Dispatch (GCD), its structure and operation to be determined.
Distribution	a) Distribution and supply unbundled, in eight distributors created in 1994 as joint stock companies. Approximately 50% state-owned.	a) Distribution services under independent operators (two companies) and integrated with Transgas (six companies). b) Regulated non-discriminatory TPA. c) Distribution companies able to contract with other generators. Supplier tariffs expected to reflect differences in costs.
Supply and End-User Choice	a) Distributors are also suppliers. b) Retail tariffs regulated except for direct customers of Transgas; tariffs are cross-subsidised.	a) Customers can contract freely according to annual demand: above 15 mcm in 2005, above 5 mcm in 2008. b) Distributors licensed to act as exclusive, regulated suppliers for captive ("protected") customers. c) Prices for eligible customers unregulated.
Regulator	a) Regulation including wholesale and retail prices defined by Energy Regulatory Administration and approved by Ministry of Finance.	a) New regulator (ERO) sets tariffs for distribution networks and, for captive customers, ensures non-discriminatory access to gas facilities.
Public Service Obligations	Obligation to serve lies with distributors.	Obligation to serve captive customers and to provide access for liberalised customers. Mechanism to require distributors to provide supply beyond scope of licence and be compensated through distributors fund.
International Trade	a) International transit owned and operated by Transgas. b) No direct imports by distribution companies except through distribution network.	a) Transgas remains sole operator of transit. b) Temporary limit on imports to protect against adverse financial impact and obligations of take-or-pay import contracts.

Source: IEA.

The Introduction of Competition

The Czech authorities plan to implement the following measures to fulfil the requirements of the EU Natural Gas Directive:

- Unbundling infrastructure facilities (transmission and storage) of Transgas and the regional distribution companies.
- The introduction of third party access (TPA).
- Creation of a Gas Control Dispatch (GCD) in charge of gas supplies.
- Setting a clear schedule for the opening of competition in supply for major consumers.

Operation of the high-pressure transmission network and storage facilities within Transgas will be unbundled by account separation in 2002. Access to transmission for Transgas's competitors will be by negotiated TPA and access to distribution networks by regulated TPA. Transgas and the regional distribution companies will have to publish their commercial conditions, including tariffs for use of their distribution facilities by a third party.

The schedule for opening the gas market is shown in Table 19. Distribution companies, as well as power plants and CHPs, will be eligible from 1st January 2005. An eligible consumer will be free to contract with any EU supplier. The distribution companies will have to serve non-eligible customers (captive consumers) at the tariff set by ERO. Foreign companies could operate in the Czech natural gas market on the basis of reciprocity.

A transitional period of two years has been requested by the Czech government to comply fully with the directive schedule after the country is admitted as an EU member. The decree providing Transgas a monopoly on imports will be abolished on the date of accession of the Czech Republic to the EU.

Table 19
Schedule for Opening the Natural Gas Market to Competition

Starting date	*Eligibility limit for individual consumers (mcm of gas per year)*	*Number of customers (thousands)*	*Total sales (%)*	*Necessary conditions*
01.01.2001				New Energy Act, establishment of ERO
01.01.2003				Price distortions phased out
01.01.2005	15	200	28	Effective access to gas system facilities
01.08.2008	5	300	33	Effective access to gas system facilities

Source: Ministry of Industry and Trade.

The new Energy Act, in force since January 2001, includes the transfer of full responsibility for regulation to the Energy Regulatory Office (ERO). ERO is responsible for wholesale and consumer pricing, licensing of operators, defining rules for unbundling, and guaranteeing fair conditions of access to the gas system facilities.

Privatisation

The government plans to transform Transgas into a stock company owned by the National Property Fund. Its privatisation is scheduled for 2002. The government will decide at a later stage the share to remain state-owned. The Transgas sale will include the majority shares of six regional distribution companies owned by the State. NPF's minority shares in the two independent companies, Prague Gas (PP) and Southern Bohemian Gas (JCP), will be sold in a separate tender. The reasons given for the "one-package" sale include maximisation of revenues, maintaining long-term contracts between Transgas and distributors and positioning the integrated holding company as a sizeable player at the European level.

CRITIQUE

The Czech Republic has been successful in converting from domestic coal, mainly brown coal, to natural gas and thereby reducing emissions of pollutants. The share of natural gas in TPES has reached 20% and is expected to reach 25% in 2010. However, despite its economic and environmental advantages, natural gas has a limited share of the power generation and CHP/district heating mix. This is largely because of the priority given to solid fuels and nuclear energy, and of the restrictions on independent power producers facilities. The future commissioning of two additional nuclear reactors at Temelín in 2002 is likely to reduce the development of gas-fired IPPs.

The Czech Republic can be commended for having strengthened security of its gas supply, thanks to diversification of imports and an increase in storage capacity. Gas from Norway will soon represent one-fourth of total supply, and storage already covers one-third of total consumption.

Scenarios for domestic gas demand up to 2010 appear overly optimistic. It is realistic to expect final consumption to remain stable at 5.1 bcm (6.6 Mtoe) but highly optimistic for the power generation and CHP sector to reach 8 bcm (4.2 Mtoe) in 2010 with a threefold increase compared with 1999. The existence of competitive coal and the increasing share of nuclear power are negative factors for the penetration of gas into power generation and district heating. Furthermore, the scenarios were developed before the 1997 economic crisis.

Future gas sales by Transgas may be smaller than anticipated if distribution companies and eligible consumers purchase gas directly from foreign suppliers. It is

important that Transgas be able to adjust future deliveries to meet demand. To adapt better to the market environment after the introduction of competition, very careful consideration should be paid to long-term contracts and the possible re-negotiation of existing contracts. Flexibility clauses included in the Gazexport (Russia) and GFU (Norway) contracts may allow deliveries to be adjusted to demand without penalties. The Energy Act gives Transgas the possibility of refusing suppliers access to transmission in case of "major economic and financial difficulty" with take-or-pay contracts. Use of this clause by Transgas should be monitored by the Energy Regulatory Office.

The new Yamal pipeline (Belarus-Poland-Germany) provides an additional supply route for gas imports and transit from Russia. In the medium to long term, this new route may enable the Czech Republic to benefit from newly developed gas fields and therefore enhance its security of supply. But the Yamal pipeline could also divert Russian gas currently transiting the country (15 bcm per year). Transgas could lose the portion of that gas it received in exchange for transit fees. Uncertainties remain about gas demand in Western Europe after 2005, as well as about the availability of funding for investment in Yamal and neighbouring gas fields.

The impact of the Yamal and "Link" pipelines on transit gas volumes appears to be limited for the next five years, during which time the Transgas pipeline transiting the Czech Republic will remain the major route for Russian exports. But the Brotherhood pipeline is an ageing facility used at nearly full capacity. It needs to be upgraded and extended.

Progress has been made in restructuring the gas sector. Distribution and transmission have been unbundled and regional distribution companies have been created, thereby improving services to customers. Private investors have acquired minority shares in six distribution companies and majority shares in two. Transgas has been made more efficient through organisational restructuring in preparation for privatisation. Its transformation into a joint stock company will increase the independence of the company's management from the State.

The Czech authorities acknowledge the importance of price adjustment in the reform process. They have made progress in reducing distortions. But consumer prices are still below cost, since they only cover purchase and transit fees and not storage and distribution costs. This pricing has increased peak demand and necessitated larger storage capacities with higher unloading flows. The cost of increasing storage and other facilities to cover household demand has not been charged to household customers. Artificially low prices discourage investment and maintenance, and this raises concerns about economic efficiency and security of gas supply in the medium term. Mixed ownership of distribution companies poses additional financial and management constraints on timely new investments.

The planned price increases for the period 2000-2002 should take into account the recent rise in the world gas prices. A further adjustment is crucial to achieve cost-reflective prices, without which the gas industry cannot be competitive in the

liberalised market. It will also be essential for the Energy Regulatory Office to establish a fair and credible pricing mechanism. Regarding support for low-income households, the government should not try to solve social welfare problems through energy cross-subsidies, but should provide direct support to affected categories of consumers.

The government should note that pricing can have a significant impact on future demand for gas. Consumption by households may not drop very much after the price increase, at least in the short term, owing to the difficulty of changing facilities and equipment. But careful assessment of future demand is necessary. The government may need to consider adjusting the prices for peak time use or creating additional storage capacity if peak demand is not covered by current storage capacities. The cost of building and maintaining additional storage capacity should be taken into account in households and services tariffs. In addition, interruptible contracts with industrial users may provide enough flexibility to address the seasonal fluctuation of gas demand and limit the need for storage capacity.

The Czech government has chosen "negotiated" third party access (TPA) for transmission and storage and "regulated" TPA for distribution. But the new Energy Act does not include compulsory provisions for access to storage facilities, and the unbundling of Transgas's transmission and storage functions will be done by account separation. So, Transgas may retain its monopoly position on the market, and effectively limit its competitors' access to gas transmission, storage and distribution, unless ERO rigorously enforces the regulations.

In order to provide effective and fair access to transmission and storage facilities, the Czech government should envisage creating separate entities with their own accounts and management in the same way as for the electricity sector. In a second stage, ownership of the corporate entities should be separated from ownership of supply and distribution. The government should also establish clear and non-discriminatory rules of access for all necessary gas facilities.

But, since the Czech gas market is dominated by Transgas, there is still concern about monitoring of competition and regulation of the pricing mechanisms by ERO at wholesale and customer levels. Moreover, Transgas's dominance will be reinforced, resulting from the "one-package" privatisation, integrating Transgas and six of the eight distribution companies in the same group. The financial link between the six distribution companies and Transgas may influence the choice of supplier by the distribution companies to the advantage of Transgas. It is important, therefore, that the relevant state bodies (ERO, the Office for the Protection of Economic Competition) closely follow the gas market and enforce regulations to ensure fair and effective competition. The government should require non-exclusive contracts between Transgas and the distribution companies, as it did in the oil sector between the supplier (Ceska Rafinerska) and its subsidiary (Benzina a.s.).

The existence of long-term import contracts with Transgas was one reason why the Czech government was cautious about timing of the market opening. Surrounding EU countries are liberalising their market at a much faster pace. Since border trade

may require reciprocity in the future, it is important for the Czech government to maintain the current schedule, or even accelerate it. Otherwise, eligible consumers in the power and heat generation markets and in industry may face constraints in finding suitable natural gas suppliers. There is a real risk that the final result of the liberalisation process may be the transfer of state-owned monopolies to private ownership in a limited competitive environment, leading to quasi-monopoly tariffs at the expense of consumers.

Transit activities carried out solely by Transgas will be included in the privatisation. The Czech authorities should ensure that the new owner is highly reliable in operating the pipeline, enforces the existing contracts and does not abuse its monopoly position in future contract negotiations.

RECOMMENDATIONS

The government should:

- ☐ Ensure that gas prices for all users are cost-reflective by the end of 2002, by including the cost of all services in customer tariffs and by eliminating cross-subsidies between customer groups and distribution companies.
- ☐ Continue diversification of Transgas's supply purchases on an economic basis.
- ☐ Unbundle Transgas's transmission and storage by creating separate structures before ownership separation.
- ☐ Ensure sufficient storage and transport capacities to cover peak demand consistent with future gas pricing.
- ☐ Establish a transparent and independent pricing system for wholesale and final consumers under the supervision of the Energy Regulatory Office.
- ☐ Ensure fair and effective competition among distributors, including the establishment of non-exclusive contracts between Transgas and the distributors.
- ☐ Ensure continuous operation of transit activities under fair contractual conditions.

10

OIL

MARKET OVERVIEW

The Czech oil sector has experienced dramatic changes in terms of supply, structure and market since 1990. All crude oil is imported; net imports amounted to 5.9 Mtoe and are handled by four domestic refineries. Imports of petroleum products are gaining market share (37.5% of final consumption in 1999).

Demand

In 1999, oil consumption reached 8.3 Mtoe and represented 21.4% of TPES. From 1990 to 1999, oil demand decreased by 8% with dramatic changes in sectoral and product use. Oil remains the second most important source of energy supplied in the Czech Republic.

Sectors

The transport sector became the largest oil consumer in 1996, followed by industry. Consumption has remained stable in other sectors.

The share of oil products consumption for transport was 29% in 1990 and reached 49.6%, or 3.85 Mtoe, in 1998. This was attributed to motorisation of households which grew by 53% between 1990 and 1998, reaching 3.7 million vehicles or 1.03 per household; to the replacement of rail freight by road transport; and to increasing consumption by tourist vehicles. Gasoline dominates in road transport, followed by diesel.

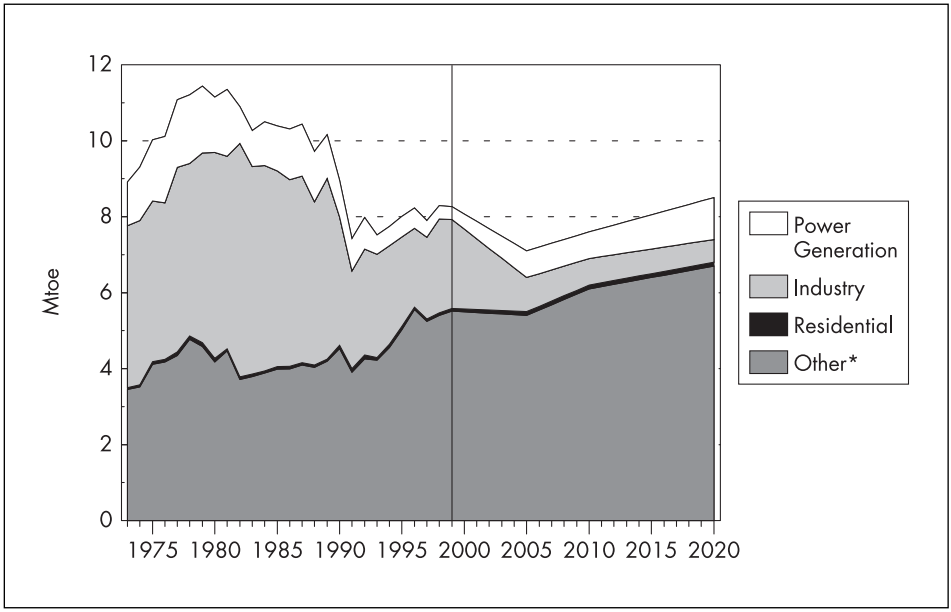
Industry demand has dropped and its market share was 43.8%, or 3.4 Mtoe, in 1998, of which 0.93 Mtoe was petrochemical feedstock. Fuel oil consumption decreased by 28% from 1990 to 1998 and heating oil by 48%, mainly because of the restructuring of industry, whose output dropped by 40% from 1990 to 1994. The massive switch to natural gas also explains this decrease.

Consumption in other sectors, such as power generation and households, is negligible and was limited to 0.51 Mtoe in 1998. Oil product consumption by district heating (16% of the generation mix) is steadily declining. Consumption of oil by agriculture reached 0.33 Mtoe. Oil is the main source of energy used by agriculture.

Products

The quality of oil products has progressively improved. Automotive fuels represented 4.37 Mtoe, or 44%, of total oil products consumption in 1999; unleaded gasoline

Figure 28
Oil Demand by Sector, 1973 to 2020



* includes transport, commercial, public service and agricultural sectors and other transformation and energy consumption.
Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001, and country submission.

accounted for 1.43 Mtoe. Production of leaded gasoline by the major refiner, Ceska Rafinerska (CRC), ended on 1st January 2001 and retail sales of leaded gasoline ended in January 2001. The consumption of diesel oil rose to 2.31 Mtoe in 1999; fuel oil consumption reached 1.12 Mtoe, which included a growing share (45% in 1999) of fuels with a sulphur content of less than 1%.

Environmental objectives and structural changes in the economy explain the changes in patterns of consumption. The Czech Republic adopted EU legislation on oil products quality (Directives 98/70/EC and 2000/71/EC) which restricts the production and sale of leaded gasoline and improves the quality of gas/diesel oil and fuel oil by reducing the sulphur content of diesel oil to 0.05%.

Forecasts

The share of oil in TPES is expected to decline slightly to 18.5% (7.6 Mtoe) in 2010. Private cars and trucks will be the leading sector as further reductions are expected in consumption of gas/diesel oil and fuel oil in industry and other sectors. Biofuel in the form of rape seed is already added to diesel and represents 7% of automotive fuel input. This is expected to reach 10% in 2010.

Supply and Trade

Production

Oil production is marginal. The Czech Republic has limited reserves of crude oil: 12 Mt of proven recoverable reserves, mostly light crude oil (WEC 1998), concentrated mainly in the southern part of the country. In 1999, domestic production of crude oil was a modest 183 kt, of which 60% was exported to neighbouring countries. The remainder went to the Pardubice refinery, which is the only domestic client.

A consortium formed by the Canadian company Geocan Energy Inc. and the Czech companies Unigeo a.s. and Ceska Naftarska Spolecnost s.r.o. may begin exploration in the Rostin region in the southeast of the country in coming years.

Imports: Diversification of Supply and Opening of the Oil Products Market

Crude Oil

The oil sector relies heavily on imports. In 1999, crude oil imports covered 99% of the input of the three Czech refineries. Import volumes were stable between 1990 and 1996 at around 7.4 Mtoe before dropping to 6.8 Mtoe in 1998 and then to 5.9 Mtoe in 1999 owing to the impact of the 1997 economic crisis on consumption and to increasing imports of oil products.

Until 1996, Russia was virtually the Czech Republic's sole supplier, using the Druzhba pipeline (transiting through Ukraine and Slovakia) since the Adria pipeline, the alternative supply route from the Adriatic, closed in 1991. Deliveries of Russian crude oil are not always reliable and the supplies of relatively low quality with a high sulphur content.

In 1994, Czech refiners began to diversify their supply by signing contracts with several different Russian oil companies, notably Lukoil. Between 1998 and 2000, no major interruptions occurred. Czech refineries were able to have access to newly developed oil fields in Russia with better qualities of crude oil.

But the major supply diversification was achieved thanks to the commissioning in 1996 of a pipeline referred to as the IKL or Mero pipeline, connecting Ingolstadt in Germany to the Czech refineries of Kralupy and Litvínov. The IKL links the Czech Republic with the Western European transport network and gives access to the international market. Starting in 1996, purchases on the spot market and under long-term contracts with various countries such as Algeria, Libya, Syria and Norway were made by Ceska Rafinerska (CRC) and delivered through the IKL pipeline. The possibility of buying on international markets also made it possible to purchase higher-quality crude.

This new purchase policy for both traditional and new supply sources has enabled CRC to diversify crude oil supply sources, contracting companies, types of contract, supply routes and crude oil qualities. In 1999, with total imports of 6 Mtoe, Russia remained the dominant crude oil supplier with 5.3 Mtoe and a share of 83% (88% in 1996 and 86% in 1997). Caspian Sea producers, Kazakhstan and to a lesser extent Azerbaijan delivered 0.3 Mtoe (5%). North African exporters contributed 0.6 Mtoe or 10% of total imports and Norway delivered 0.1 Mtoe.

Oil Products

Thanks to the liberalisation of imports of oil products and the opening of the retail market, imported oil products increased their share in the Czech market, allowing the supply of higher-quality products at competitive prices. Most imports were higher-quality products from Western Europe that the domestic industry was not always in a position to supply at competitive prices.

Imports of oil products have improved security of supply. Total imports of oil products reached 3 Mt (2.76 Mtoe) in 1999 (plus 29% compared with 1998) and gained 36.7% of the Czech market in 1998 compared with 29.5% in 1997. Imports concentrated on the light product markets: 1.07 Mtoe of motor gasoline with a 55% market share, 1.03 Mtoe of gas/diesel oil with a 40% share as well as kerosene with a 41% share. Fuel oil imports amounted to 0.3 Mtoe or a 25% market share. The main supplier is Bratislava Slovnaft refinery in Slovakia with 1.12 Mt, followed by TotalFinaElf's refinery Leuna MIDER in Germany with 0.75 Mt, the OMV refinery in Swechat (Austria) with 0.7 Mt, and Poland with 0.24 Mt. OECD countries are the dominant supplier group with 1.8 Mt or 65% of the total.

Exports

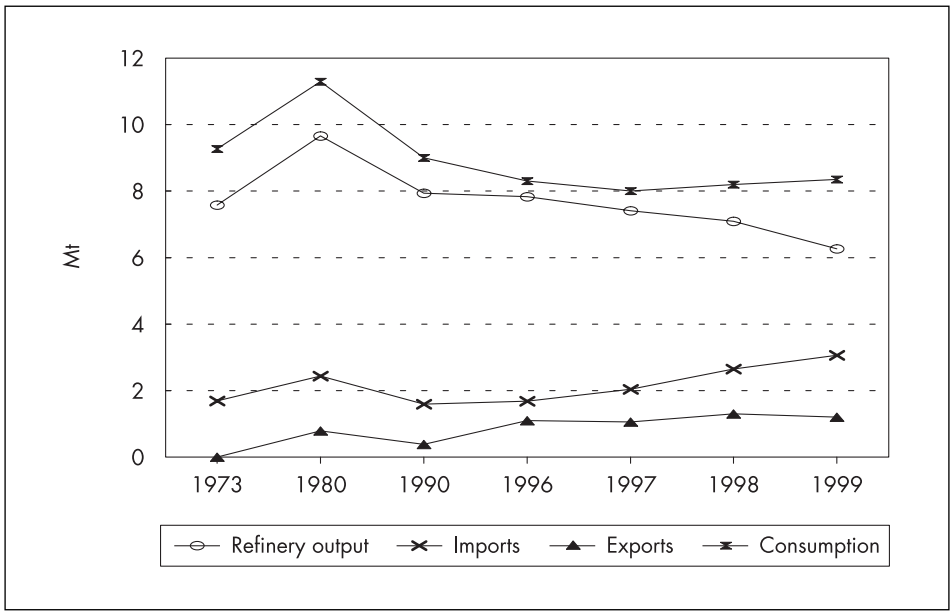
The structure of demand does not mirror the Czech refinery output, leading to complementary imports of selected products. The Czech refineries have also developed exports of oil products with a total of 1.4 Mt in 1999 up from 0.4 Mt in 1990. The main recipients were Germany with 0.4 Mt, Austria with 0.4 Mt, Poland with 0.2 Mt, and Hungary with 0.1 Mt; others took 0.3 Mt. Diesel oil is the main export (0.6 Mt), followed by heavy fuel oil (0.2 Mt), unleaded gasoline (0.1 Mt) and jet fuel (0.1 Mt).

INDUSTRY INFRASTRUCTURE: MODERNISATION

Transport

The main supply pipeline is the Druzhba, which delivers Russian and CIS crude oil at its entry point at the border with Slovakia and then to the three Czech crude oil distillation refineries. Built in 1963, the Druzhba has an annual capacity of 10 Mt. Modernisation (remote control and reconstruction) started in 1999 and should be

Figure 29
Oil Products: Supply and Demand, 1973 to 1999



Source: *Oil Information 2000*, IEA/OECD Paris, 2000.

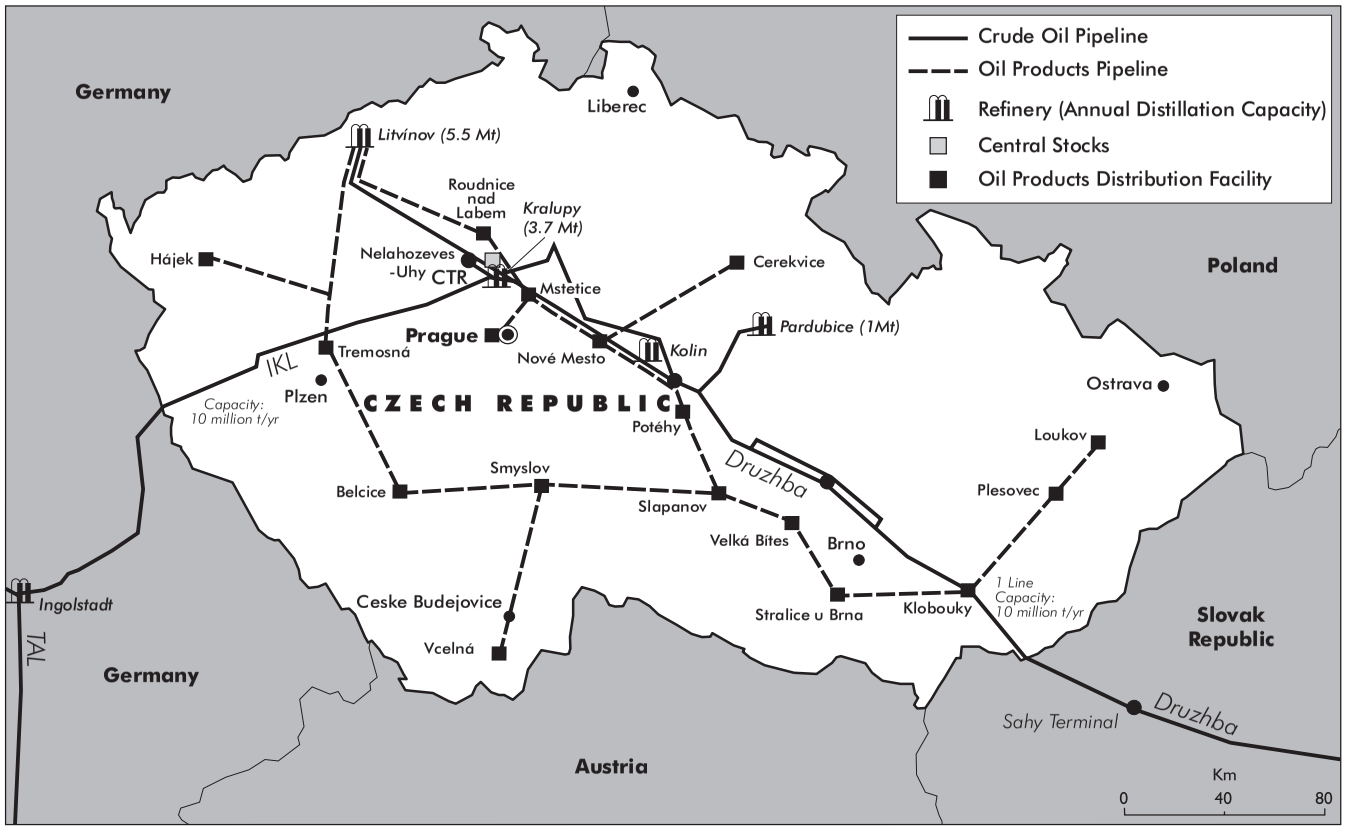
finished by the end of 2003. During the period 1996-1998, the country received 17.5 Mt via the Druzhba, covering 81% of the refinery input.

Until 1991, the Adria pipeline was able to transport 4 to 5 Mt of crude oil from Africa and the Middle East annually from the Croatian port of Rijeka through Hungary and Slovakia, where it connects with the Druzhba. In 1991, the conflict in Croatia stopped the operation and the facilities were mothballed and maintained in operational condition by the transit countries. Because alternative supply routes are sufficient and more efficient, use of the Adria pipeline would only be considered if it were also used by other countries on the line (Hungary, Slovakia).

Since 1996, the 340-km Ingolstadt-Kralupy-Litvínov (IKL) pipeline has delivered 10 Mt (73 million barrels) annually. It is supplied by the Trans-Alpine Line (TAL), allowing crude oil imports from the Italian port of Trieste on the Adriatic and from the North Sea. This modern facility has been used at only about 20% of its capacity; 4 Mt were delivered from 1996 until 1998. The higher price of lighter crude oil on the international markets compared to the Russian option explains this low usage.

Products are transported to consumers from Czech refineries and also from the Slovak Slovnaft refinery in Bratislava by product pipelines with adjacent facilities for rail and road tank cars, or directly by rail and road from the domestic and foreign refineries.

Figure 30
Oil Infrastructure, 2000



Source: IEA.

Two state-owned companies own and operate transport and storage facilities: Mero CR for crude oil and Cepro for oil products.

Refining Capacities

The refining sector consists of two main units, Litvínov and Kralupy, which are both owned by the main company, Ceska Rafinerska, part of the Unipetrol group. Smaller refineries are operated by Paramo in the Eastern Bohemian town of Pardubice and by Koramo in Kolin.

The Litvínov refinery has an annual distillation capacity of 5.5 Mt of crude oil supplied from Russia by the Druzhba pipeline. Its output of 3.6 Mt in 1999 consisted mostly of automotive fuels. In 1999, the refinery invested in a new visbreaking unit, enabling the heaviest oil fractions to be broken into light products.

The second largest refinery is Kralupy with a total distillation capacity of 3.7 Mt per year supplied by both the Druzhba and IKL pipelines. A new fluid catalytic cracking unit (FCC) will be commissioned in 2001, allowing the transformation of heavy crude oil residues into light products. The FCC will allow the production of a higher proportion of automotive fuels of international standards (from 1.3 Mt to 2 Mt) and less fuel oil (from 1 Mt to 0.3 Mt)[23]. Since 1998, the refinery has been certified ISO 9002.

The Pardubice refinery is a smaller unit owned by the company Unipetrol since the end of 2000. It refines domestic and CIS crude oil with a yearly capacity of 1 Mt. Its main outputs are gas/diesel oil, bitumen and lubricants. In 1999, the company installed a new vacuum atmospheric distillation unit and a unit for hydrogenation of middle distillates. The refinery meets around 10% of Czech gas/diesel oil demand.

The Koramo oil refinery in Kolin processes various semi-products from Ceska Rafinerska's refineries. Lubricating oils from Koramo accounted for 70% of total domestic production in 1999.

Highly competitive conditions for refineries in the Czech Republic and the surrounding region as well as new environmental standards for emissions and oil products have forced the sector to restructure and modernise ageing equipment, which had been suffering from efficiency levels 20 to 25% lower than Western standards, insufficient productivity, low product quality and high environmental impact. The sector has succeeded in retaining a high domestic market share, notably 63% in 1999 with higher-quality products.

23. Total investment in the FCC amounted to CZK 6.8 billion with a 30% tax relief. Chemopetrol also benefited from CZK 2.9 billion of tax relief for a total investment of CZK 7.52 billion.

Unipetrol's Environmental Profile

The oil industry used to have major negative impacts on the environment because the centrally-planned economy did not take environmental considerations into account in the design, construction and operation of energy systems. Unipetrol is a major energy consumer, with energy consumption in 1999 of 1.3 Mtoe (3.5% of TPES), including 0.2 bcm of gas and 2 TWh of electricity. The group also produced 1.4 TWh of electricity, of which 0.45 TWh were sold.

Unipetrol has made substantial efforts to improve its environmental record.

Since 1999, Unipetrol has included environmental protection in its strategy and investment policy to:

- Reduce the unit energy consumption per tonne of product, feedstocks and water.
- Reduce pollutant emissions. Its emissions of sulphur dioxide and particulates dropped by 85% and 98.7% respectively between 1990 and 1998.
- Reduce waste disposal and increase recycling;
- Mitigate past environmental problems by decontaminating soil and ground water at refineries, pipelines and filling stations.
- Improve the quality of products in compliance with European Union standards for unleaded gasoline, lower sulphur and benzene content of diesel, and the use of biofuel.

The objective for 2004 is to improve unit energy consumption by 20% and raw materials consumption by 10%, and reduce emissions of sulphur oxide and volatile organic compounds (VOC) by 70%. The company has also developed an Environmental Impact Assessment for new projects and plans to introduce a life-cycle analysis of products by 2004.

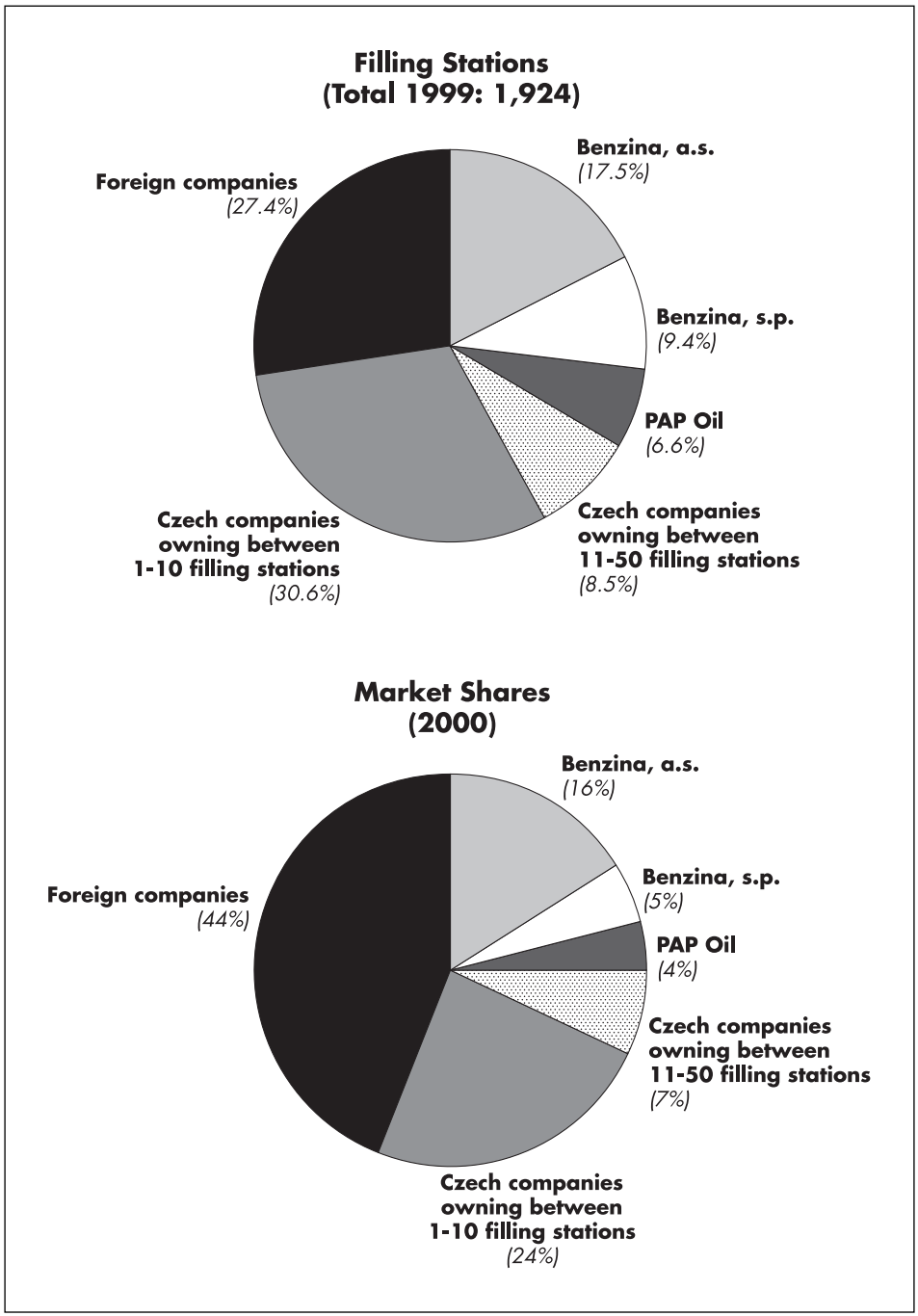
Total environmental expenses, including fees and payment for non-compliance with environmental standards, increased from CZK 0.5 billion in 1991 to 3.5 billion in 1997, largely to comply with the new environmental legislation, and fell to CZK 2.3 billion in 1999 or nearly one-third of total investment. Unipetrol self-finances 90% of these expenses. The National Property Fund has covered 95% of the decontamination costs which amounted to CZK 224 million in 1999.

Source: Unipetrol annual reports.

Storage

Crude oil storage facilities with a total capacity of 0.8 mcm are located near the Kralupy refinery. A 50% expansion of central stock capacity is planned by 2005. The Administration of State Material Reserves (ASMR) is in charge of the organisation of stockpiling and is the owner of the strategic reserves. The state-owned company Cepro owns and operates the oil products storage facilities.

Figure 31
Oil Products Retail Network



Sources: Czech Association of Petroleum Industry and Trade (CAPPO), country submission and IEA estimates.

Retail

At the end of 1999, the retail network for automotive fuels had 1,924 filling stations, an increase of 172% compared with 1994. Benzina a.s., a subsidiary of Unipetrol, operates the largest network with 336 filling stations or 17.5% of the total number, followed by Benzina s.p., a state-owned company with 180 stations (9.4%). Major foreign companies such as Agip, Aral, Conoco, Esso, OMV, Slovnaft and TotalFinaElf also operate about 500 filling stations, accounting for 27.4% of the total number and a 44% market share (see Figure 31). Shell recently reinforced its position by acquiring the network of the German retailer DEA. Ownership in the retail sector remains thinly spread; of a total of 400 registered companies, 357 operate no more than four filling stations each, generally in rural areas.

Cepro owns loading facilities for both railway and trucks and is active in the sale of motor fuels. The major retailer networks (most Czech companies and all foreign companies) are members of the Czech Association of Petroleum Industry and Trade (CAPPO); CAPPO members represent nearly 60% of all filling stations and a market share of approximately 70%.

REGULATORY FRAMEWORK AND PRIVATISATION

Prices and Taxes

Significant liberalisation of the oil market has been achieved; crude oil is now traded at international prices. Price controls on oil products were abolished in 1994, restrictions on oil products imports were removed and the retail network was opened to competition.

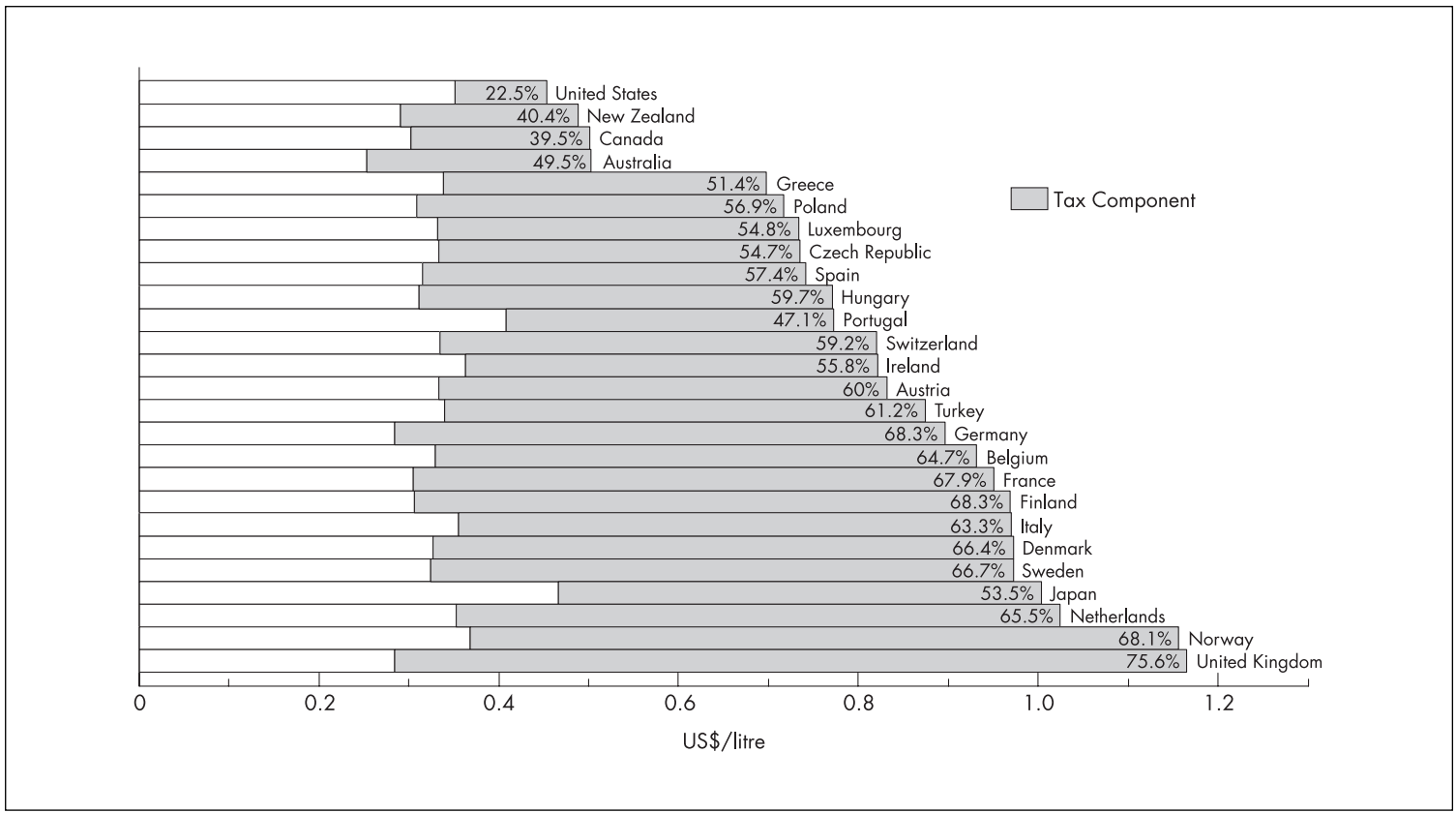
The MIT is in charge of licensing refiners, importers and retailers. The Office for the Protection of Economic Competition monitors competition in the sector.

Pre-tax prices became market-based as competition developed and have moved towards international levels; in 2000, the price of RON 95 gasoline reached CZK 29/litre or $0.74 and automotive diesel cost CZK 25/litre or $0.64, compared with the OECD Europe average of $0.97 for RON 95 gasoline and $0.83 for diesel.

The tax on automotive fuel includes an excise tax and 22% VAT, which together represent 56% of the final gasoline price and 51% of the diesel price. Customs duties on gasoline and gas/diesel oil from EU countries are 2.26% and 2.56% respectively, and 5.6% and 6.4% from non-EU countries. There is no duty on oil products imported from Slovakia.

Figure 32

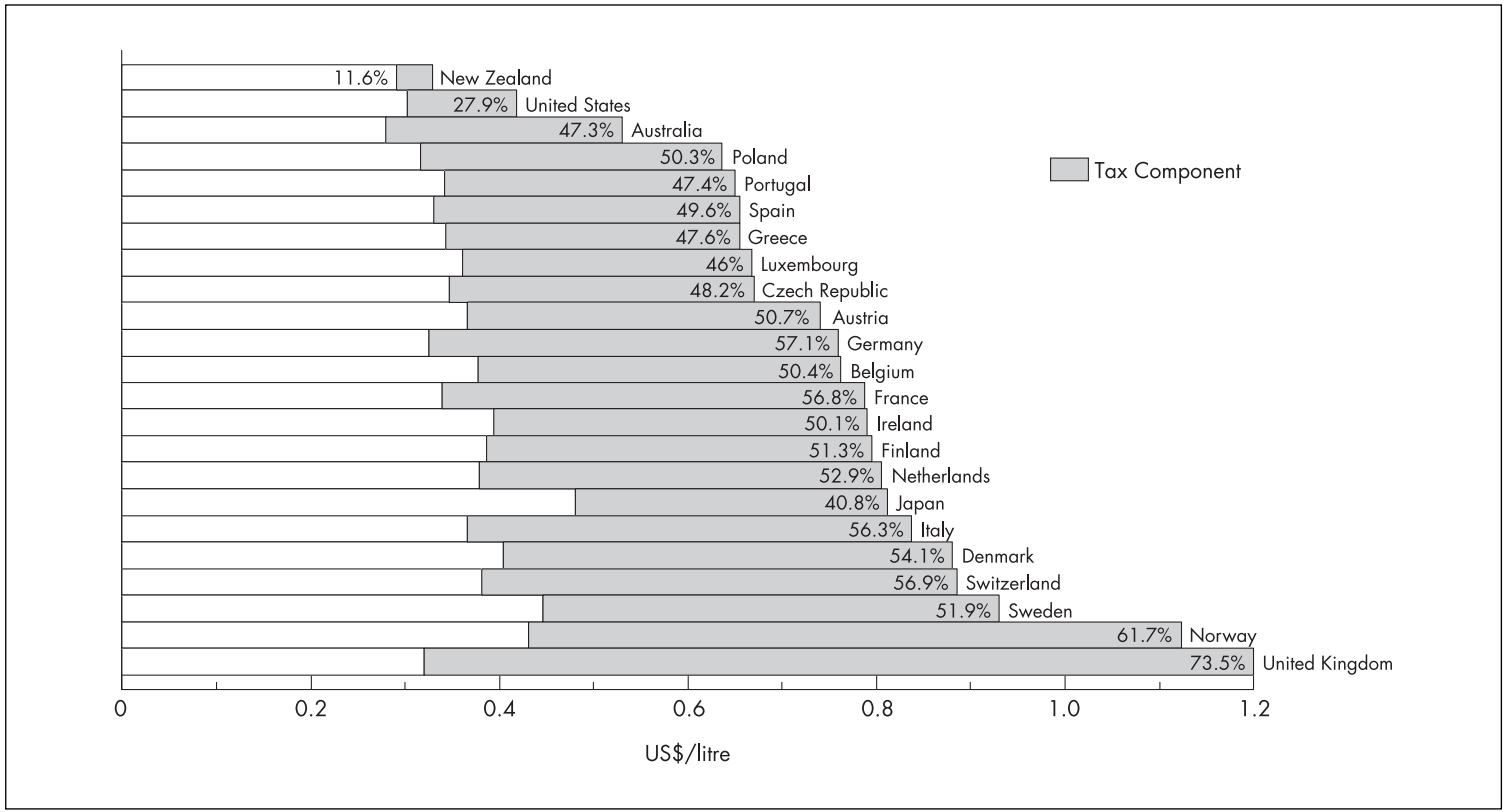
OECD Gasoline Prices and Taxes, 4th Quarter 2000



Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2001.

Figure 33

OECD Automotive Diesel Prices and Taxes, 4th Quarter 2000



Note: data not available for Canada, Hungary, Mexico and Turkey.
Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2001.

Structure and Ownership

The State retains control of the majority of assets of major oil companies, but since 1995 has started transferring ownership to the private sector. The sole domestic oil producer, Moravské Doly, was privatised in 1998.

Unipetrol, the 63% state-owned holding company, is the major oil operator in the Czech Republic, integrating refining (Ceska Rafinerska), petrochemical (Chemopetrol, Kaucuk) and retailing (Benzina a.s.) activities. In 1996, the International Petroleum Consortium (IPC), equally owned by Shell, Conoco and Agip, spent $632 million to acquire 49% of Ceska Rafinerska, Unipetrol's biggest subsidiary and the dominant domestic refiner. This was the first major privatisation operation in the oil sector in Central Europe. In 1997, the National Property Fund sold 33% of the capital of Unipetrol on the stock exchange.

At the beginning of 2000, the government started majority privatisation of Paramo, the main owner of the Pardubice refinery. Three offers were considered by NPF: a joint bid by Cepramo, a Czech company, and Rosneft, a major Russian oil producer; and offers by the Canadian company Norex Petroleum, which is currently a supplier of crude oil to the refinery through a Russian subsidiary and Unipetrol. In July 2000, the inter-ministerial privatisation committee ranked the Norex bid first but the Cabinet of Ministers decided in September to overturn that decision and awarded the bid to Unipetrol. Norex was disqualified for not having provided sufficiently clear information regarding its ownership.

As is the case for privatising state-owned electricity and natural gas companies, the government considered various options to privatise Unipetrol. The first option was to offer the entire holding as an integrated group. The second option was to carry out separate sales by main sector of activity: refining, petrochemicals and retailing. The last option was to sell further shares on the stock exchange.

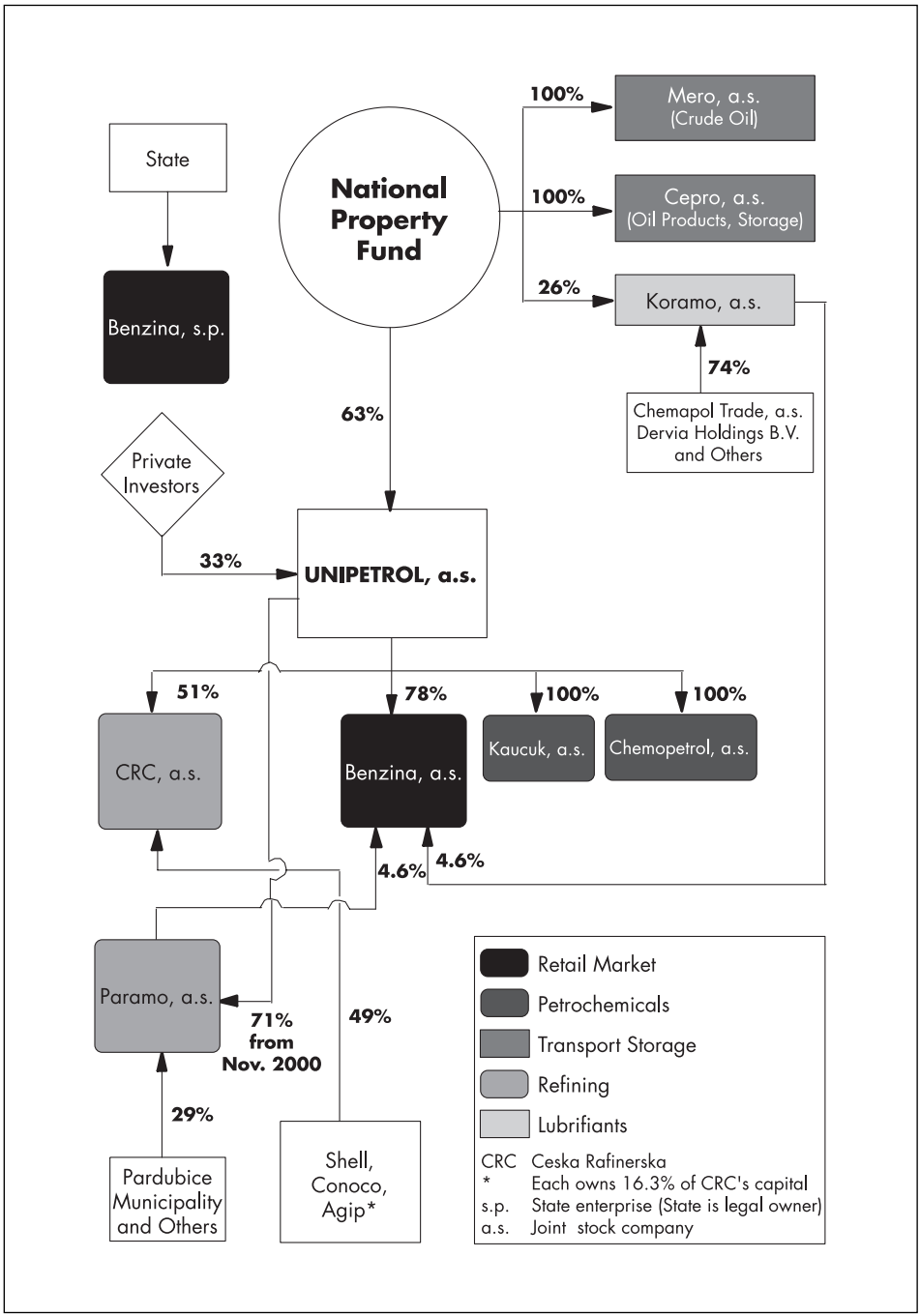
The government chose the first option by announcing its intention to sell its 63% share in Unipetrol, including Ceska Rafinerska, Paramo, the retailer Benzina a.s. and the petrochemical companies. The government's aim is to sell these companies as a single group to optimise its revenue. Unipetrol will integrate all Czech refineries, including Paramo and petrochemical capacities, but only a part of the retail network. The conditions for the privatisation of Benzina, s.p., the other state-owned retailer, are being prepared. The transport and storage companies Mero and Cepro will remain state-owned.

EMERGENCY STOCKS AND EMERGENCY RESPONSE MEASURES

Emergency Response and Legal Authority

The IKL pipeline reduces Czech dependence on Russian oil imports and provides greater flexibility in responding to possible supply disruptions. A National

Figure 34
Financial Links in the Oil Industry
(November 2000)



Sources: Country submission and annual reports.

Emergency Scheme Operator (NESO) responsible for oil crisis management has been established. The NESO is a co-ordinating committee of relevant government bodies and oil industry representatives. The Administration of State Material Reserves (ASMR) plays a key role as it is in charge of stockpiling and monitoring strategic and company stocks in addition to emergency response. The role of ASMR was strengthened by the Act on Emergency Oil Stocks (No. 189/99 of November 1999) and accompanying amendments that provide a legal basis for the implementation of the International Energy Program (IEP) and Co-ordinated Emergency Response Measures (CERM) measures, including oil allocation and demand restraint.

Emergency Reserves

The act ensures compliance with the IEA stockholding obligation by requiring that stocks held by ASMR cover at least 90 days of net imports. The act also reflects other IEA requirements, such as the exclusion of certain categories of stocks defined in the annex to the IEP Agreement and deductions for operating stocks, as well as European Union requirements for minimum levels of products in total stocks and arrangements for bilateral stocks in EU countries. The act calls for increasing state reserves gradually from 54 days of net imports in October 2000 to 90 days in 2005. Commercial stocks held by the oil companies and industry amounted to approximately 43 days of imports in 2000.

Stocks held by ASMR are owned by the government and financed from the state budget. Faced with possible storage capacity constraints, ASMR is considering bilateral arrangements for holding some stocks in neighbouring countries. In addition, there are non-compulsory commercial stocks that are owned and financed by oil companies. In times of emergency, these stocks could also be controlled by ASMR.

The government would declare a state of emergency on the recommendation of the chairman of ASMR. The ASMR would then manage the crisis situation and release the state-owned stocks up to explicit limits approved in advance by the government. Stocks held by oil companies could also be drawn down according to NESO instructions and under the supervision of ASMR.

Emergency Demand Restraint

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

implemented at short notice, typically the day after issuing a public notice. The implementation of rationing could take longer, as coupons would have to be printed and distributed.

CRITIQUE

The Czech oil industry and the domestic market have both undergone dramatic changes during the last decade. Yet indisputable progress has been made: crude oil supply has been diversified, the refining industry has been restructured and partially privatised, the retail market has been opened to competition and has reached market prices, and stockpiling and emergency preparedness legislation has been passed.

The progress in diversification of crude oil supply from Russia is especially noteworthy. The commissioning of the IKL-Mero pipeline to Germany allows the major domestic refineries access to the international oil market and reduces their vulnerability to disruptions of crude oil supply from CIS oil fields and dependence on a single, ageing transport infrastructure: the Druzhba pipeline. Imported oil delivered through the IKL pipeline has contributed to security of supply, albeit at a higher cost than Russian crude oil. Diversification and security of supply have also been improved by multiple contracts with Russian suppliers. This policy combining economic and strategic imperatives should be strengthened in order to guarantee optimal and flexible supply to the refining industry. The authorities should continue to maintain the Ingoldstadt pipeline connection in serviceable condition.

Competition in the market increased with liberalised imports of petroleum products and retail competition under the supervision of the Office for the Protection of Economic Competition. Import restrictions have been lifted. Import licences are easily granted to traders without quotas, and customs duties are low. Pre-tax prices are based on the market.

The oil sector has been modernised, the quality of fuels improved and emissions of pollutants significantly reduced. Restructuring of the oil industry is well in hand. New investments will improve productivity, pollution control, safety and the quality of products. The oil industry has been partially privatised, while significant direct foreign investment has especially benefited the sector, with the purchase of the refining company Ceska Rafinerska and the retail network. This will enable the industry to remain competitive with other market operators in the region. Improvement of environmental performance at refineries and filling stations remains a major issue in terms of reduction of emissions and soil pollution.

The Czech government intends to reorganise Unipetrol as the major oil operator in the domestic market in order to sustain regional competition before privatisation. It intends to sell the majority of its shares in Unipetrol and its subsidiaries in a single package in order to optimise revenue. The re-integration of the oil sector will be

partial as the new Unipetrol will integrate all refining and petrochemical activities, but not the whole retail network.

The effects on competition of Unipetrol's privatisation will depend on the profile of the new owner(s) of the company. The transfer of ownership of the three existing crude oil refineries to a single operator will create a *de facto* monopoly in refining. In the retail market, the current healthy level of competition is ensured by free imports of oil products and multiple retailers under supervision of the Office for the Protection of Economic Competition. But the retail market could face a dominant situation if Unipetrol's subsidiaries Benzina a.s., the largest network, and Paramo are owned by an operator already holding a significant share of the market. This is particularly likely if Shell, Conoco and Agip, the minority shareholders of Ceska Rafinerska, acquire Unipetrol, and consequently control all domestic refining which covers 65% of total consumption and a significant retail market share. Indeed, the acquisition of Benzina a.s. and Paramo would add around 371 filling stations or 19.3% of the total to the current 184 (9.6%) managed by the three companies. The market share of this new retail group could rise to 33-36%. The future privatisation of Benzina s.p., the remaining state-owned and second largest distribution network, may also influence competition in the retail market.

The government will also have to agree with Shell, Conoco and Agip, the minority shareholders of Ceska Rafinerska, who have held 49% of the company since 1996 and who could block the sale of Unipetrol as a whole or Ceska Rafinerska alone to other oil companies.

Although the Czech retail market for oil products is highly competitive, there is a concern that further concentration in the hands of a single private operator may work against competition in the oil industry [24]. This issue is directly related to confusion of the roles of the State as owner, regulator and operator. The government should therefore avoid creating distortion of competition and should reinforce the role and authority of the Office for the Protection of Economic Competition.

The Czech authorities have decided to maintain full state ownership of Mero and Cepro, the company in charge of transport and storage of crude oil and oil products respectively. The activities of these companies are seen as natural monopolies that cannot be privatised. Other oil companies should be ensured access without discrimination to the transport and storage facilities owned by Mero and Cepro.

The Czech government has achieved laudable results in order to comply with IEA standards for emergency stocks and emergency response measures. The country has already fulfilled most of the requirements.

24. For example, in Poland one operator controls 70% of domestic refining capacity and 40% of the retail network, limiting opportunities for the second main refiner and the other retailers both independent and foreign. The anti-monopoly office has investigated several cases of abuse of dominant position.

RECOMMENDATIONS

The government should:

- ☐ Maintain supply through the Ingolstadt-Kralupy-Litvínov (IKL) pipeline.
- ☐ Maintain high safety and environmental standards in the oil sector, including transport, refining, retailing and final products.
- ☐ Ensure that conditions for fair and effective competition in the whole sector are guaranteed by the Office for the Protection of Economic Competition.
- ☐ Make sure that operating companies have non-discriminatory access to transport and storage facilities.

11

COAL

INTRODUCTION

The Czech coal mining industry started operation in 1876 and has contributed greatly to the development of domestic industrial sectors, including metallurgy, organic chemicals and energy (power generation and district heating). The share of coal in TPES increased to 70% during the central planning period. However, this extensive use of coal, notably brown coal, caused serious environmental problems both in coal-mining areas and in areas where it is used. Coal remains dominant in domestic energy production and still represents nearly half of primary energy supply. In 1999, the coal industry employed some 48,330 persons and represented half of total employment in the energy sector, 72% less than in 1990. The industry is located in two main regions, Northern Moravia and Northern Bohemia.

MARKET OVERVIEW

Production

Both brown coal/lignite and hard coal are produced. At present there are about 1.6 billion tonnes of brown coal reserves and 0.05 billion tonnes of lignite in active mines in the Czech Republic. In addition to these reserves, nearly 1 billion tonnes are blocked by the limits on mining imposed by the government on environmental grounds. Hard coal reserves in active mines (Ostravsko-Karvinske Doly–OKD, Ceskomoravske Doly–CMD) are equally divided between coking coal and steam coal, and are estimated at 0.37 billion tonnes.

The brown coal fields yield poor quality coal in terms of calorific value, ash content and sulphur content but have relatively favourable geological characteristics. As a consequence, the environmental impact is serious when coal is used without de-pollution systems. The quality of hard coal is higher but geological conditions are difficult (low thickness and high depth of coal seams). So, hard coal mining productivity is low compared to large producer countries.

In 1999, coal production in the Czech Republic amounted to 23.1 Mtoe representing 82% of total domestic energy production and 48.1% of TPES. Hard coal accounted for 40% (9.1 Mtoe) of total coal production and brown coal 60% (13.6 Mtoe).

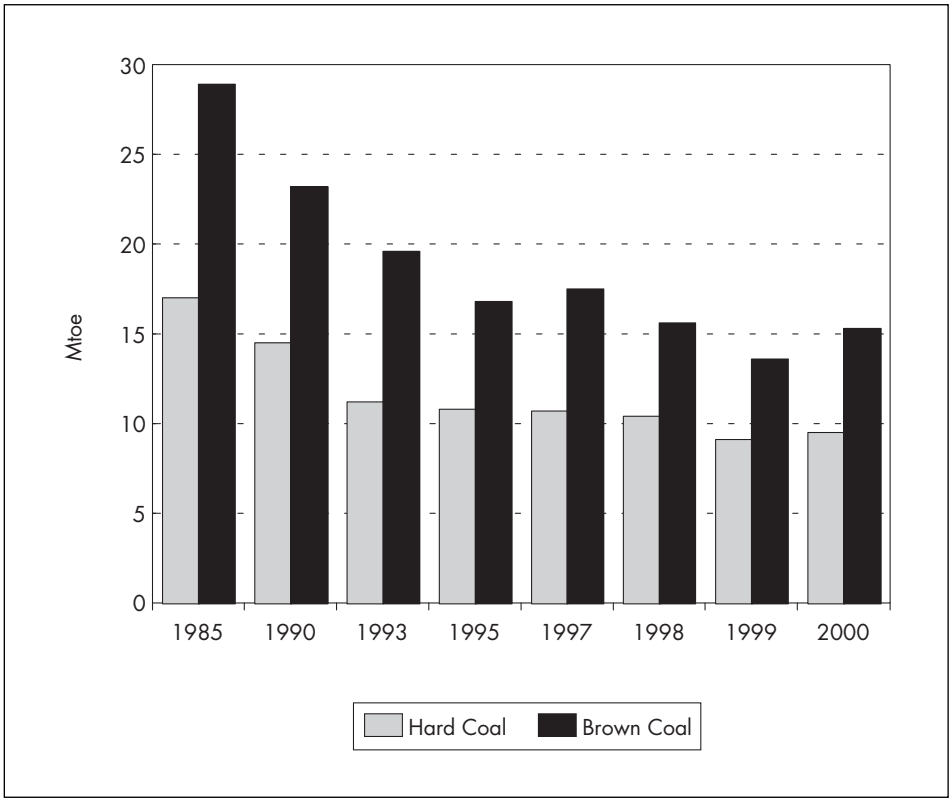
The country was the fourth largest hard coal producer in OECD Europe in 1999. Coking coal production was 7.9 Mt (5.6 Mtoe) and steam coal 6.6 Mt (3.7 Mtoe), corresponding to 55% and 80% of 1990 production, respectively. The remaining active coal fields which are underground at a depth of 700-1,000 metres, are centred in Ostrava-Karvina neighbouring Polish Silesia and in the central basin of Kladno

(see figure 37). The five mining complexes in Ostrava-Karvina produce nearly 80% of total domestic hard coal. Coke is produced at the pit on one site in Ostrava and also by the major metallurgical companies. Coking coal and coke account for as much as 80% of the revenue of the hard coal industry.

In 1999, 44.2 Mt (13 Mtoe) of brown coal were mined, of which 75% (34.4 Mt) was in Northern Bohemia in fields operated by the Severoceske Doly (SD) and Mostecká ubelná spolecnost (MUS) mining companies. The other coal fields are Sokolov in Western Bohemia where the SU mining company produces 11 Mt annually and Hodonin (Southern Moravia) with 0.5 Mt of lignite. Most of the mines are open cast, and only two underground coal mines, one brown coal and one lignite, are still in operation.

The decline of coal mining accelerated from 1989 as a result of restructuring of the coal industry, falling domestic and export demand, and the enforcement of environmental standards. Between 1989 and 1999, hard coal and brown coal production fell by 42% and 48%, respectively. Coke production was halved from 7.1 to 3.3 Mt.

Figure 35
Coal Production per Type, 1985 to 1999
(Mtoe)



Sources: *Coal Information*, IEA/OECD Paris, 2000, and country submission.

Demand

In 1999, the share of coal in TPES fell to 48.1% or 18.6 Mtoe, down from 63% in 1990. Its share in TFC fell to 14.4% or 3.6 Mtoe, down from 49.4% in 1990. The demand for hard coal was 5.7 Mtoe (9.1 Mt) and 12.4 Mtoe (41.6 Mt) for brown coal. Power generation was the main end-use, consuming 60% of total coal supply, followed by mine coke ovens (17%), industry (13.5%), CHP/district heating (7%) and households (3%).

Domestic demand for coking coal comes from coke plants operated by the coal industry, which produces coke for domestic consumers and for export, and also from coke plants in the metallurgy sector. In 1999, domestic demand was 4.15 Mt or half the total coking coal production. Since 1990, coking coal consumption has fallen by nearly 40% because of the restructuring (downsizing and changes in process) of the largest Czech metallurgical companies, Nova Hut and Trinecke Zelezarny, which together account for two-thirds of domestic demand for coking coal and 15% of domestic demand for steam coal.

Steam coal and brown coal are mainly consumed by heat and power generation (CHP) plants, representing two-thirds of TPES. Brown coal-fuelled power plants are generally located near the coal mines and connected by conveyor. Their marginal generation costs are low, at CZK 0.32-0.40/kWh, and they are able to compete in both domestic and export markets.

Consumption of brown coal by heat and power plants fell by 12% or –3.5 Mt from 40.9 Mt/12.4 Mtoe between 1990 and 1998. However, several generation units switched to steam coal, which created a new demand of 4.3 Mt or 2.4 Mtoe. Enforcement of higher environmental emission standards for energy facilities above 5 MW capacity under the Clean Air Act is the main reason for the decommissioning of non-upgradable heat and power plants. However, since 1990, the installation of desulphurisation units at power plants has helped maintain coal's dominant position of 70% in the fuel mix for power generation.

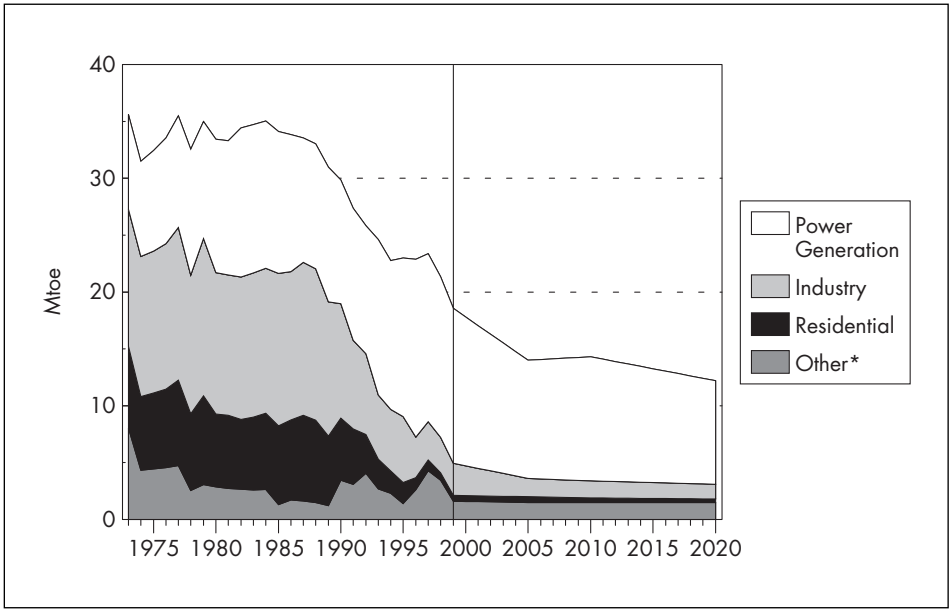
Direct use of solid fuels in non-energy sectors dropped by 71% between 1990 and 1998. Steam coal and coking coal consumption decreased by 86% and 38%, respectively, during the same period. Industry and other sectors reduced their brown coal purchases by 74% and 96%, respectively. This has radically reduced urban air pollution.

Demand Forecasts

The MIT forecasts a further 17% reduction of total coal production between 1999 and 2005, to 19 Mtoe in 2005, and then to 17 Mtoe in 2010. The share of coal in TPES will drop from 48.1% to 34.8% in 2010.

Hard coal production is forecast to decline by 20% from 1999 to 2010, as domestic markets for steam coal, the energy sector and industry, and steel industry and export markets in the case of coking coal will continue to shrink. Brown coal output is

Figure 36
Coal Demand, 1973 to 2020



* includes transport, commercial, public service and agricultural sectors and other transformation and energy consumption.
Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2000, and country submission.

projected to fall by about 30% reaching 32 Mt in 2010 owing to the increased share of nuclear power and falling domestic demand by direct users. In 2010, solid fuels are expected to have stabilised their share of the power generation mix at a level of 50%.

Trade

The Czech Republic is a net exporter of coal. Two-thirds of exports are coking coal, i.e. 3.5 Mt in 1999, were mainly sold to German, and also to Austrian and Central European iron and steel industries. In 1999, 2.6 Mt of steam coal were exported, mainly to Germany, Austria and Slovakia. Total hard coal exports have increased by 1 Mt since 1990, thanks to an increase of sales to Austria and Germany, and represent 40% of total production and 50% of coking coal. In addition, 3.3 Mt of brown coal were exported in 1999, mostly to nearby German power plants.

The coke producers, the metallurgy industry and OKD import hard coal from Poland (1.1 Mt in 1999). However, imports are subject to quotas set by the MIT. In 1999, the authorised import quota of 1.2 Mt was not completely filled since domestic coal was more competitive than Polish supply. Coke exports fell from 1.4 Mt in 1990 to 1 Mt in 1999.

INDUSTRY RESTRUCTURING

From Public to Private Ownership

The Czech government has encouraged the restructuring of the industry and the progressive privatisation of the coal companies.

The 15 different mining companies that existed in 1990 have been reorganised into six companies; two for hard coal mining, OKD and CMD, and four for brown coal and lignite mining: MUS, SD, the Northern Bohemia coal company, SU the Sokolov coal company (Western Bohemia) and Lignit in Hodonin (Southern Moravia). Majority shares of five state joint stock companies were owned by the National Property Fund. At the end of 1998, the country's largest hard coal mining company, OKD, merged with the second largest, CMD. The new OKD is owned by a private company, Karbon Invest (49.2%) and NPF (45.6%), and holds a majority share in CMD. The government plans to fully privatise OKD once its restructuring is finalised, and to create two separate entities within OKD: one in charge of market activities and the other to supervise the phasing-out of mines, with the help of state subsidies.

In 1998, the Swiss company Investenergy SA acquired 46.3% of the capital of MUS, the second largest brown coal producer at that time, and took over the company with a coalition of minority shareholders. The government represented by NPF could not oppose the operation and, in 1999, NPF sold its remaining share to Investenergy. SD is the country's biggest brown coal producer and is owned by the State and CEZ, a.s., which also purchases 80% of its total output. As CEZ, a.s., the main client of the three companies, will reduce its purchases of brown coal by 10-12 Mt in the years 2001-2005 after the commissioning of the Temelín nuclear power plant, MUS and SD are expected to merge to facilitate restructuring. The conditions for this merger, notably concerning shareholding between Investenergy SA, NPF and CEZ, a.s., have not been set.

The Reform of the Regulatory and Institutional Framework

The Czech Mining Authority under the MIT has the main responsibility for implementing coal policy. The Ministry of Finance provides financial support for the restructuring of the industry. The Ministry of the Environment is in charge of environmental issues. The Office for the Protection of Economic Competition monitors the coal market, which has only a limited number of players on both the supply and demand sides, where the brown coal power plants are captive players. The State retains a strong direct influence on the brown coal companies through its majority shares in two of the three main mining companies. The State also holds minority shares in OKD, the hard coal company. CEZ, a.s., the power company and the biggest coal consumer, also has a significant share in the biggest brown coal producer.

The Mining Act passed in 1993 regulates the coal sector, along with various governmental decrees concerning the industry's restructuring and downsizing to

Table 20
Key Indicators and Ownership of Coal Mining Companies, 2000

	Hard coal		*Brown coal*			
	OKD	*CMD*	*MUS*	*SD*	*SU*	*Lignit*
Coal production (Mt)	11.8	3.1	13.2	21.2	9.9	0.5
Employees (thousands)*	22.9	5.4	8.7	5.9	6.2	0.5
Productivity (t/man-year)*	430	560	1,524	3,575	1,590	1,280
Capital (billion CZK)	24.3	..	2.8	6	4.7	..
Ownership						
State (NPF)	45.8%			54%	48.7%	
CEZ, a.s.				39%		
Municipalities		9%			9.6%	
Private companies	49.2% (Karbon Invest)	80% (OKD)	95% (Investenergy-Switzerland)			100% (Lignit)
Others	5%	11%	5%	7%	41.7%	

* 1999.

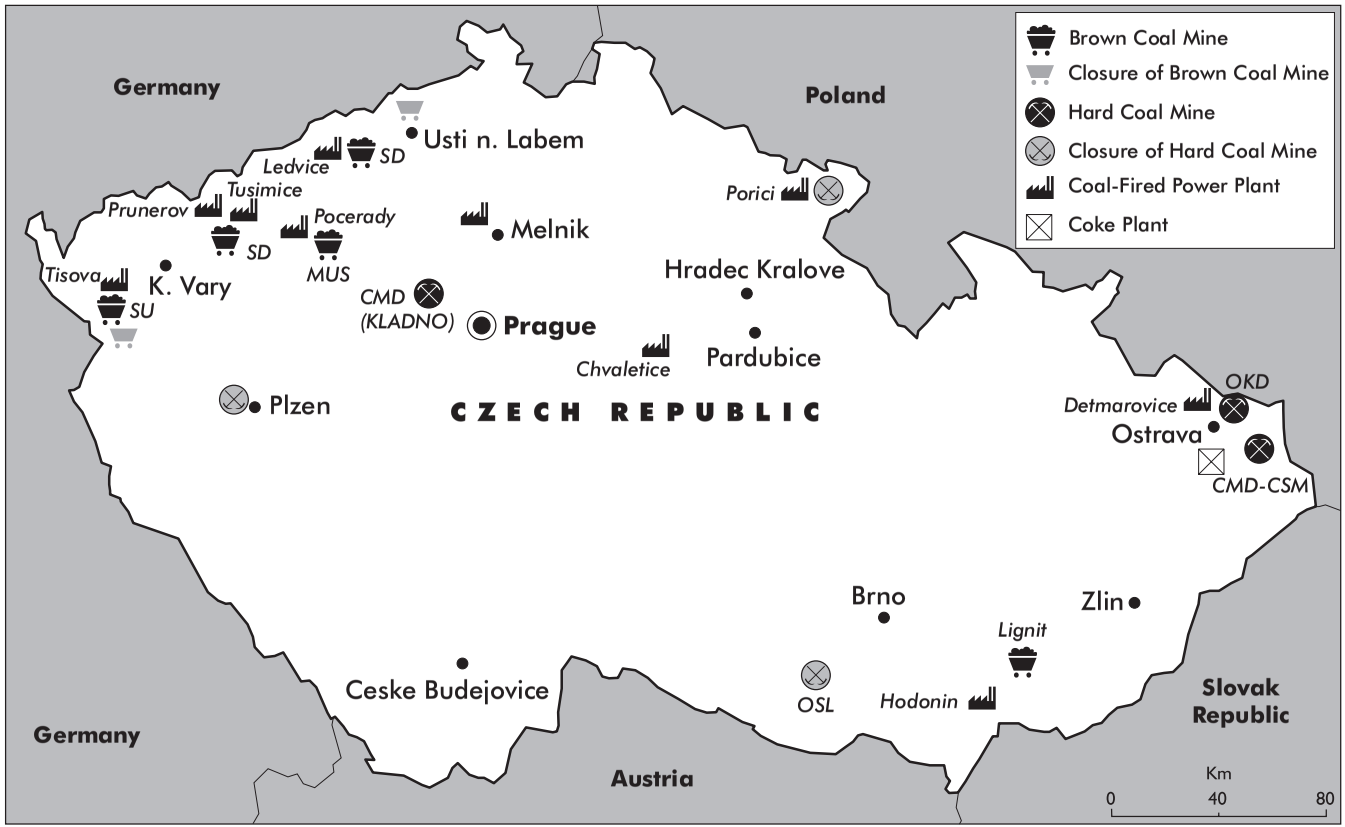
Sources: OKD, WEC, country submission.

economically sustainable levels. The government abolished price controls in 1994 and prices are now agreed by a limited number of coal companies and major consumers under medium- to long-term contracts.

The Czech government has cut the number of inefficient mines and the labour force. From 1992 to 1998, 12 hard coal mines were closed out of a total of 19 and the number of brown coal mines dropped from nine to five. The labour force in hard coal mines shrunk by 60% to 25,630 employees; in brown coal mines it shrunk by 51% to 18,640 employees. Rationalisation and modernisation occurred in the remaining seven hard coal and five brown coal mines. The productivity gain has been substantial, with an average increase of 67% for hard coal and 45% for brown coal. The biggest hard coal company earned CZK 1,595 per tonne at a production cost of CZK 1,400 per tonne in 1999. Imports of hard coal, principally from Poland, remained below 1.23 Mt per year, equivalent to 13% of 1999 consumption, because of the import quota. The quota is to be abolished in 2002.

Following the initial phase of restructuring begun in 1993 and accompanied by significant phasing-out of coal mines and privatisation, the Czech government is committed to implementing a second phase. In the hard coal sector, at least two mines are scheduled for closure in Ostrava in 2003 and 2006, or earlier if domestic and foreign coking coal demand declines further. Brown coal production is expected to fall by 10-12 Mt, equivalent to around 25% of total production by 2005, when the Temelín nuclear power plant comes into operation at full capacity. The underground brown coal mines with low productivity will probably be closed first and restructuring of other mines will continue.

Figure 37
Coal Infrastructure, 2000



Source: Country submission.

State Financial Support

Downsizing and phasing-out of coal mines according to EU procedures will continue along with the privatisation of coal companies, while ensuring the best long-term use of coal resources. Hard coal mines were reduced from 19 in 1992 to seven in 1999 and brown coal mines were reduced from nine to five. Restructuring of the coal industry has been financially supported by the State in three main areas:

- Technical closure of mines.
- Restoration of site areas damaged by mining.
- Social and health benefits for redundant staff, the unemployed and pensioners.

State subsidies are used to close the mines and mitigate environmental damage and social hardship, but are not used to support production. The heavy job cuts in mining in Northern Bohemia and Northern Moravia, where it is the sole industry, have had severe social impacts. In 1999, total financial support received by the coal industry for downsizing and phasing out mines was CZK 2.68 billion.

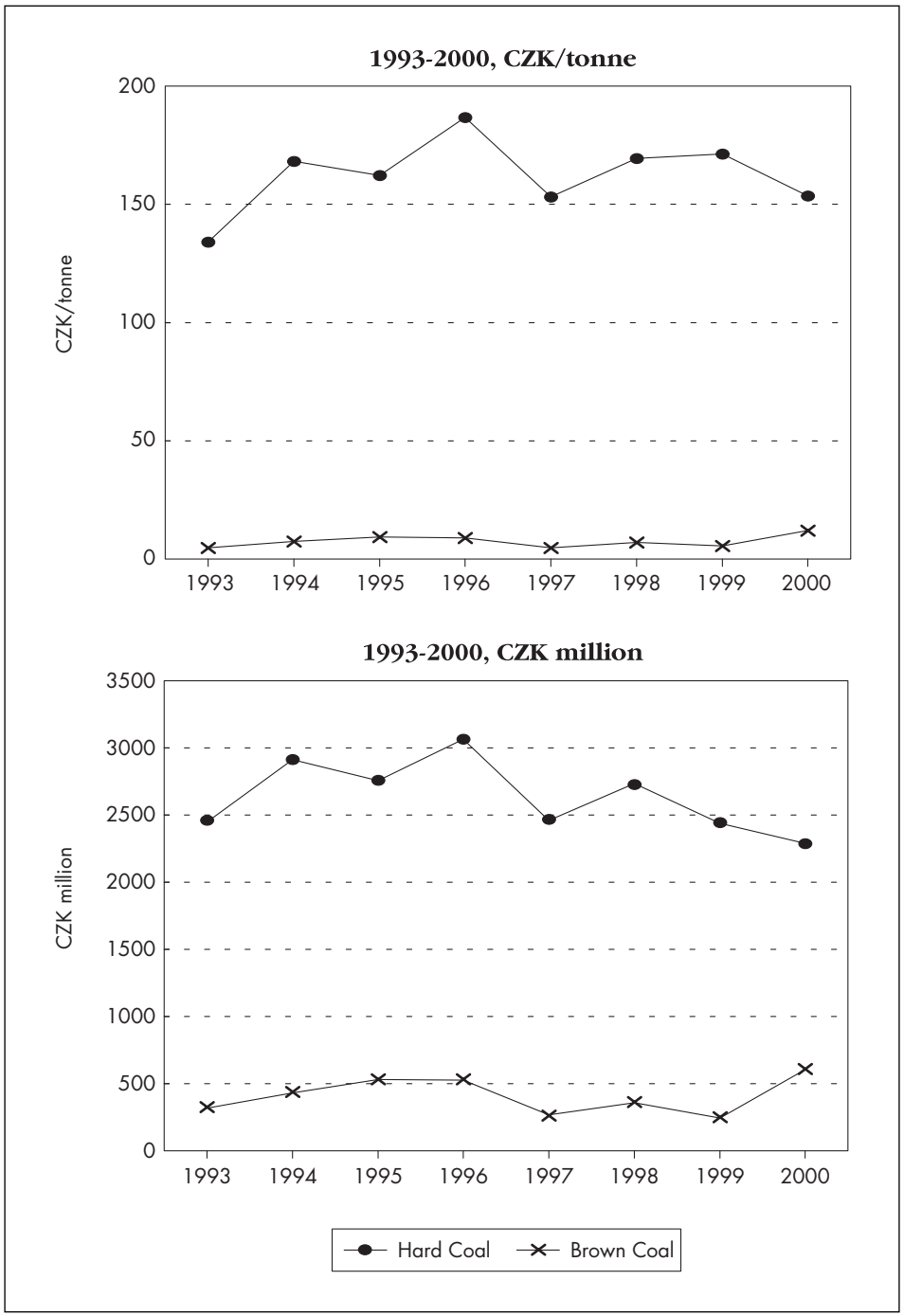
Subsidies for hard coal mine closures represented 88% of total subsidies in 1993 and 90% in 1999 (this share was expected to drop to 78% in 2000). The subsidies peaked in 1993 and in 1999, when the largest number of mines were closed, to cover social and health benefits for redundant staff and pensioners. In 1999, the hard coal mining industry received CZK 2.4 billion of non-investment subsidies, of which 92% was allocated to OKD, covering 90% of the total cost of restructuring that year. Total subsidies to hard coal mines have stabilised despite decreased production. As a result, subsidies per tonne of hard coal mined increased between 1993 and 1999, as shown in Figure 38. However, these amounts are still relatively modest compared to total sale prices equivalent to 11.5% of total sale prices in 1999 and compared to other OECD countries: $108/tce in Germany in 1999 or about 115% of the average import price.

State subsidies for phasing out brown coal mining were modest at CZK 0.24 billion in 1999, or CZK 12.5/tce, but they are expected to rise to CZK 0.6 billion in 2000. Further downsizing and phasing-out of existing mines will necessitate an increase in the State's financial contribution.

CRITIQUE

The Czech government has made substantial progress in restructuring its coal sector. Uneconomic mines have been downsized and phased out, and parts of the industry have been privatised. Productivity has greatly increased, although significant room for improvement still exists. With state aid, additional coal mines will close and environmental restoration of sites will continue. The amounts of state aid have stabilised during the last decade.

Figure 38
State Subsidies to the Coal Industry, 1993 to 1999



Sources: *Coal Information*, IEA/OECD Paris, 2000, and country submission.

The future of the Czech coal industry appears to be based on segments with confirmed market potential: brown coal mines supplying power plants complying with environmental standards and hard coal mines supplying coking coal for regional customers.

Brown coal demand is expected to shrink in the short term by more than 10 million tonnes, since the commissioning of the Temelín nuclear power plant will displace coal-fired power plants. This will put additional pressure on the coal sector to restructure and increase productivity. Further privatisation should help in this respect.

However, the relatively low cost of brown coal and the potential for productivity improvements suggest that this sector can remain viable in the medium term. Consumption of brown coal for power generation is expected to stabilise at 32 Mt after 2010, when it will represent around half the fuel input for electricity generation. Future demand is heavily dependent on the development of power generation and long-term power exports to neighbouring markets. Brown coal-fired power plants benefit from competitive marginal generation costs and desulphurisation equipment.

Where a brown coal mine serves a single nearby power plant, it may make sense for the State to integrate its ownership of the coal mine company with the power company if that company is also majority state-owned.

For hard coal, productivity improvements and further restructuring are necessary to ensure the long-term competitiveness of the industry. While import limitations are currently not binding on the industry because of the high U.S. dollar, appreciation of the Czech currency has exposed the hard coal industry to greater competition from neighbouring countries, particularly Poland. Current plans to restructure the industry, including closure of uneconomic mines and further privatisation, will certainly need to be carried out.

RECOMMENDATIONS

The government should:

- ☐ Continue with current plans to restructure the coal sector, including the closure of uneconomic mines and restoration of closed sites.
- ☐ Ensure compliance of coal mining and coal utilisation with EU environmental standards.
- ☐ Consider integrating ownership of brown coal mines that exclusively supply a single power plant with ownership of that plant.

12

ENERGY RESEARCH AND DEVELOPMENT[25]

GENERAL POLICY FRAMEWORK

In 1998-1999, the document "Analysis of Previous Trends and Existing State of Research and Development in the Czech Republic and Comparisons with the Situation Abroad" was drawn up and approved by the government. The analysis identified the positive aspects of current R&D as well as weaknesses and confirmed the need to transform science and technology policy with the aim to:

- Improve the efficiency and performance of Science and Technology (S&T).
- Improve legislation on state support for S&T.
- Ensure closer linkage of S&T policy with other governmental policies.
- Increase the objectivity and transparency of S&T support allocation.
- Concentrate state support on fewer and more effectively co-ordinated programmes and projects.

This background report was used to prepare the National Science and Technology Policy of the Czech Republic, approved by the government on 5 January 2000. The National S&T Policy sets particular tasks for this area and proposes the adoption of further key legislative measures, particularly the new act on science and technology in 2000 and the launch of a national programme of research.

The Administrative and Institutional Framework

At present, there is no ministry specifically in charge of R&D. The formulation, implementation and evaluation of S&T policy are carried out by various official bodies such as the Ministry of Industry and Trade, which ensures technology development; the Ministry of Education, Youth and Sports, which is responsible for S&T policy, including international co-operation; and the Ministry of Health, which deals with S&T in the health care system. The fully autonomous Academy of Sciences includes 64 research and service institutes and is state-funded. The Grant Agency of the Czech Republic, established to support S&T projects with grants, is also involved in budget allocation. State support of S&T represented 0.49% and 0.51% of GDP in 1998 and 1999, respectively. In 2002, it is expected to represent 0.7% of GDP. It is not possible to provide data on R&D expenditures as the database of the Council of the Government of the Czech Republic for Research and Development contains inaccurate and incomplete data.

25. This chapter is based mainly on a document of the Committee for Science and Technology Policy of the OECD's Directorate for Science, Technology and Industry (March 2000, unpublished).

This council provides advice on legislative documents related to S&T and makes recommendations on financial allocations for S&T projects. It has no power to set guidelines for different programmes or to administer them.

In fact, R&D projects are developed by experts in all fields from various bodies such as public laboratories, universities, private research institutes and ministries. At present, there is a predominance of small projects: 65 S&T programmes in 20 areas. The result is that almost 70% of state support goes to small and non-complex projects.

There are six separate projects on nuclear energy, nine programmes on renewables, four on energy efficiency, eight on fossil fuels, and three on power and storage technology. A new S&T programme is being developed and it is expected that, as from 2000, purpose-oriented financing will focus on five thematic programmes and three cross-cutting programmes.

IEA Implementing Agreements

The government is aware of the many benefits that IEA Implementing Agreements (IAs) can add to its R&D efforts. It is involved in discussions with possible partners with the aim of becoming a member of one or more IAs.

CRITIQUE

The government is making commendable efforts to finance R&D and aims to increase funding. However, energy-related R&D activities are spread too widely and undertaken in too many institutions. The current structure of R&D may impede full achievement of the government's objectives for the energy sector. The government should establish clear priorities among the various R&D fields and concentrate on those that are most promising. A central body, such as the Council of the Government of the Czech Republic for Research and Development, could play this role, which is essential for the success of national R&D policy.

In addition, participation of Czech R&D institutions in IEA Implementing Agreements would stimulate R&D and allow it to benefit from international co-operation.

RECOMMENDATIONS

The government should:

- ☐ Review the structure of government R&D and select a limited number of projects identified as effective in meeting the national energy policy objectives, and concentrate resources on them.

- ☐ Investigate the advantages of participating in relevant IEA Implementing Agreements.

A

ANNEX

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit: Mtoe

SUPPLY

		1973	1990	1998	1999	2005	2010	2020
TOTAL PRODUCTION		**38.51**	**38.52**	**30.74**	**27.95**	**27.30**	**25.60**	**21.40**
Coal[1]		38.01	34.71	26.04	23.08	19.00	17.00	12.00
Oil		0.04	0.21	0.42	0.38	0.20	0.20	0.20
Gas		0.36	0.20	0.17	0.18	0.20	0.20	0.30
Comb. Renewables & Wastes[2]		–	–	0.55	0.69	1.00	1.30	1.90
Nuclear		–	3.28	3.43	3.48	6.70	6.70	6.70
Hydro		0.09	0.12	0.12	0.14	0.20	0.20	0.20
Geothermal		–	–	–	–	–	–	–
Solar/Wind/Other		–	–	–	–	–	–	0.10
TOTAL NET IMPORTS[3]		**6.99**	**7.63**	**10.54**	**9.65**	**12.60**	**15.50**	**21.90**
Coal[1]	Exports	2.56	7.26	6.23	6.21	5.60	4.00	1.10
	Imports	0.15	1.57	1.08	0.84	0.80	1.20	1.40
	Net Imports	–2.41	–5.69	–5.15	–5.37	–4.80	–2.80	0.30
Oil	Exports	0.04	6.56	1.40	1.32	0.10	0.40	0.40
	Imports	8.91	15.16	9.69	9.17	7.40	8.00	8.60
	Bunkers	–	–	–	–	–	–	–
	Net Imports	8.87	8.60	8.29	7.85	7.30	7.60	8.20
Gas	Exports	0.01	–	0.00	–	–	–	–
	Imports	0.73	4.78	7.61	7.44	10.70	11.00	13.20
	Net Imports	0.72	4.78	7.61	7.44	10.70	11.00	13.20
Electricity	Exports	0.44	0.76	0.93	1.05	0.80	0.70	0.40
	Imports	0.25	0.70	0.72	0.77	0.20	0.40	0.60
	Net Imports	–0.19	–0.06	–0.21	–0.28	–0.60	–0.30	0.20
TOTAL STOCK CHANGES		**–0.08**	**1.25**	**–0.05**	**0.99**	**–0.70**	**–**	**0.10**
TOTAL SUPPLY (TPES)		**45.42**	**47.40**	**41.22**	**38.58**	**39.20**	**41.10**	**43.40**
Coal[1]		35.59	29.84	21.35	18.56	14.00	14.30	12.20
Oil		8.91	8.96	8.29	8.26	7.10	7.60	8.50
Gas		1.01	5.26	7.68	7.73	10.80	11.30	13.60
Comb. Renewables & Wastes[2]		–	–	0.55	0.69	1.00	1.30	1.90
Nuclear		–	3.28	3.43	3.48	6.70	6.70	6.70
Hydro		0.09	0.12	0.12	0.14	0.20	0.20	0.20
Geothermal		–	–	–	–	–	–	–
Solar/Wind/Other		–	–	–	–	–	–	0.10
Electricity Trade[4]		–0.19	–0.06	–0.21	–0.28	–0.60	–0.30	0.20
Shares (%)								
Coal		*78.4*	*63.0*	*51.8*	*48.1*	*35.7*	*34.8*	*28.1*
Oil		*19.6*	*18.9*	*20.1*	*21.4*	*18.1*	*18.5*	*19.6*
Gas		*2.2*	*11.1*	*18.6*	*20.0*	*27.6*	*27.5*	*31.3*
Comb. Renewables & Wastes		*–*	*–*	*1.3*	*1.8*	*2.6*	*3.2*	*4.4*
Nuclear		*–*	*6.9*	*8.3*	*9.0*	*17.1*	*16.3*	*15.4*
Hydro		*0.2*	*0.3*	*0.3*	*0.4*	*0.5*	*0.5*	*0.5*
Geothermal		*–*	*–*	*–*	*–*	*–*	*–*	*–*
Solar/Wind/Other		*–*	*–*	*–*	*–*	*–*	*–*	*0.2*
Electricity Trade		*–0.4*	*–0.1*	*–0.5*	*–0.7*	*–1.5*	*–0.7*	*0.5*

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

Unit: Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	1998	1999	2005	2010	2020
TFC	**33.07**	**35.30**	**25.34**	**24.82**	**24.10**	**25.50**	**27.64**
Coal[1]	20.66	17.43	3.85	3.57	2.50	2.30	2.00
Oil	8.06	8.09	7.77	7.72	6.30	6.80	7.20
Gas	1.81	4.19	6.21	6.12	6.60	6.60	7.30
Comb. Renewables & Wastes[2]	–	–	0.31	0.32	0.40	0.40	0.60
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
Electricity	2.54	4.14	4.20	4.14	4.10	4.70	5.30
Heat	–	1.45	2.99	2.96	4.20	4.70	5.24
Shares (%)							
Coal	*62.5*	*49.4*	*15.2*	*14.4*	*10.4*	*9.0*	*7.2*
Oil	*24.4*	*22.9*	*30.7*	*31.1*	*26.1*	*26.7*	*26.0*
Gas	*5.5*	*11.9*	*24.5*	*24.7*	*27.4*	*25.9*	*26.4*
Comb. Renewables & Wastes	–	–	*1.2*	*1.3*	*1.7*	*1.6*	*2.2*
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
Electricity	*7.7*	*11.7*	*16.6*	*16.7*	*17.0*	*18.4*	*19.2*
Heat	–	*4.1*	*11.8*	*11.9*	*17.4*	*18.4*	*19.0*
TOTAL INDUSTRY[5]	**19.42**	**18.63**	**12.71**	**11.46**	**10.60**	**11.00**	**11.60**
Coal[1]	12.06	10.06	3.13	2.83	1.60	1.50	1.30
Oil	5.30	4.23	3.56	3.45	2.20	2.30	2.30
Gas	0.46	2.02	2.85	2.63	3.00	2.70	3.00
Comb. Renewables & Wastes[2]	–	–	–	0.01	0.20	0.20	0.30
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
Electricity	1.61	2.32	1.62	1.62	1.50	1.80	2.00
Heat	–	–	1.55	0.92	2.10	2.50	2.70
Shares (%)							
Coal	*62.1*	*54.0*	*24.6*	*24.7*	*15.1*	*13.6*	*11.2*
Oil	*27.3*	*22.7*	*28.0*	*30.1*	*20.8*	*20.9*	*19.8*
Gas	*2.4*	*10.9*	*22.4*	*23.0*	*28.3*	*24.5*	*25.9*
Comb. Renewables & Wastes	–	–	–	*0.1*	*1.9*	*1.8*	*2.6*
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
Electricity	*8.3*	*12.4*	*12.7*	*14.1*	*14.2*	*16.4*	*17.2*
Heat	–	–	*12.2*	*8.1*	*19.8*	*22.7*	*23.3*
TRANSPORT[6]	**2.46**	**2.86**	**3.93**	**4.12**	**3.90**	**4.50**	**5.00**
TOTAL OTHER SECTORS[7]	**11.18**	**13.81**	**8.70**	**9.25**	**9.60**	**10.00**	**11.04**
Coal[1]	8.47	7.37	0.72	0.74	0.90	0.80	0.70
Oil	0.60	1.27	0.52	0.36	0.40	0.40	0.60
Gas	1.35	2.17	3.33	3.47	3.60	3.70	3.90
Comb. Renewables & Wastes[2]	–	–	0.31	0.31	0.20	0.20	0.30
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
Electricity	0.76	1.56	2.39	2.33	2.40	2.70	3.00
Heat	–	1.45	1.44	2.04	2.10	2.20	2.54
Shares (%)							
Coal	*75.7*	*53.3*	*8.3*	*7.9*	*9.4*	*8.0*	*6.3*
Oil	*5.4*	*9.2*	*5.9*	*3.9*	*4.2*	*4.0*	*5.4*
Gas	*12.1*	*15.7*	*38.3*	*37.5*	*37.5*	*37.0*	*35.3*
Comb. Renewables & Wastes	–	–	*3.6*	*3.4*	*2.1*	*2.0*	*2.7*
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
Electricity	*6.8*	*11.3*	*27.4*	*25.2*	*25.0*	*27.0*	*27.2*
Heat	–	*10.5*	*16.5*	*22.0*	*21.9*	*22.0*	*23.0*

Unit: Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	1998	1999	2005	2010	2020
ELECTRICITY GENERATION[8]							
INPUT (Mtoe)	**9.70**	**16.54**	**19.62**	**19.48**	**22.20**	**23.60**	**23.90**
OUTPUT (Mtoe)	**3.54**	**5.38**	**5.56**	**5.52**	**5.92**	**6.22**	**6.33**
(TWh gross)	41.17	62.56	64.62	64.16	68.80	72.30	73.60
Output Shares (%)							
Coal	*85.1*	*71.8*	*71.6*	*69.9*	*50.6*	*51.3*	*42.7*
Oil	*11.3*	*4.8*	*1.0*	*0.7*	*1.0*	*1.1*	*1.8*
Gas	*0.9*	*1.0*	*3.9*	*4.7*	*7.7*	*8.6*	*14.4*
Comb. Renewables & Wastes	–	–	*0.9*	*1.3*	*0.9*	*1.1*	*2.2*
Nuclear	–	*20.1*	*20.4*	*20.8*	*37.4*	*35.5*	*34.9*
Hydro	*2.6*	*2.3*	*2.2*	*2.6*	*2.5*	*2.4*	*2.6*
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	*0.0*	–	–	*1.5*
TOTAL LOSSES	**13.62**	**13.54**	**14.32**	**14.15**	**15.10**	**15.60**	**15.76**
of which:							
Electricity and Heat Generation[9]	6.16	9.34	10.29	10.30	11.70	12.30	11.86
Other Transformation	5.90	1.73	1.01	1.11	1.00	0.90	1.10
Own Use and Losses[10]	1.57	2.48	3.02	2.74	2.40	2.40	2.80
Statistical Differences	**–1.27**	**–1.45**	**1.56**	**–0.39**	**–**	**–**	**–**

INDICATORS

	1973	1990	1998	1999	2005	2010	2020
GDP (billion 1995 US$)	40.52	54.61	52.80	52.40	59.81	67.34	87.05
Population (millions)	9.92	10.36	10.30	10.28	10.30	10.30	10.30
TPES/GDP[11]	1.12	0.87	0.78	0.74	0.66	0.61	0.50
Energy Production/TPES	0.85	0.81	0.75	0.72	0.70	0.62	0.49
Per Capita TPES[12]	4.58	4.57	4.00	3.75	3.81	3.99	4.21
Oil Supply/GDP[11]	0.22	0.16	0.16	0.16	0.12	0.11	0.10
TFC/GDP[11]	0.82	0.65	0.48	0.47	0.40	0.38	0.32
Per Capita TFC[12]	3.33	3.41	2.46	2.41	2.34	2.48	2.68
Energy-related CO_2 Emissions (Mt CO_2)[13]	166.1	150.4	121.6	110.6	97.1	100.6	100.2
CO_2 Emissions from Bunkers (Mt CO_2)	0.7	0.7	0.4	0.4	0.4	0.4	0.4

GROWTH RATES (% per year)

	73–79	79–90	90–98	98–99	99–05	05–10	10–20
TPES	1.2	–0.2	–1.7	–6.4	0.3	1.0	0.5
Coal	–0.3	–1.4	–4.1	–13.1	–4.6	0.4	–1.6
Oil	4.2	–2.2	–1.0	–0.3	–2.5	1.4	1.1
Gas	14.3	8.0	4.9	0.6	5.7	0.9	1.9
Comb. Renewables & Wastes	–	–	–	25.0	6.4	5.4	3.9
Nuclear	–	–	0.6	1.4	11.5	–	–
Hydro	13.3	–4.1	–0.4	20.0	5.6	–	–
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
TFC	2.8	–0.9	–4.1	–2.0	–0.5	1.1	0.8
Electricity Consumption	3.4	2.6	0.2	–1.5	–0.2	2.8	1.2
Energy Production	2.0	–1.0	–2.8	–9.1	–0.4	–1.3	–1.8
Net Oil Imports	3.9	–2.4	–0.5	–5.2	–1.2	0.8	0.8
GDP	2.5	1.4	–0.4	–0.8	2.2	2.4	2.6
Growth in the TPES/GDP Ratio	–1.3	–1.6	–1.3	–5.7	–1.9	–1.4	–2.0
Growth in the TFC/GDP Ratio	0.3	–2.2	–3.7	–1.3	–2.7	–1.2	–1.7

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, biogas, 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. A negative number indicates that exports are greater than imports.
5. Includes non-energy use.
6. Includes less than 1% non-oil fuels.
7. Includes residential, commercial, public service and agricultural sectors.
8. Inputs to electricity generation include inputs to electricity, CHP and heat plants. Output refers only to electricity generation.
9. Losses arising in the production of electricity and heat at 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 dollars at 1995 prices and exchange rates.
12. Toe per person.
13. "Energy-related CO_2 emissions" specifically means CO_2 from the combustion of the fossil fuel components of TPES (i.e. coal and coal products, peat, crude oil and derived products and natural gas), while CO_2 emissions from the remaining components of TPES (i.e. electricity from hydro, other renewables and nuclear) are zero. Emissions from the combustion of biomass-derived fuels are not included, in accordance with the IPCC greenhouse gas inventory methodology. Also 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 1999 and applying this factor to forecast energy supply. Future coal emissions are based on product-specific supply projections and are calculated using the IPCC/OECD emission factors and methodology.

B

ANNEX

INTERNATIONAL ENERGY AGENCY "SHARED GOALS"

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

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

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

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

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

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

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

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

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

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

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

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

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

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

C

ANNEX

GLOSSARY AND LIST OF ABBREVIATIONS

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

AIJ	Activities Implemented Jointly.
a. s.	joint stock company.
ASMR	Administration of State Material Reserves.
bcm	billion cubic metres.
BP	British Petroleum.
CEA	Czech Energy Agency.
CENTREL	Regional group of four Central European power transmission companies: CEPS a.s. of the Czech Republic; MVM Rt. of Hungary; PSE SA of Poland; SE a.s. of Slovakia.
Cepro	oil products transport and storage company.
CEPS a.s.	Czech Electricity Transmission System.
CERM	Co-ordinated Emergency Response Measures.
CEZ, a.s.	power generation company.
CIS	Commonwealth of Independent States.
CHP	combined production of heat and power; sometimes, when referring to industrial CHP, the term "co-generation" is used.
cm	cubic metre.
CMD	Ceskomoravske Doly (hard coal mining company).
CO	carbon monoxide.
CO_2	carbon dioxide.
COMECON	Council for Mutual Economic Assistance (former socialist countries' economic co-operation body).
CRC	Ceska Rafinerska (oil refining company).
CSO	Czech Statistical Office.
CZK	Czech currency (koruna). 2000 exchange rates: one US dollar equivalent to CZK 39 and one euro equivalent to CZK 35.
EC	European Commission.
ELI	Efficient Lighting Initiative (IFC/GEF project).
EIA	Environmental Impact Assessment.
EMO	Electricity Market Operator.

EPC	Energy Performance Contracting.
ERO	Energy Regulatory Office.
ESCo	Energy Services Company.
ESF	Energy Saving Fund.
EU	The European Union, whose members are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom.
FCC	Fluid Catalytic Cracking.
GCD	Gas Control Dispatch.
GDP	Gross Domestic Product.
GEF	Global Environmental Facility.
GHG	greenhouse gases.
GJ	gigajoule, or 1 joule $\times 10^9$.
GW	gigawatt, or 1 watt $\times 10^9$.
IA	Implementing Agreement.
IAEA	International Atomic Energy Agency.
IEA	International Energy Agency whose Members are Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, the United States.
IEP	International Energy Program, one of the founding documents of the IEA.
IKL	Ingolstadt-Kralupy-Litvínov oil pipeline.
IPC	International Petroleum Consortium.
IPP	Independent Power Producer.
ISO	International Organisation for Standardisation.
JI	Joint Implementation.
JSC	Joint Stock Company.
kt	thousand tonnes.
LFO	light fuel oil.
LPG	liquefied petroleum gas; refers to propane, butane and their isomers, which are gases at atmospheric pressure and normal temperature.
mcm	million cubic metres.
Mero	oil transport company.
MIT	Ministry of Industry and Trade.

MOE	Ministry of the Environment.
MOF	Ministry of Finance.
MPa	unit of pressure, 1 MPa is equivalent to 1 bar.
Mt	million tonnes.
Mtoe	million tonnes of oil equivalent; see toe.
MUS	Mostecká ubelná spolecnost (brown coal mining).
MW	megawatt of electricity, or 1 watt $\times 10^6$.
MWh	megawatt-hour, or one megawatt $\times$ one hour, or one watt $\times$ one hour $\times 10^6$.
MW_t	megawatt of heat, or 1 watt $\times 10^6$.
NESO	National Emergency Scheme Operator.
NGO	non-governmental organisation.
NMVOCs	non-methane volatile organic compounds.
NPF	National Property Fund.
NO_x	oxides of nitrogen.
NPP	nuclear power plant.
OECD	Organisation for Economic Co-operation and Development.
OKD	Ostravsko-Karvinske Doly (hard coal mining).
PJ	petajoule, or 1 joule $\times 10^{15}$.
PHARE	EU technical assistance programme for Central and Eastern Europe.
PPP	purchasing power parity: the rate of currency conversion that equalises the purchasing power of different currencies, i.e. estimates the differences in price levels between different countries.
RAWRA	Radioactive Waste Repository Authority.
R&D	research and development, especially in energy technology; may include the demonstration and dissemination phases as well.
SEF	State Environmental Fund.
SEVEn	Energy Efficiency Centre.
SONS	State Office for Nuclear Safety.
SO_2	sulphur dioxide.
s. p.	state enterprise.
S&T	science and technology.
tce	tonne of coal equivalent.

TFC	total final consumption of energy; the difference between TPES and TFC consists of net energy losses in the production of electricity and synthetic gas, refinery use and other energy sector uses and losses.
toe	tonne of oil equivalent, defined as 10^7 kcal.
TPA	third party access.
TPES	total primary energy supply.
tU	tonne of uranium.
TSO	Transmission System Operator.
TW	terawatt, or 1 watt $\times$ 10^{12}.
TWh	terawatt $\times$ one hour, or one watt $\times$ one hour $\times$ 10^{12}.
UCTE	Union for the Co-ordination and Transmission of Electricity.
UED	Central Dispatch Centre.
UGS	Underground Storage Facilities.
UNFCCC	United Nations Framework Convention on Climate Change.
$	United States dollar.
USSR	Union of Socialist Soviet Republics.
VAs	voluntary agreements.
VAT	value-added tax.
WEC	World Energy Council.
WENRA	Western European Nuclear Regulators' Association.

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