INTERNATIONAL ENERGY AGENCY

ENERGY POLICIES OF IEA COUNTRIES

2001 Review

OECD

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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).

ACKNOWLEDGEMENTS

Much of the information in this report is drawn from in-depth reviews conducted by representatives of IEA Member countries and members of the IEA Secretariat.The information contained in this publication is the best available as of July 2001 and is subject to change. The desk officer listed in each team was responsible for managing the review and was principal author of the report, which has also been published in a separate volume and appears in summary form here. The desk officers also wrote the shorter standard reviews included here.

Shigetaka Seki, head of the Country Studies Division, supervised preparations for this book and wrote the section on energy market trends. Many members of the IEA staff contributed to this book. Major contributions came from Carlos Ocaña (electricity), Sylvie Cornot (gas), Stephane Lemoine (coal) and Jonathan Pershing (environment). Karen Treanton, Lisa Guarrera and Jason Elliott prepared the Key Statistics and Indicators, Monica Petit prepared the figures, and Marilyn Ferris provided administrative assistance for the project.

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Standard Reviews

Finland – Gudrun Lammers; Hungary – Gudrun Lammers; Ireland – John Cameron; Italy – Lea Gynther; Japan – John Cameron; Switzerland – Lea Gynther

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OVERVIEW OF ENERGY POLICY AND MARKET DEVELOPMENTS

MARKET TRENDS

INTRODUCTION

The past year or so has been a very active and changing period in world energy markets. During the second half of 2000 and the first half of 2001, oil prices remained high and volatile. Regional imbalances occurred, especially in automobile gasoline and heating oil. Some IEA countries saw sharp protests from lorry drivers and other consumers in the autumn of 2000. Several governments responded by temporarily suspending part of their oil taxes. The price of natural gas rose even higher than that of oil. A crisis in electricity supply in California nearly bankrupted some suppliers, produced rolling blackouts, and raised some serious questions about how to structure future deregulation of electricity markets.

On the environmental front, 178 countries agreed to a set of key implementing arrangements added to the 1997 Kyoto Protocol at the reconvened Sixth Conference of the Parties to the UN Framework Conventions on Climate Change in Bonn (July 2001). But the Protocol lost the support of a key country, when the newly-elected US Administration announced that it would not ratify the agreement.

For the first time in many years, the security of oil supply leaped to the top of many countries' agendas, with prices rising steadily and shortages appearing in some countries. In September 2000, the United States announced the release of 30 million barrels of crude oil from its Strategic Petroleum Reserve (SPR) for sale to private companies under "swap" arrangements. The move helped calm oil-price volatility and reduced regional imbalances for some key products.

Recent Events in Energy Markets

In September 2000, oil product prices soared in most OECD countries, triggered by a sharp increase in the price of crude oil and generally low stock levels. Prices fell slightly after peaking in September, but were still higher in 2001 than in 2000. Gasoline prices have increased sharply in the United States over the past two years, a trend that could have a negative impact on the economy.

A special session of the IEA Governing Board was held on 4 October 2000 to discuss the oil market situation. The Board determined that there was a sufficient supply of crude oil available on the market to meet world demand. Board members acknowledged, however, that oil prices were unusually volatile in the short term and that sustained high oil prices could jeopardise global economic growth. While it welcomed the positive effect on the market resulting from the US release from the SPR, the Board invited oil companies and refineries to consider intensifying short-term refinery operations to bring more oil products to the market. In Japan, the government responded by inviting oil companies to increase heating oil exports to ease the global imbalance. The need for better information, especially on crude oil production and worldwide product stockholding, was reaffirmed by the Board. Finally, the Board focused on ways to reduce oil dependence by improving energy efficiency, diversifying supplies and accelerating the deployment of new energy technologies. The press release of the special session is attached as Annex E.

The Seventh International Energy Forum held in Riyadh in November 2000 gave oil producers and consumers an opportunity to discuss recent developments in international oil markets. The final statement of the forum said that "greater stability and transparency in the oil market to reduce price volatility is in the interests of producers and consumers". This provided strong political support for an initiative to improve oil data transparency and integrity. The IEA launched the initiative jointly with five other international organisations: the Asian Pacific Economic Co-operation, EUROSTAT (Statistical Office of the European Commission), OLADE (Latin American Energy Organisation), the Organisation of Petroleum Exporting Countries, and the United Nations.

Average prices of natural gas rose even faster than those of oil products in 2000, while coal prices remained stable. Although it did not lead to a major supply disruption, the halting of liquefied natural gas exports from Arun in Indonesia owing to political unrest reminded the international community that supply security increasingly involves gas as well as oil.

Progress in Market Reform

In many countries, reform in the electricity and gas markets progressed significantly. The power shortage in California illustrated the possible effects of reform on security of supply and prices. While the precise events that unleashed the Californian crisis are unlikely to recur elsewhere, these events show that significant challenges for investment and security of supply may emerge in the newly reformed markets. The dangers can be particularly acute during the transition to competition. The crisis suggests that a well-designed reform programme is essential for the successful introduction of competition and for achieving the dual goals of economic efficiency and security of supply. Although liberalised electricity markets have generally performed well, effective competition and well-functioning electricity markets do not develop overnight. Relatively long transitions seem inevitable. A second generation of reforms is being developed in many countries to cope with the perceived shortcomings of the first generation.

Legislative and regulatory reform in the gas sector was initiated by the European Union (EU) Gas Directive, which came into force in August 2000. In most European countries, a growing number of consumers have been given a choice of supplier. Progress was also made last year in other IEA countries. Natural gas prices rose throughout 2000, mainly because of the growing demand for gas and partly because most long-term gas contracts are indexed to oil prices, which were higher in 2000 than in previous years.

Global Climate Change Mitigation

After several years of contentious debate, the international negotiations under the United Nations Framework Convention on Climate Change reached a political agreement in Bonn in July 2001. The agreement sets the stage for moving forward towards ratification of the Kyoto Protocol – although uncertainty still surrounds some details regarding national implementation of the treaty. Prior to the Bonn session, the United States announced it would not become party to the Kyoto agreement, citing concerns at the lack of global participation and the potential economic damage compliance would bring. EU countries have agreed they would seek ratification and entry into force without the United States. The seventh session of the Convention's Conference of the Parties will meet in November in Marrakech, where further implementation details will be hammered out. Earlier in 2001, the Third Assessment Report of the Intergovernmental Panel on Climate Change was released, confirming the severity of the problem. In spite of recommendations for action by the panel, the past decade has witnessed a steady increase in greenhouse gas emissions in most OECD countries. Policies so far enacted by governments have not substantially altered the global trend.

Sustainable Development

The production and use of energy affects each of the three pillars of sustainable development – the economy, the environment and social welfare. The important role energy plays in sustainable development was widely discussed in 2000 and 2001. Within the UN Commission for Sustainable Development, energy issues were the focal point of dialogue culminating in a Ministerial meeting in 2001. Chief among the issues was the need for providing access to the 2 billion people without access to modern energy services and the growing global demand for energy and related investments. The IEA analysed these and other issues in 2000 for the cross-cutting OECD effort on sustainable development, and released the IEA Statement on Sustainable Development in April 2001 (see Annex D). IEA Energy Ministers concluded that the world will not be on a sustainable energy path unless considerable changes are made and committed themselves to develop and use the most effective possible means to achieve sustainable development.

Energy Policy Developments

In 2000-2001, debates took place in many IEA Member countries on both short-term and long-term energy policy. In November, the European Commission issued a Green Paper "Toward a European Strategy for the Security of Energy Supply". In the United States, the National Energy Policy Development Group published its recommendations in May 2001, encouraging improving efficiencies of energy use, investment in energy infrastructure and growth in energy supply. In June 2001, Japan released a report including revised projections for energy supply and demand. The report stresses the importance of additional efforts to improve energy efficiency and deployment of renewables, the role of nuclear power in energy security and global climate change mitigation, and enhanced co-operation in Asia for energy supply security.

IEA Ministerial Meeting

In May 2001, IEA Energy Ministers met to discuss security of energy supply, energy market reforms and the challenge of global sustainable development. The ministers reaffirmed the importance of the IEA's "Shared Goals" (see Annex F) to meeting sustainable development goals. They agreed that action must be taken to modify longer-term trends in greenhouse gas emissions within the framework of the United Nations Framework Convention on Climate Change (UNFCCC). They recognised that oil price volatility was a major concern, that global oil demand would continue to increase and that localised supply problems existed for some fuels. They also expressed concern about long-term security of supply and about the escalating environmental effects of energy use. The ministers emphasised the importance of building and holding adequate stocks and of continuing efforts on energy efficiency improvement and diversification. They indicated their intentions to increase the role of renewable energy and to create greater transparency in the world energy market. They said that progress in regulatory reform has contributed to reduced costs and greater efficiency in energy use and has created new opportunities for innovative energy solutions. The ministers welcomed the constructive and improved dialogue between producers and consumers. The Ministerial Communiqué is attached as Annex E.

Market Trends

Over the past decade, energy demand grew steadily in OECD countries[1]. Growth was strongest in the OECD Pacific region. Since 1990, gas has increasingly substituted for coal in the energy mix in OECD Europe. In OECD North America and in the OECD Pacific region, demand for both coal and gas increased significantly, a result of strong growth in demand for power generation.

Developments in Non-member Countries

Energy reform and energy security are also high on the agenda in many non-member countries. Energy reform is crucial in order to meet their rapidly rising energy demand. Reform has progressed in Central and Eastern European countries, while liberalisation of the gas markets in South America has made this region one of the most attractive for investments in exploration and production. The ways in which energy security is achieved differ from country to country. Energy security in Russia is dependent on price reform, corporate transparency and improvements in energy efficiency.

1. This book is based on information and data as of July 2001. For total primary energy supply, final data up to 1999 and the estimates for 2000 are used. For world energy production, final consumption, energy intensity and CO_2 emissions, final data up to 1999 are included. For energy prices, quarterly data up to first quarter of 2001 are used.

ENERGY DEMAND: OECD

Total primary energy supply (TPES) in OECD countries was 5,306 Mtoe in 2000, up 18% on its 1990 level. TPES increased by 33% in OECD Pacific, by 20% in OECD North America and by 8% in OECD Europe.

Oil accounted for 41% of TPES in OECD countries in 2000, its share remaining stable over the last decade. The share of gas rose from 19% in 1990 to 22% in 2000. Coal's share decreased from 23% to 20%, although coal demand rose only modestly from 1990 to 2000.

The substitution of gas for coal intensified in OECD Europe. From 1990 to 2000, coal demand fell by 26%, and gas demand increased by 51%. The demand for gas has exceeded that for coal since 1998 in the region. Gas demand grew sharply in OECD Pacific (63%), and coal demand increased by 35%, reflecting growth in demand for electricity.

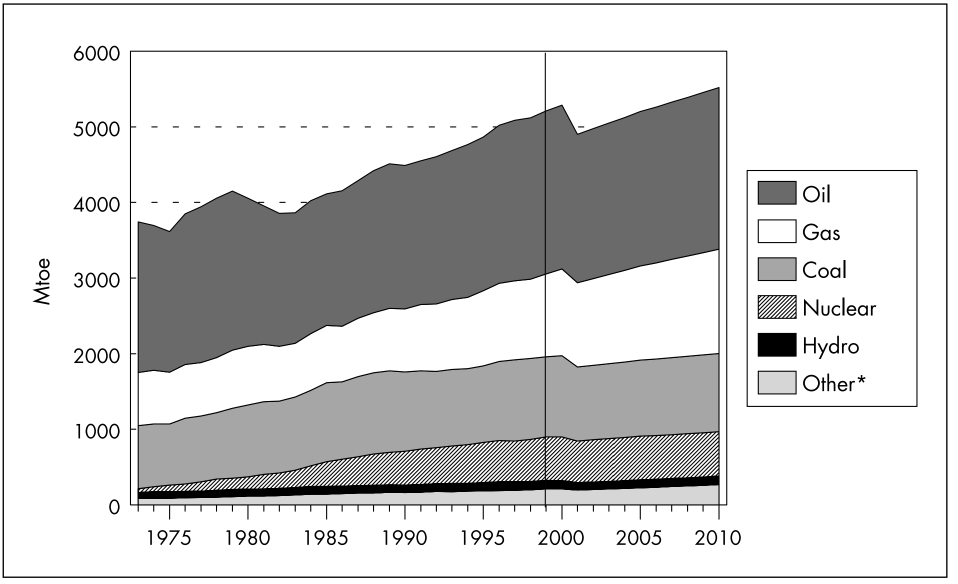
Table 1
Total Primary Energy Supply in OECD Regions
(Mtoe)

	1998	*1999*	*2000**
TPES Total			
Total OECD	5 135	5 229	5 306
North America	2 591	2 661	2 713
Europe	1 747	1 745	1 755
Pacific	798	823	838
Oil			
Total OECD	2 169	2 137	2 161
North America	1 050	1 047	1 068
Europe	732	701	704
Pacific	387	389	389
Gas			
Total OECD	1 057	1 102	1 153
North America	600	623	659
Europe	363	379	389
Pacific	94	100	105
Coal			
Total OECD	1 075	1 064	1 079
North America	573	574	574
Europe	337	317	323
Pacific	165	173	182

* Estimates based on preliminary data.

Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001.

Figure 1
Total Primary Energy Supply in OECD Countries, 1973 to 2010



* includes, geothermal, solar, wind, combustible renewables and waste, electricity and heat trade and ambient heat production.

Note: excluding Iceland, Korea, Mexico, Norway and Poland from 2001 to 2010.

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

Oil

Oil demand reached 2,161 Mtoe in 2000, up 16% on its 1990 level. The share of oil in TPES decreased in OECD North America from 42% in 1990 to 39% in 2000, while it increased in OECD Pacific from 44% to 46%. The share increased by one percentage point to 40% in OECD Europe. Oil demand grew rapidly in OECD Pacific in the early 1990s, but growth stalled in 1998, reflecting the economic slowdown in Japan and Korea. The economic recovery of Korea brought a slight increase in oil demand in 2000.

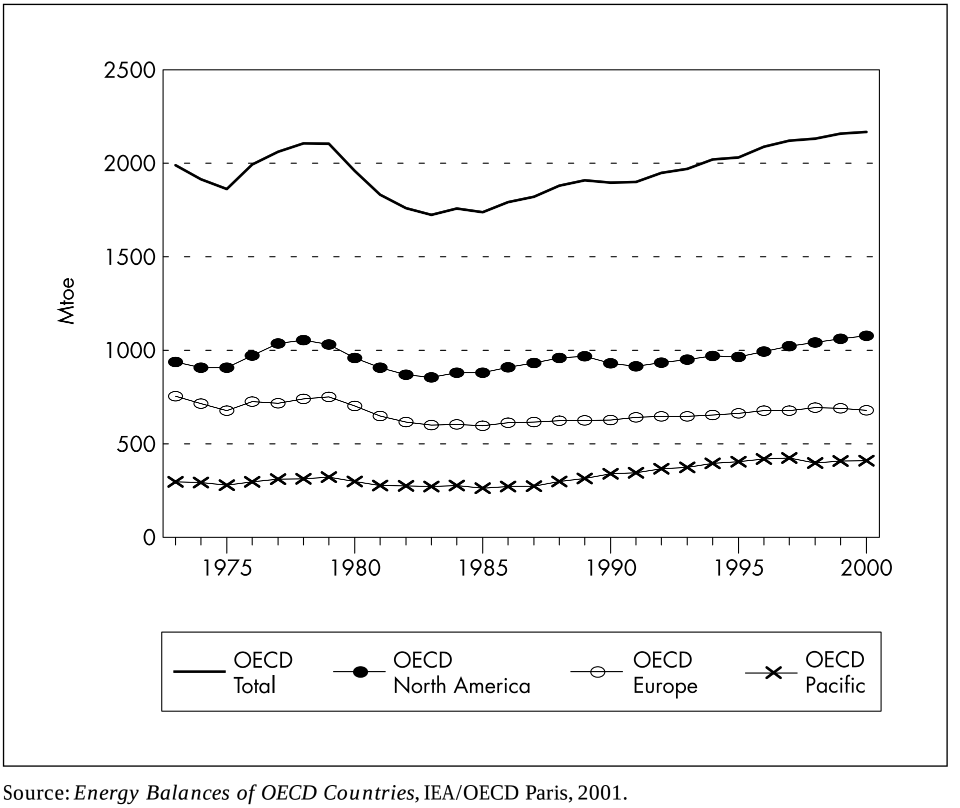
From 1990 to 2000, North American oil demand increased by 147 Mtoe, 124 Mtoe in the US alone. One-quarter of the demand growth was liquefied petroleum gas (LPG) and naphtha for petrochemicals. The balance was for light products, gasoline, diesel and jet kerosene; half of this growth was for gasoline. Demand for petrochemical feedstocks increased annually by 3.3%. Transport demand rose by 2.2% per year.

Demand for oil products in OECD Pacific increased by 109 Mtoe, two-thirds for petrochemical feedstocks which grew by some 5% per year. Demand for transport fuel, including kerosene, was also substantial, increasing by 2.5% per year. This increase was offset, however, by declining demand for light and heavy fuel oil and for "other products" (including crude oil burned directly to produce electricity). The declines were concentrated in Japan where total oil demand increased only by 0.4% per year from 1990 to 2000. Korea accounted for over 70% of the increase in oil demand in OECD Pacific. Demand there grew by 7.5% per year, largely owing to growth in petrochemical feedstocks and transport fuel demand.

Oil demand in OECD Europe increased by some 70 Mtoe from 1990 to 2000. A dramatic decline in heating oil deliveries occurred primarily in Germany in 1999 and 2000. The declines may be temporary, because, although gas is substituting somewhat for heating oil, German consumers purchased large quantities of heating oil when oil prices collapsed in 1998. Their heating oil tanks are typically large enough to hold as much as two years supply. Decline in demand for heavy fuel oil in OECD Europe was concentrated in the United Kingdom and Italy, and, to a lesser extent, in France. The increasing availability and use of natural gas in electricity generation was responsible for much of the decline. Demand for jet kerosene was the fastest growing of all oil products in OECD Europe, increasing on average by 5% per year. Demand for transport diesel increased by 3.7% per year.

Figure 2

Oil Demand in OECD Countries (by Region), 1973 to 2000

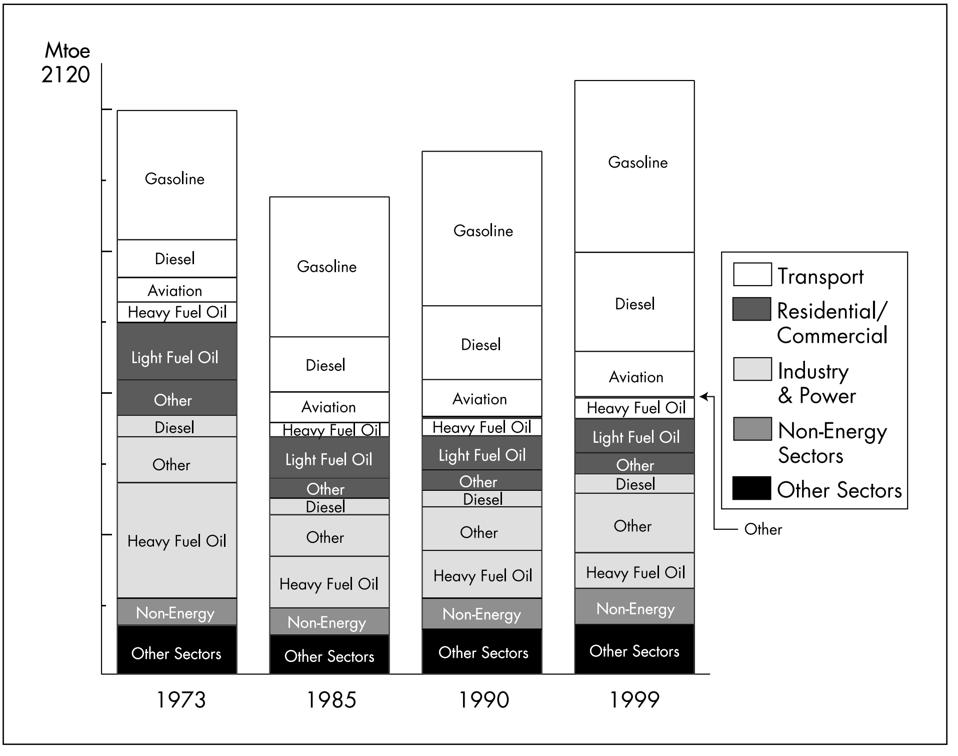


Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001.

Between 1990 and 1999, demand for petroleum products increased by 22% in the transport sector in OECD countries, 11% in the industry sector and 3% in the residential/commercial sector. Oil is not an easily substitutable fuel in the transport sector. The transport sector accounted for 62% of total consumption of petroleum products, followed by the industry sector (18%) and the residential/commercial sector (14%). Gasoline remained the dominant fuel, accounting for 52% of total oil demand. Its share dropped from its 1998 level, owing to a sharp increase in diesel consumption (28%) in 1999. Demand for heavy fuel oil decreased significantly in the industry sector from 1990 to 1999.

Figure 3

Consumption of Oil Products by Sector in IEA Countries, 1973 to 1999



Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001.

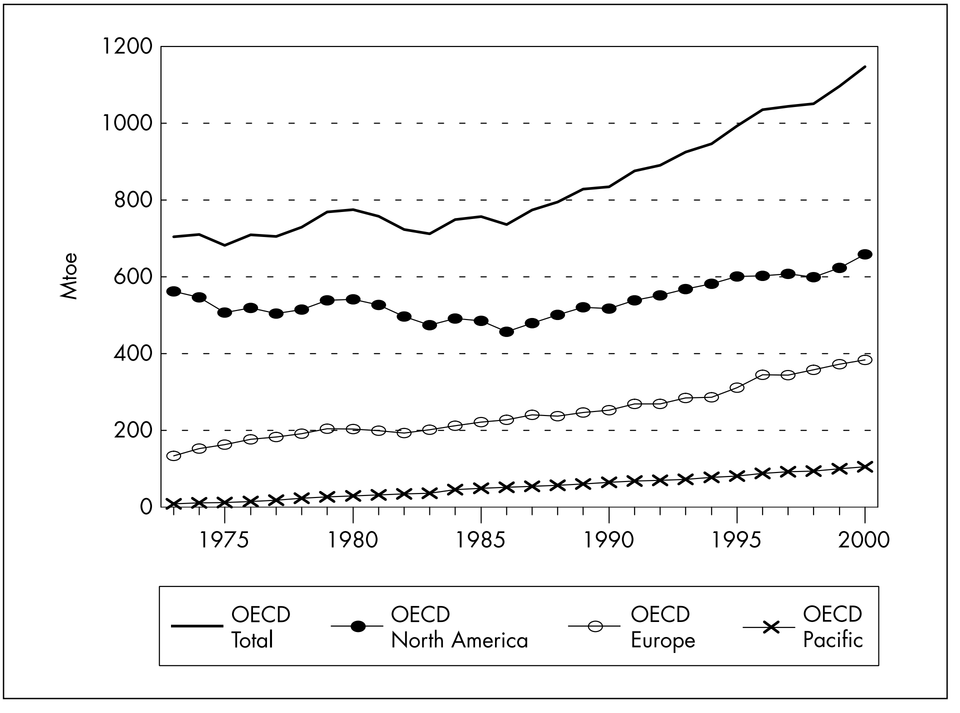
Gas

Gas demand in OECD countries increased by nearly 40% over the past decade, reaching 1,153 Mtoe in 2000. Gas was the fastest growing fuel, reflecting strong demand for electricity generation. In 2000, the share of gas in TPES in OECD North America (24%) was the largest among the OECD regions, followed by OECD Europe (22%) and OECD Pacific (13%).

Annually, gas demand rose by 5% in OECD Pacific, by 4.2% in OECD Europe and by 2.5% in OECD North America. Gas demand nearly doubled in the UK, and grew by some 50% in Italy and Japan. Demand for gas increased dramatically in Korea, from 3 Mtoe in 1990 to 16 Mtoe in 2000. In OECD Europe, rising gas demand reflected strong demand in the industry sector, a result of solid economic growth and higher penetration rates for gas in the sector. Over the past five years, natural gas consumption in Western Europe increased by 20%. The number of customers rose by 15%, and gas now supplies more than 80 million homes and businesses.

Figure 4

Natural Gas Demand in OECD Countries (by Region), 1973 to 2000



Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001.

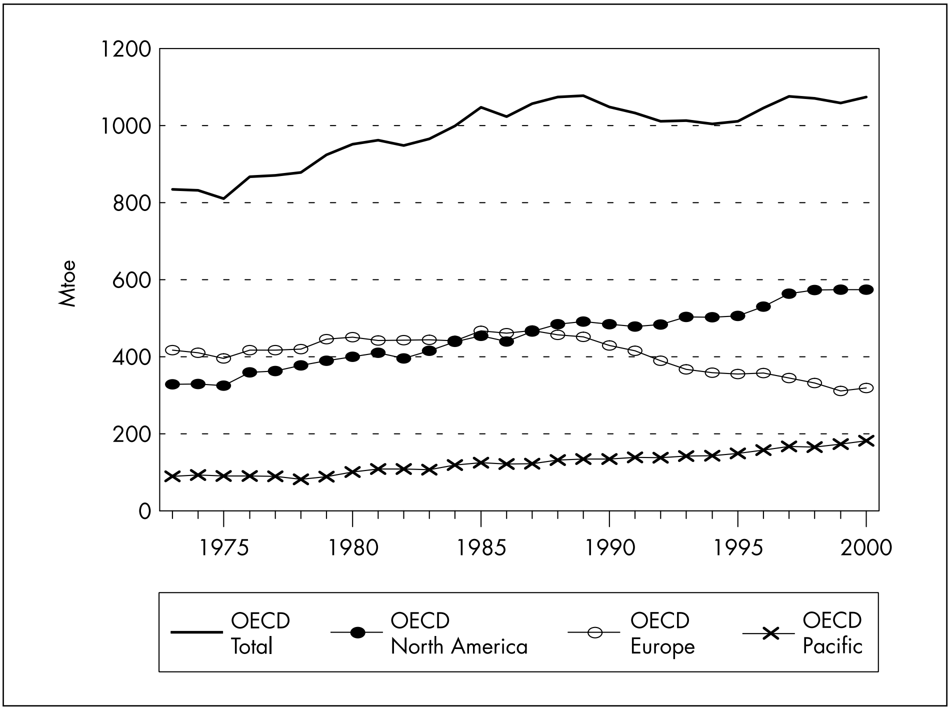
Coal

Coal demand in OECD countries as a whole increased modestly from 1990 to 2000. It fell by 26% in OECD Europe, as gas substituted for coal in the power generation sector and for space heating. Demand grew by 35% in OECD Pacific, owing to rising demand for coal-fired generation. In the first half of the decade, coal demand grew in OECD North America, but growth stalled in the past three years. In 2000, the share of coal in TPES was largest in OECD Pacific (22%), followed by OECD North America (21%) and OECD Europe (18%). Coal's share in TPES fell by 9 percentage points from 1990 to 2000 in OECD Europe, but remained stable in OECD North America and OECD Pacific.

Coal use declined in the major coal consumers in OECD Europe. From 1990 to 2000, it fell from 64 Mtoe to 37 Mtoe in the UK (-42%), and from 129 to 79 Mtoe in Germany (-38%). Demand for coal increased from 457 to 536 Mtoe (18%) in the US, from 74 to 94 Mtoe (27%) in Japan and from 25 to 38 Mtoe (52%) in Korea.

Figure 5

Coal Demand in OECD Countries (by Region), 1973 to 2000



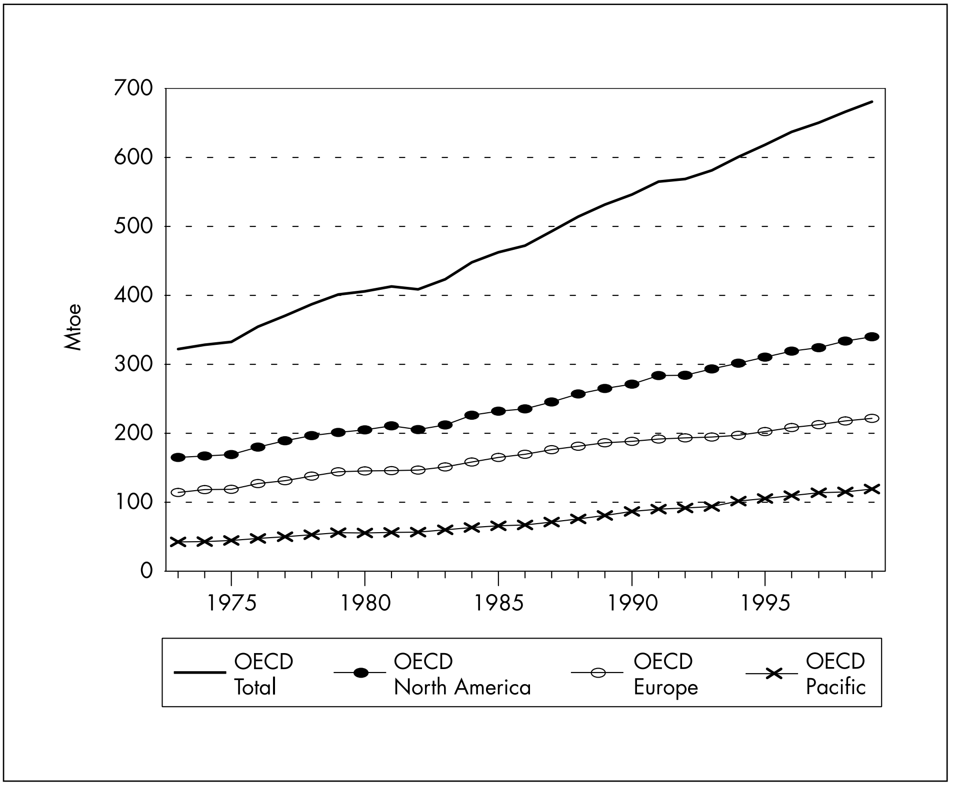
Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001.

Electricity

In 1999, electricity consumption in OECD countries was 683 Mtoe, up 25% from 1990. North America accounted for 50% of total OECD electricity consumption, followed by Europe (33%) and Pacific (17%). Electricity consumption increased annually by 2.7% in OECD North America, reflecting strong economic growth between 1990 and 1999. Consumption grew by 3.5% a year in the OECD Pacific over the period, sparked by high growth in Korea, some 11% a year. Growth was 2.5% in Japan and 3% in Australia. Electricity consumption increased by 1.8% a year in OECD Europe, by 2.5% in France, 2.2% in Italy and 1.7% in the UK. Electricity grew by only 0.3% per year in Germany.

Figure 6

Electricity Demand (Final Consumption) in OECD Countries (by Region), 1973 to 1999



Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001.

Table 2

Electricity Consumption

(Mtoe)

	1997	*1998*	*1999*
Total OECD	652	668	683
North America	324	334	340
Europe	214	220	224
Pacific	114	115	119

Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001.

Table 3
Total Final Consumption in OECD Regions
(Mtoe)

	1997	*1998*	*1999*
TFC Total			
Total OECD	3 490	3 478	3 553
North America	1 719	1 707	1 756
Europe	1 228	1 243	1 247
Pacific	543	528	550
Industry			
Total OECD	1 057	1 041	1 056
North America	459	449	458
Europe	384	383	379
Pacific	215	209	219
Residential/Commercial			
Total OECD	1 159	1 143	1 164
North America	534	519	532
Europe	467	471	471
Pacific	159	154	162
Transport			
Total OECD	1 146	1 169	1 203
North America	655	671	692
Europe	338	349	358
Pacific	153	150	154

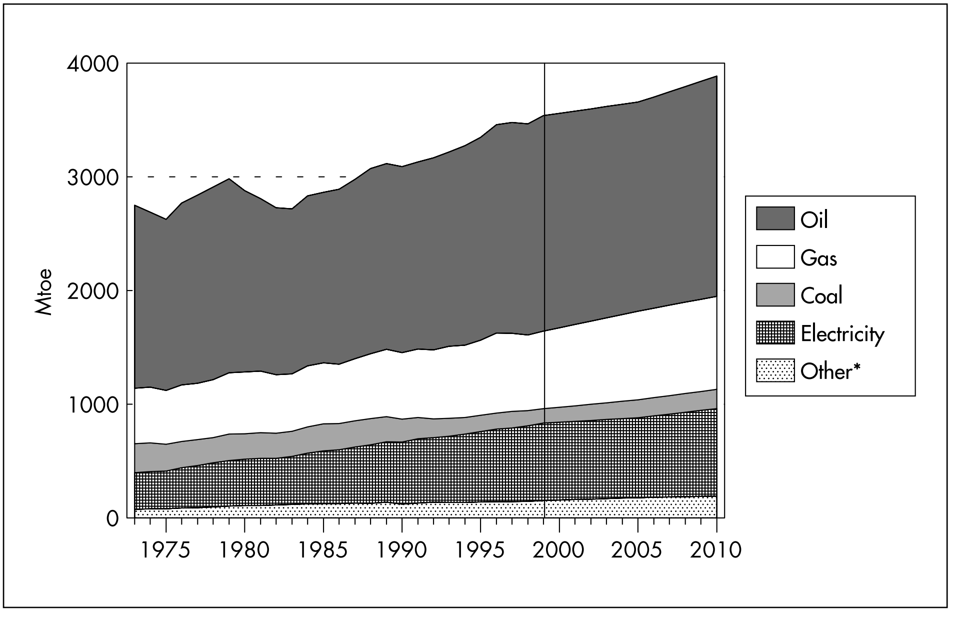
Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001.

ENERGY CONSUMPTION BY SECTOR

Total final consumption (TFC) in OECD countries was 3,553 Mtoe in 1999, growing at an annual average of 1.6% from 1990. Petroleum products accounted for the largest share in total final consumption with 53%, followed by gas (19%), electricity (19%) and coal (4%). Electricity grew fastest, at 2.5% per year, followed by gas (1.7%) and oil (1.7%). Coal consumption declined by some 4% per year from 1990 to 1999.

Figure 7

Total Final Consumption in OECD Countries (by Source), 1973 to 2010



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

Note: excluding Iceland, Korea, Mexico, Norway and Poland from 2000 to 2010.

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

Industry Sector

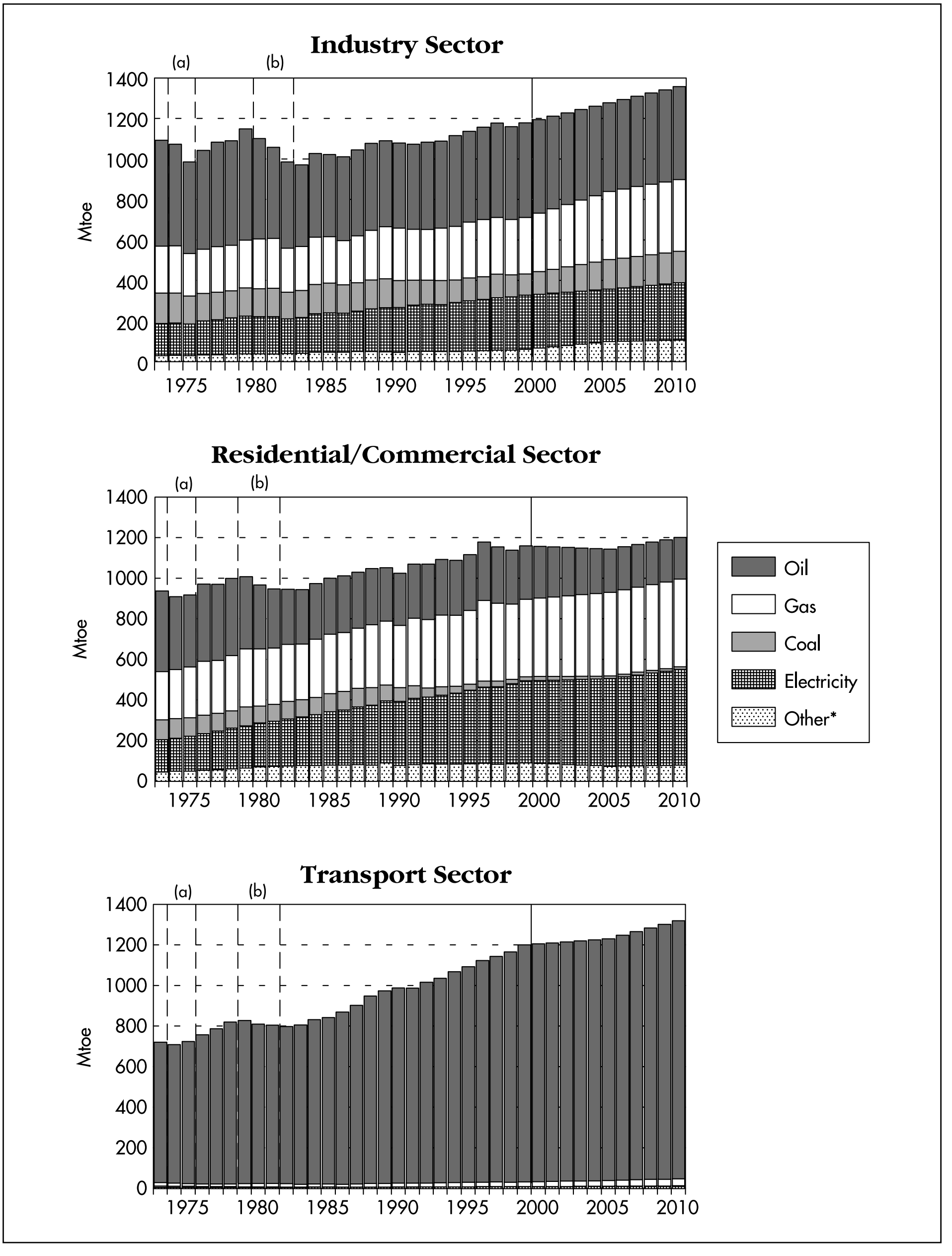
In 1999, OECD energy consumption in the industry sector was 1,056 Mtoe, an increase of 6% over 1990. Electricity consumption grew sharply, up 20% from 1990, while coal fell by 33%. Petroleum products and gas consumption increased by 11% and 8% respectively.

In 1999, petroleum products accounted for 32% of industrial energy consumption, followed by natural gas (27%) and electricity (25%). The share of gas in final consumption was stable during the period 1990 to 1999, while that of electricity increased by 3 percentage points. The share of coal declined from 16% to 10% from 1990 to 1999.

In 1999, the industry sector accounted for 40% of total final consumption in OECD Pacific, 30% in OECD Europe and 26% in OECD North America. The pace of growth was highest in OECD Pacific, at an annual average of 2.4% from 1990, followed by OECD North America at 1.2%. Consumption was stable in OECD Europe.

Figure 8

Final Consumption by Sector and by Source in OECD Countries, 1973 to 2010



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

Note: excluding Iceland, Korea, Mexico, Norway and Poland from 2000 to 2010.

(a) corresponds to the first oil shock (end 1973) and macro-economic recession induced by this shock.

(b) corresponds to the second twin oil shock (early 1979 and end 1980) and the macro-economic recession induced by this double shock.

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

The share of electricity went up in all three regions. The share rose faster in OECD North America and OECD Pacific, some 3% a year, than in OECD Europe, where it rose by about 1% a year. The share of electricity among fuels was about the same (some 25%) in all three regions in 1999.

In OECD Europe, the share of petroleum products in the industrial sector was 29%, being stable in the 1990s. The share of gas rose to 28% in 1999 from 24% in 1990, while the share of coal fell sharply from 19% to 12% over the period. In OECD North America, the share of natural gas fell from 36% in 1990 to 34% in 1999; the oil product share remained roughly 27% over the past decade. The share of coal decreased marginally from 12% in 1990 to 7% in 1999. Petroleum products accounted for a half of industrial energy consumption in OECD Pacific; their share rose from 45% in 1990 to 49% in 1999. The share of natural gas increased from 7% in 1990 to 9% in 1999, while that of coal fell from 18% to 13%.

Residential / Commercial Sector

In 1999, energy consumption in the residential/commercial sector in OECD countries was 1,164 Mtoe, up 13% over 1990. Electricity and gas consumption grew by 28% and 24% respectively from 1990, while oil consumption increased by only 2.4% and coal consumption shrank by 69%. Shares by fuel in the residential/commercial sector in 1999 were 35% for electricity, 33% for gas, 23% for petroleum products and 2% for coal. The electricity share increased by 4 percentage points from 1990 and the gas share by 3 percentage points, while coal share fell by 5 percentage points.

In 1999, the residential/commercial sector accounted for 38% of total final consumption in OECD Europe, 30% in OECD North America and 29% in the OECD Pacific region. Between 1990 and 1999, the growth of energy consumption was strongest in OECD Pacific, at an average annual rate of 2.9%, followed by OECD North America (1.2%) and OECD Europe (1.1%).

The structure of fuel use differed significantly among regions. In OECD Pacific, the share of petroleum products was 41%, followed by electricity (38%) and gas (15%) in 1999. Electricity accounted for the largest share in OECD North America (41%), followed by natural gas (39%) and petroleum products (15%). In OECD Europe, natural gas held the largest share (33%), followed by electricity (26%) and oil (25%). The share of coal fell sharply, dropping from 12% to 4% between 1990 and 1999 in OECD Europe and from 8% to 1% in the OECD Pacific.

Transport Sector

In 1999, total final consumption in the OECD transport sector was 1,203 Mtoe, up 22% from 1990. Since 1990, the share of oil has remained at 97%, and the shares of gas and electricity were stable at 2% and 1% respectively.

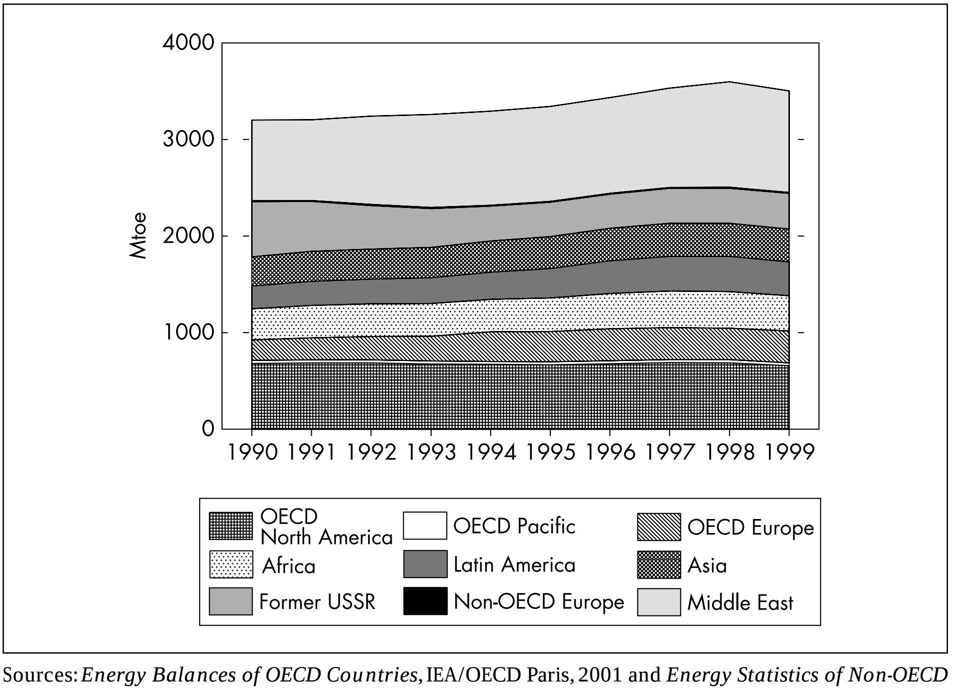
OECD North America accounts for 58% of the OECD's total transport demand, followed by OECD Europe (30%) and OECD Pacific (13%). Between 1990 and 1999, the growth of consumption was strongest in OECD Pacific (3.2% per year), followed by OECD Europe (2.1%) and OECD North America (2%). Penetration of natural gas was greatest in OECD North America at 3.3%, while it was only 0.2% in the other OECD regions. On the other hand, electricity had shares of 1.7% and 1.5% respectively in OECD Europe and OECD Pacific, while it was 0.1% in OECD North America. These shares were stable in the last decade.

WORLD ENERGY PRODUCTION

Oil

From 1990 to 1999, world oil production increased by some 300 Mtoe to reach 3,429 Mtoe. Oil production grew in the Middle East by some 220 Mtoe. Both OECD Europe and Latin America increased their production by some 50% or some 120 Mtoe each, and Africa and Asia by 12%, or some 40 Mtoe each. In contrast, countries of the former Soviet Union (FSU) reduced their production by 35% or some 200 Mtoe. Production in North America was fairly stable until 1998, staying at 670-690 Mtoe before falling to 640 Mtoe in 1999.

Figure 9
World Oil Production, 1990 to 1999



Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001 and *Energy Statistics of Non-OECD Countries*, IEA/OECD Paris, 2001.

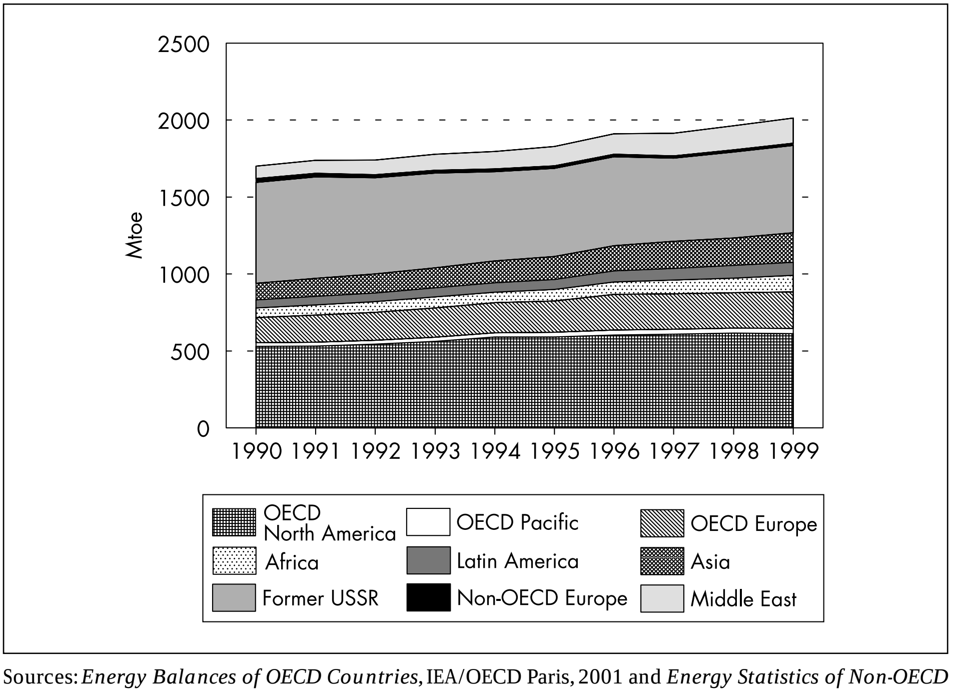
During the same period, the Middle East increased its share in world production by 4 percentage points to 30%, while the FSU share fell by 7 percentage points to 11%. The OECD Europe share of world production rose by some 3%, while the shares of Asia and Africa were unchanged. As a result, each of these four regions accounted for some 10% of world production in 1999. The OECD North America share fell marginally to 19% in 1999.

In 1999, world oil production fell by 95 Mtoe, or 2.6 % from the previous year, mostly because of the production cut by OPEC countries. Oil production in OECD North America fell by 29 Mtoe, still suffering from the low investment in the previous year caused by low crude oil prices.

Gas

World gas production steadily grew to 2,014 Mtoe in 1999, up 18% over 1990. Between 1990 and 1999, gas production increased by 83 Mtoe in North America, mostly in Canada where growing exports to the US increased. Production increased 73 Mtoe in OECD Europe, 85 Mtoe in Asia, and 83 Mtoe in the Middle East. It fell by 87 Mtoe in the FSU between 1990 and 1999. The share of FSU in world gas production fell sharply from 39% in 1990 to 28% in 1999. In contrast to the situation for oil, world gas production grew by 2.6% in 1999 reflecting the steadily increasing demand for power generation.

Figure 10
World Natural Gas Production, 1990 to 1999

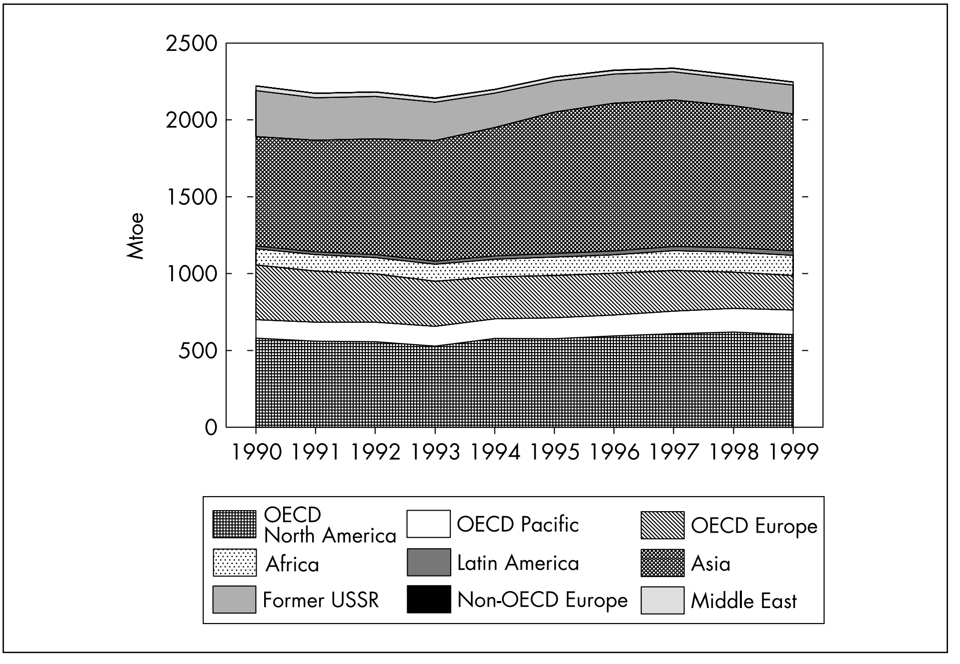


Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001 and *Energy Statistics of Non-OECD Countries*, IEA/OECD Paris, 2001.

Coal

World coal production hovered between 2,150-2,350 Mtoe in the past decade. The structure of shares by region, however, has changed significantly. Between 1990 and 1999, Asia and OECD Pacific together increased their share from 37% to 47%, while OECD Europe and the FSU decreased their shares from 16% and 14%, respectively, to 10% and 8%, reflecting the restructuring of the coal industries in OECD Europe and the FSU.

Figure 11
World Coal Production, 1990 to 1999



Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001 and *Energy Statistics of Non-OECD Countries*, IEA/OECD Paris, 2001.

Electricity: OECD

Electricity generation in OECD countries reached 9,495 TWh in 2000, up 26% on its 1990 level. Average annual growth was some 2.3%. Electricity generation from gas nearly doubled over the last decade, while generation from nuclear power increased by 29%. Coal-fired generation rose by 18%, while oil-fired decreased by 14%.

In 2000, coal accounted for the largest share of electricity generation (38.3%), although its share declined slightly over the decade. Nuclear power's share was 23.4%, up 0.7% from its share in 1990. The share of gas rose significantly, from 10.1% in 1990 to 16% in 2000. Hydropower's share fell from 15.5% in 1990 to

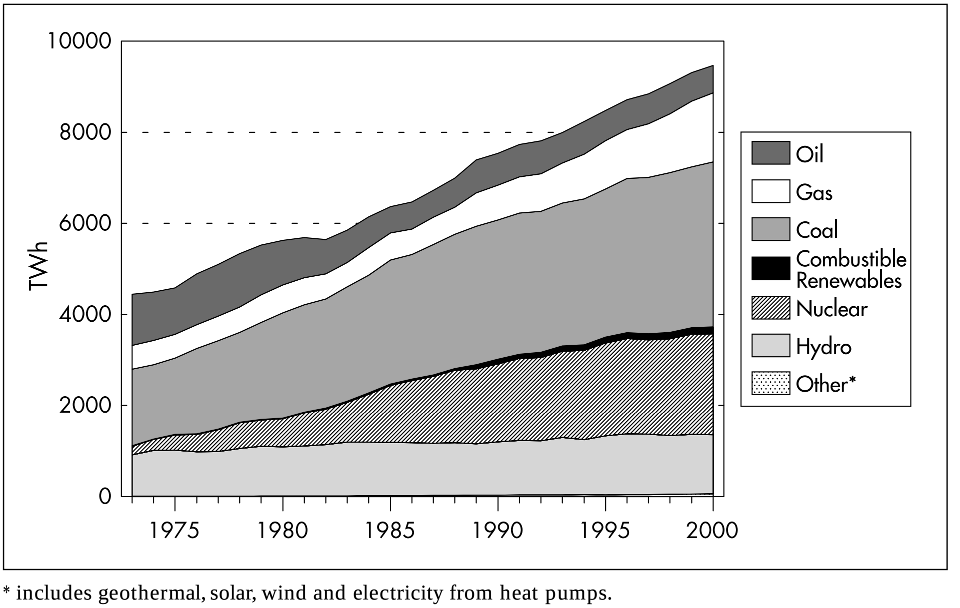
13.7% in 2000. The share of oil also fell, from 9.3% in 1990 to 6.4% in 2000. The share of electricity generation from renewables remained marginal (1.6% in 2000).

Gas-fired generation saw sharp growth in the UK and Italy, replacing coal and oil. Germany still depends heavily on coal. Power generation from both coal and gas increased in OECD North America and OECD Pacific. Those countries with a nuclear programme experienced growth in generation from nuclear power.

Table 4
Electricity Generation by Source, 1990 and 2000
(TWh)

	UK		*Germany*		*Italy*		*France*		*US*		*Japan*	
	1990	*2000*	*1990*	*2000*	*1990*	*2000*	*1990*	*2000*	*1990*	*2000*	*1990*	*2000*
Coal	207	122	322	296	36	30	35	30	1 700	2 038	123	235
Oil	34	5	10	4	103	86	9	10	131	116	253	165
Gas	4	143	40	51	40	86	3	9	382	655	165	238
Nuclear	66	86	152	170	0	0	314	415	612	799	202	309
Hydro	5	5	17	20	32	44	53	67	273	240	89	87
Comb. Renew.	1	8	5	18	3	7	2	4	85	89	18	19

Figure 12
OECD Electricity Supply by Source, 1973 to 2000



* includes geothermal, solar, wind and electricity from heat pumps.
Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001.

ENERGY PRICES

World prices for crude oil and oil products were high and volatile in 2000, a situation which has lingered in the first half of 2001. Average prices for the three main crudes were $30.37 per barrel (bbl) for West Texas Intermediate (compared to $19.31/bbl in 1999), $28.50/bbl for dated Brent ($17.97/bbl in 1999) and $26.24/bbl for Dubai ($17.30/bbl in 1999). The key factor behind the high and volatile prices last year was the low level of crude and product inventories, which were largely attributable to OPEC restraints on crude oil production.

After two smaller cuts during 1998, OPEC cut its crude production target by 1.7 mb/d on 1 April 1999. This led to a massive 2.5 mb/d drawdown in OECD stocks in the fourth quarter of 1999, which set the stage for low inventories and high prices in 2000.

OPEC's goal has been to keep the OPEC basket price within a band of $22 to $28/bbl. However, over the course of 2000, the real target appeared to be $25-28/bbl, or the upper half of the announced price band. In fact, the average price of the OPEC basket in 2000 was $28.87/bbl.

Practically speaking, OPEC's "market management" has been aimed at matching current supply and demand, and at keeping inventories low. On 1 April 2000, OPEC increased its crude oil production target by 1.7 mb/d, reversing the cut of a year earlier. It raised its target three more times during the year, for a total of 3.7 mb/d in increases during 2000. (In 2001, OPEC reversed course, and cut its crude production targets three times, by a total of 3.5 mb/d.) The increases in 2000 served merely to meet increasing world demand. OECD stocks increased by a modest 0.1 mb/d in 2000.

As a result, the markets were tight. The forward price curves in the futures markets, for both crude and products, were in backwardation (downward-sloping curves). This meant that refiners had little incentive to buy expensive crude to put into inventories, because they thought that crude would be cheaper in the future. The incentive to build product inventories was further eroded by the expectations that refiners would be buying expensive crude and would be selling products for relatively lower prices a number of weeks later. In addition, product storage costs money, and this cost could not be hedged against because of the backwardation in the futures markets.

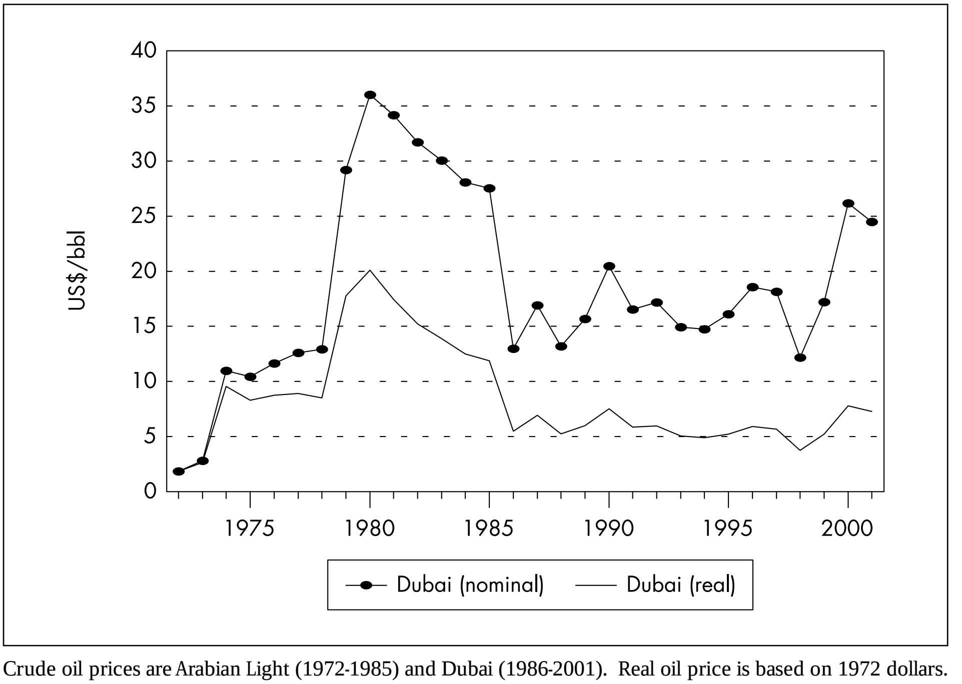
The prices of petroleum products, not crude, set the overall tone of world oil markets for most of the year. The markets were led by the US and the broader Atlantic Basin, including Europe. With low product inventories, heating oil was scarce in the winter of 1999/2000 and gasoline was in short supply in the summer of 2000. The cycle continued, with heating oil tight again in the winter of 2000/2001, and gasoline tight again in the spring and early summer of 2001. For the most part, outright crises have been averted, but prices have been high.

During the years 2000 and 2001, the crude oil and product markets have reacted nervously to weekly inventory data, OPEC meetings, events concerning Iraq, tensions in the Middle East, and the weather. With little inventory cushion available, the markets also responded quickly to news of accidents, technical problems or outages in any segment of the oil business. Capacity constraints became evident. OPEC's spare capacity to produce crude oil was relatively low. Limits were also approached or reached in tanker capacity, pipeline capacity and refining capacity. In North America, natural gas markets became very tight late in the year, and this had a direct effect on the oil sector, increasing oil demand.

Early in 2001, the crude oil markets continued to be volatile. On the product side, gasoline prices were extremely strong from mid-March through mid-May. Gasoline inventories were low and there was concern over supplies for the peak summer driving season. However, this concern subsided. By the end of April, OECD crude and product inventories were much more comfortable than at the end of December 2000. Growth in oil demand has slowed owing to continued high prices and a decelerating world economy. World demand forecasts for 2001 have been revised downwards.

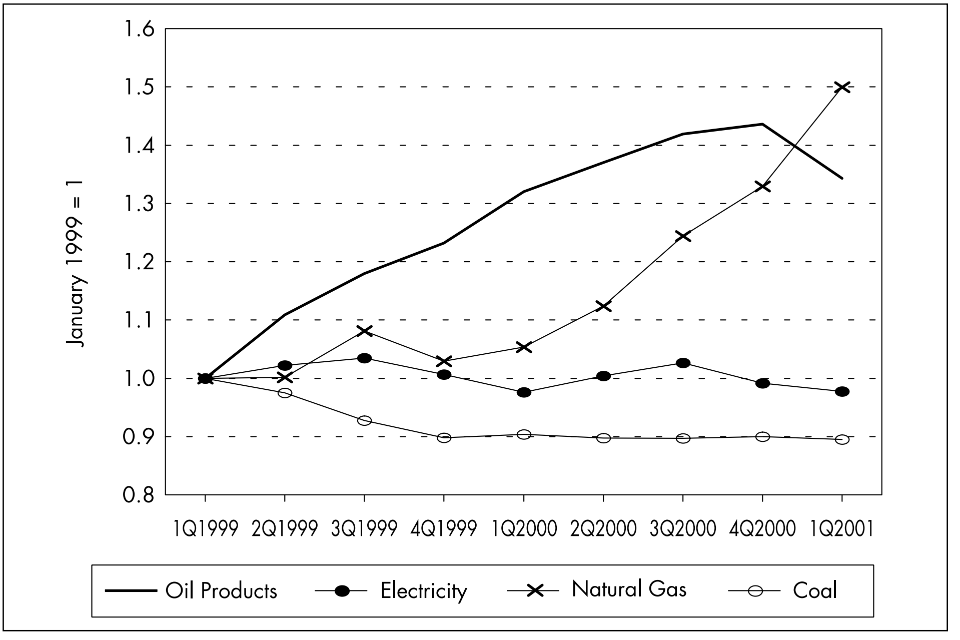
Figure 13

Crude Oil Prices, 1972 to 2001



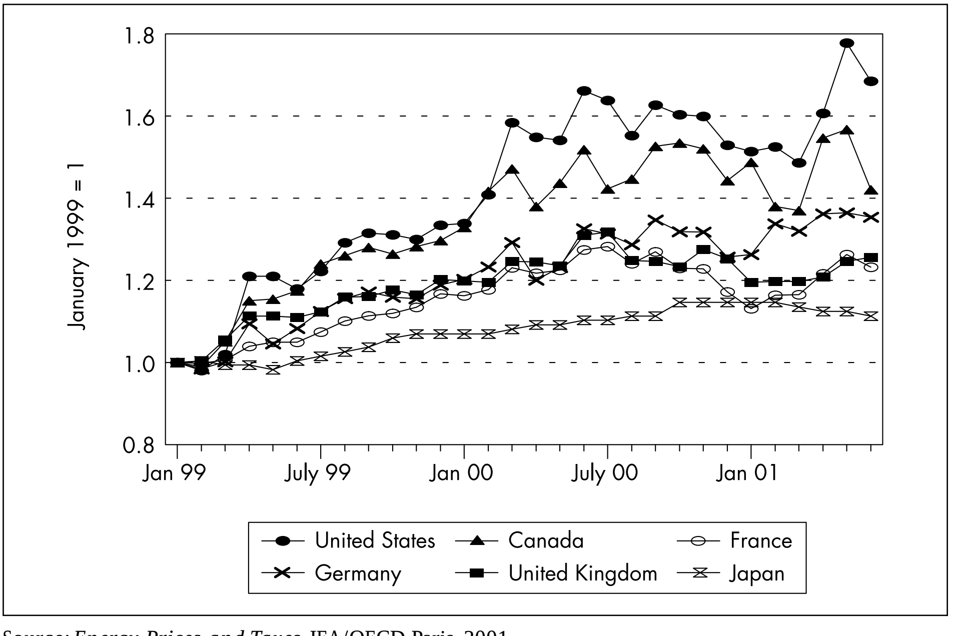
Crude oil prices are Arabian Light (1972-1985) and Dubai (1986-2001). Real oil price is based on 1972 dollars.
Source: IEA.

Figure 14
Indexed Fuel Prices, First Quarter 1999 to First Quarter 2001



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

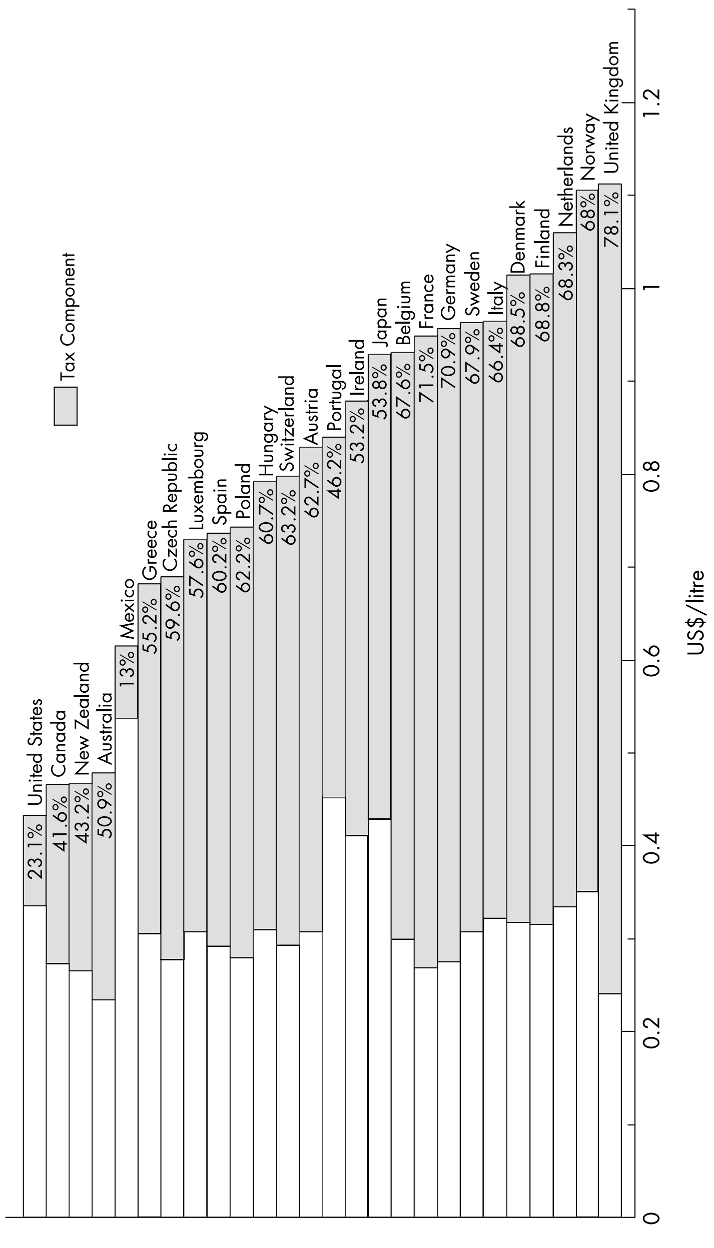
Figure 15
Gasoline Price Trends in Selected IEA Countries, January 1999 to June 2001



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

Figure 16

OECD Unleaded Gasoline Prices and Taxes, First Quarter 2001



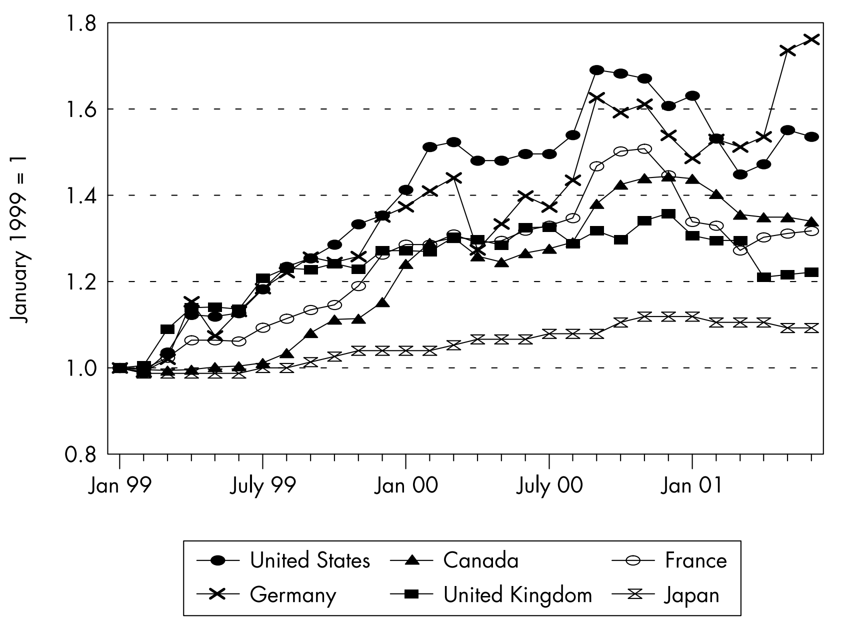
Note: Data not available for Turkey.
Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2001.

Gasoline

Gasoline prices remained high in many countries in 2000, particularly in the US where they rose by about 60% from the beginning of 1999. Relative to January 1999 level, gasoline prices in 2000 were higher in North America than in European countries and Japan (Figure 15) reflecting higher tax rates in Europe and Japan. In 2000, average gasoline prices rose sharpest in the US, followed by Canada, and IEA European countries. During the winter of 1999/2000, refiners maximised production of heating oil; however, this caused gasoline production to fall and contributed to a below-normal build-up in gasoline inventories ahead of the summer 2000 driving season. Prices fell at the end of the year in many countries, partly because of seasonally lower demand following the driving season. Gasoline stocks remained very low in the US throughout the year 2000. In Japan, weak economic growth and increased competition among retailers kept gasoline prices at the pump largely unchanged, despite the increased prices of imported crude oil and oil products owing to the depreciation of the yen against the dollar. Long-term oil import contracts and higher transportation costs, which characterise the Japanese oil market, tend to dampen the impact of short-term crude oil price changes on end-use prices. While after tax US gasoline prices rose sharply in 2000, they were still the lowest among OECD countries, at 40% to 50% of prices in most European countries and in Japan (Figure 16).

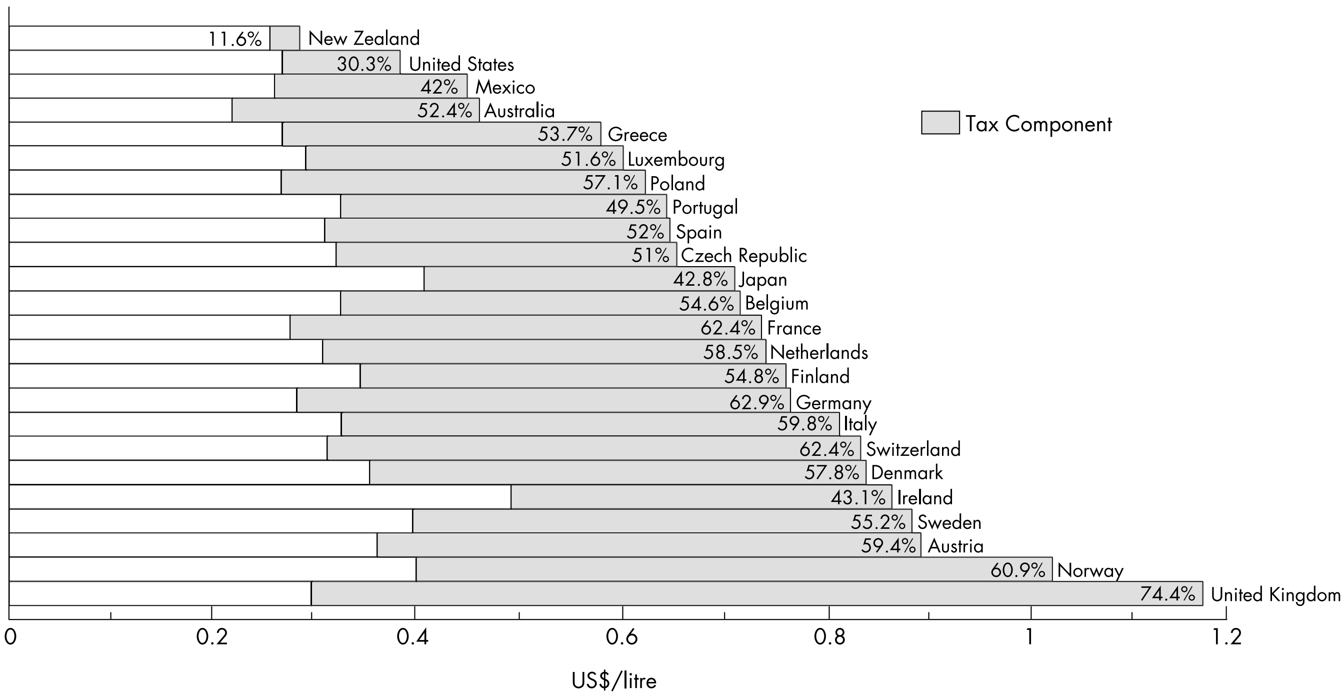
Figure 17

Diesel Price Trends in Selected IEA Countries, January 1999 to June 2001



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

Figure 18
OECD Automotive Diesel Prices and Taxes, First Quarter 2001



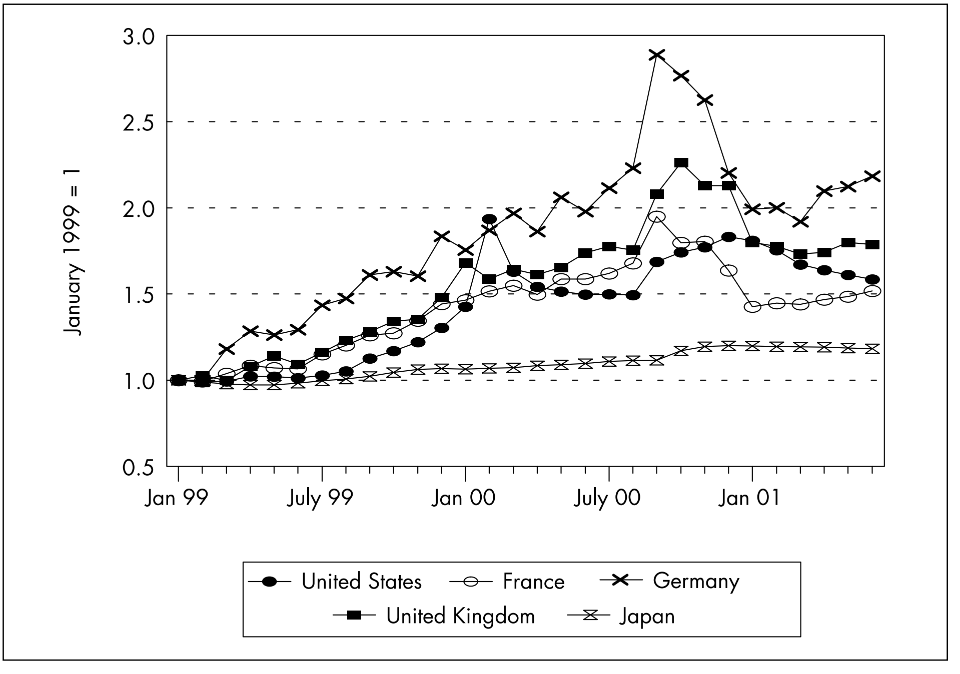
Note: Data not available for Canada, Hungary and Turkey.
Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2001.

Diesel

Relative to January 1999 levels, diesel prices in IEA European countries rose faster than gasoline prices reflecting the fact that the tax share of diesel prices are lower than for gasoline (Figure 17). Prices peaked in September 2000, and the public reaction was severe in many European countries. Protesters blocked refinery facilities and highways, and many gas stations lacked sufficient fuel supplies. Some European countries made temporary adjustments to their fuel taxes. As with gasoline prices, diesel prices in Japan remained largely unchanged in 2000.

Figure 19

Space Heating Oil Price Trends in Selected IEA Countries, January 1999 to June 2001



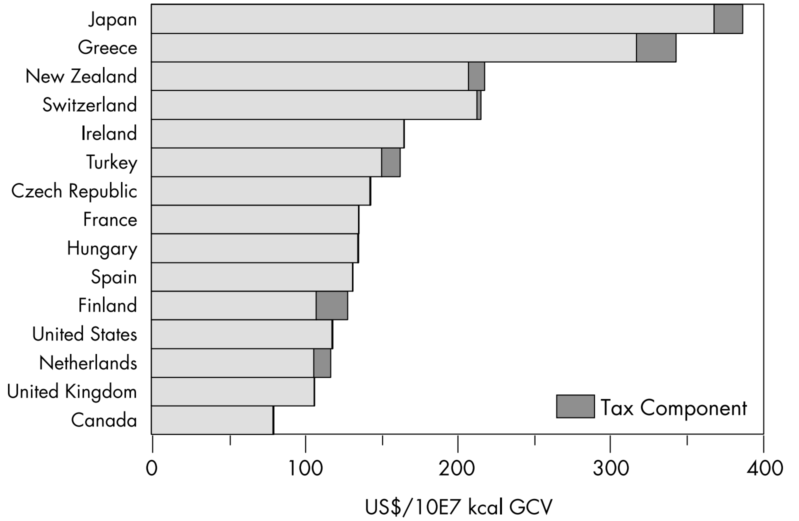
Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2001.

Space Heating Oil

Relative to January 1999 level, prices for space heating oil were higher at the beginning of 2000 reflecting low inventories and lower taxes compared with gasoline and diesel (Figure 19). Prices increased sharply in September 2000, however, with the anticipation of a cold winter and very low stock levels. Stocks were particularly low in Germany. German consumers have large storage tanks for heating oil, and they buy fuel when prices are low. High prices over the past two years meant their tanks were emptier than normal.

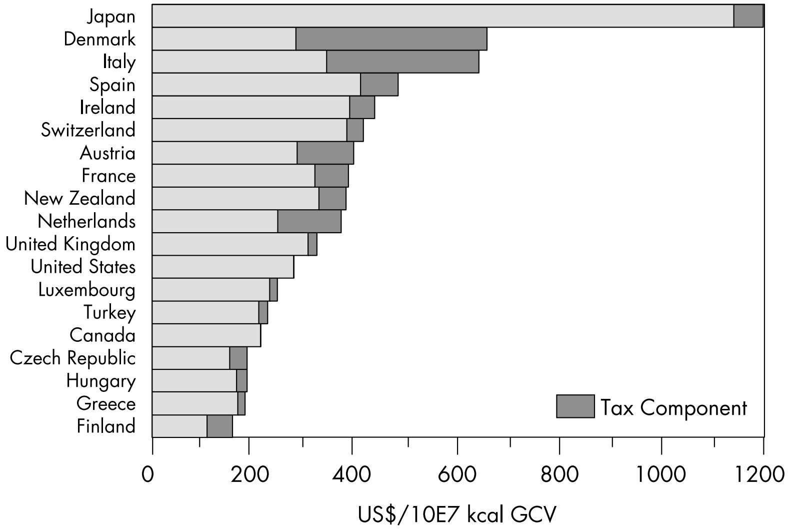
Figure 20
Gas Prices in IEA Countries, 1999

Industry Sector



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

Household Sector



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

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

Gas

In 2000, gas prices in the OECD increased sharply by 27%, faster than the price of oil products (17%). The increase was most pronounced in OECD North America (43%). Combined with the steadily growing demand for electricity generation, the forecast of a cold winter in the US tightened the gas market and prices rose. Consumers with interruptible contracts switched to other fuels, and heating oil prices also increased. OECD European countries faced similar conditions, though on a smaller scale. Long-term contracts in the OECD European gas market meant that the price increase was much more modest than in the US. There is about a six-month time lag in price changes for long-term contracts.

Natural gas prices were stable in the OECD Pacific in 2000, because of the weak Japanese economy and the time lag of price changes under long-term contracts for LNG imports.

Table 5
Quarterly Natural Gas Prices (1Q 1999 = 100)

	OECD	*OECD N. America*	*OECD Europe*	*OECD Pacific*
1Q 2000	116.9	125.5	105.5	104.3
1Q 2001	187.7	238.5	120.8	102.3

Coal

OECD steam coal prices declined by 13% between the first quarter (1Q) of 1999 and 1Q 2000. Coal prices have varied the least among all fuels over the past two years.

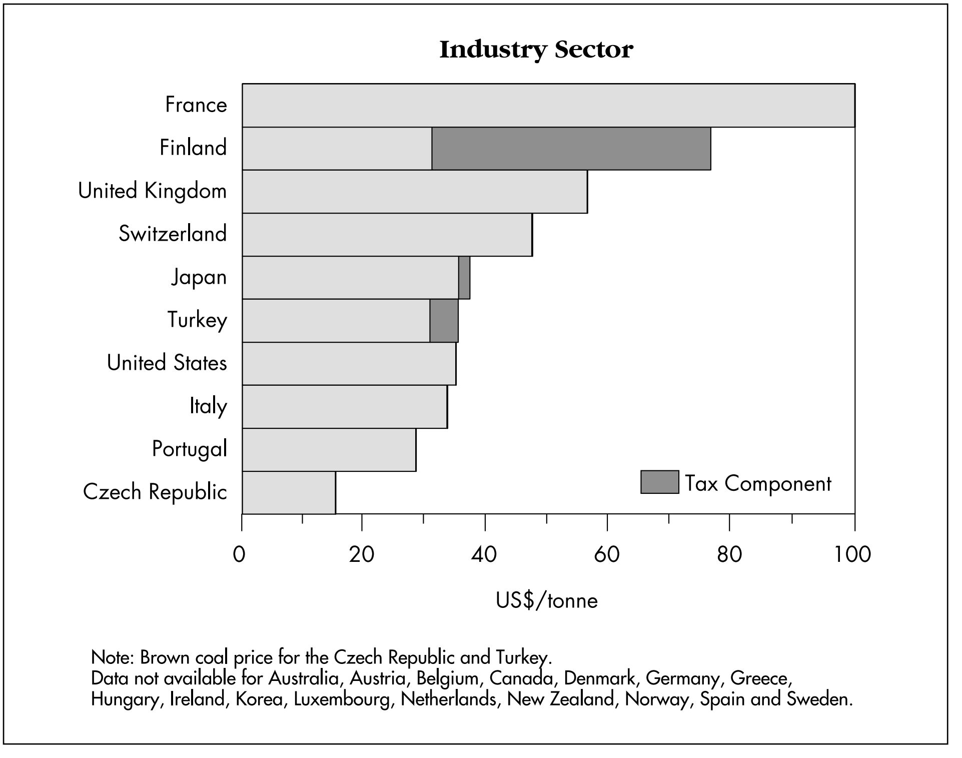
Table 6
Quarterly Steam Coal Prices (1Q 1999 = 100)

	OECD	*OECD N. America*	*OECD Europe*	*OECD Pacific*
1Q 2000	96.6	89.9	104.4	93.9
1Q 2001	96.3	88.1	108.0	90.9

Electricity

Electricity prices have declined steadily over the past few years in the OECD. Prices tend to peak in the third quarter (3Q) in OECD North America and in OECD Pacific, reflecting air-conditioning demand patterns. The indexed price in OECD North America in 3Q 1999 was 89.6, compared with 88.6 in 3Q 2000. The price in OECD Pacific fell slightly in 3Q 2000, but the fourth quarter price was slightly higher than

Figure 21
Steam Coal Prices in IEA Countries, 1999



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

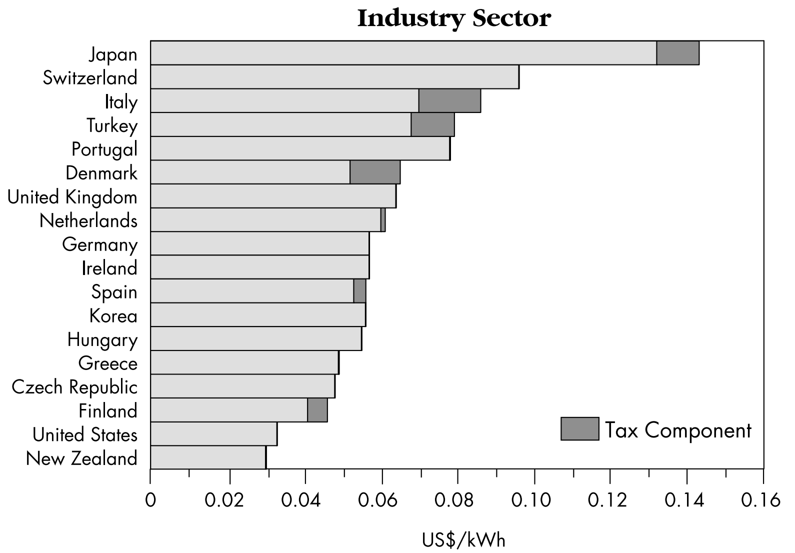
in the previous year, partly reflecting increased oil product prices. Electricity prices are expected to rise in all OECD countries, as a result of higher fuel prices and growing energy demand.

Electricity prices in the household sector continue to be strongly determined by their tax component in many countries. The Danish retail price, for example, is among the highest in the OECD, although the pre-tax price falls in the middle of the price range for OECD countries.

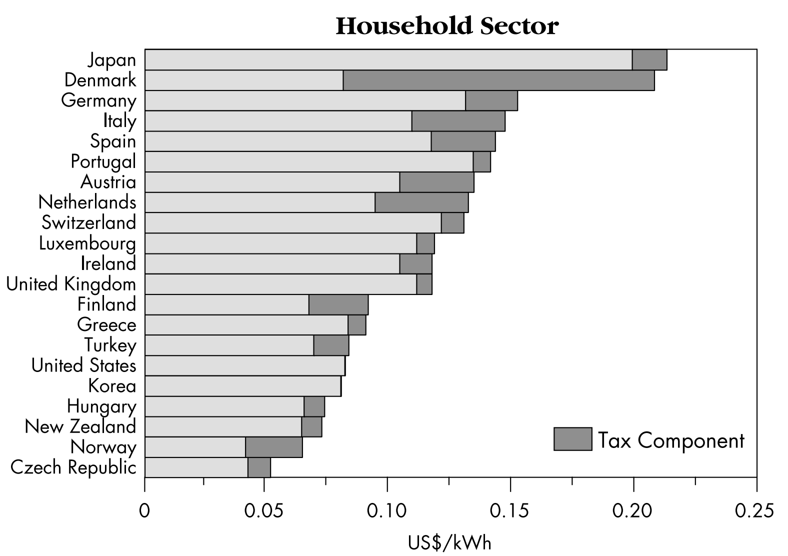
Table 7
Quarterly Electricity Prices (1Q 1999 = 100)

	OECD	*OECD N. America*	*OECD Europe*	*OECD Pacific*
1Q 2000	86.6	75.1	92.2	99.4
1Q 2001	88.5	78.5	93.7	98.5

Figure 22
Electricity Prices in IEA Countries, 1999



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



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

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

ENERGY INTENSITY AND CO_2 EMISSIONS

Energy Intensity

In 1999, energy intensity, expressed as total primary energy supply divided by GDP (PPP), fell by 6.3% in IEA countries from 1990. However, overall energy demand has remained fairly in tune with economic growth over the past decade.

Energy intensity, as measured by final consumption divided by total GDP (PPP), continued to fall in the industry sector in IEA countries. Since 1990, it has fallen by 25% in Germany, 15% in the United States, 4% in Japan and 3% in France. The average IEA indicator declined by 28% in the 1980s, and by 11% in the 1990s.

Table 8

Energy-related CO_2 Emissions, Excluding International Marine Bunkers

(million tonnes)

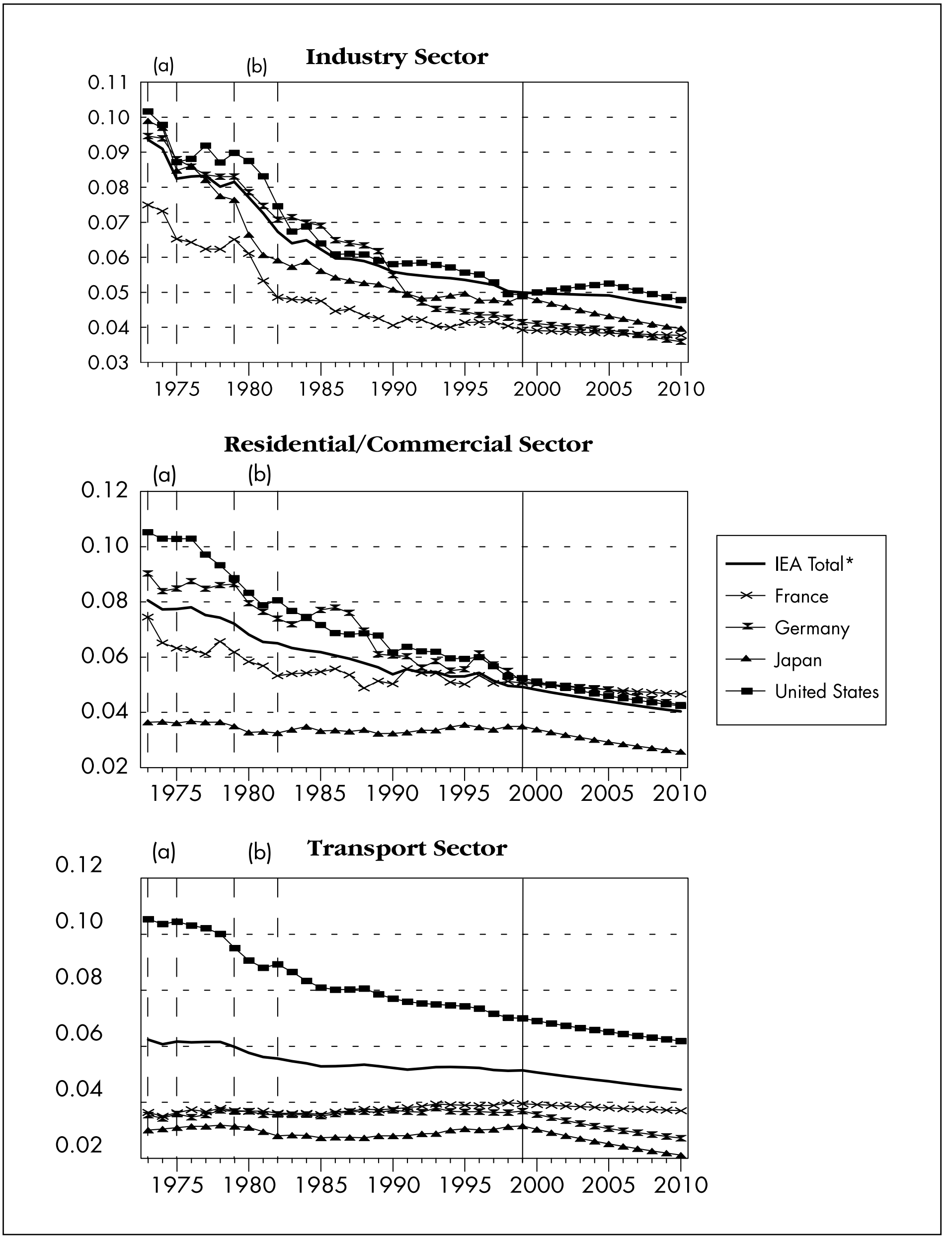
	1990	*1999*	*% change 1990-1999*	*2010*	*% change 1990-2010*
Canada	421	489	16.11	556	32.00
United States	4,846	5,585	15.25	6,624	36.69
North America	**5,267**	**6,074**	**15.23**	**7,180**	**36.32**
Australia	260	322	23.77	364	40.13
Japan	1,049	1,158	10.49	1,056	0.68
Korea	234	410	75.51	..	..
New Zealand	23	31	33.12	35	53.42
Pacific	**1,565**	**1,921**	**22.74**	**..**	**..**
Austria	57	61	6.14	64	12.68
Belgium	106	119	11.78	115	8.07
Czech Republic	150	111	–26.47	101	–33.12
Denmark	50	53	7.22	59	18.31
Finland	53	58	8.42	65	20.94
France	364	361	–0.71	462	26.80
Germany	967	822	–14.99	838	–13.28
Greece	69	82	18.16	134	93.91
Hungary	68	58	–14.36	59	–13.31
Ireland	32	40	24.09	47	47.50
Italy	397	421	6.03	451	13.83
Luxembourg	10	7	–28.33	8	–22.01
Netherlands	156	167	6.44	186	18.65
Norway	28	37	30.45	..	..
Portugal	40	61	53.09	61	53.89
Spain	212	272	28.60	289	36.77
Sweden	49	48	–0.56	53	9.13
Switzerland	41	40	–3.11	40	–2.07
Turkey	138	183	32.21	467	237.66
United Kingdom	572	535	–6.47	585	2.23
IEA Europe	**3,560**	**3,534**	**–0.71**	**..**	**..**
IEA Total	**10,392**	**11,529**	**10.94**	**..**	**..**

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

Figure 23

Energy Intensity by Sector in Selected IEA Countries, 1973 to 2010

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



* excluding Korea and Norway from 2000 to 2010.

(a) corresponds to the first oil shock (end 1973) and the macro-economic recession induced by this shock.

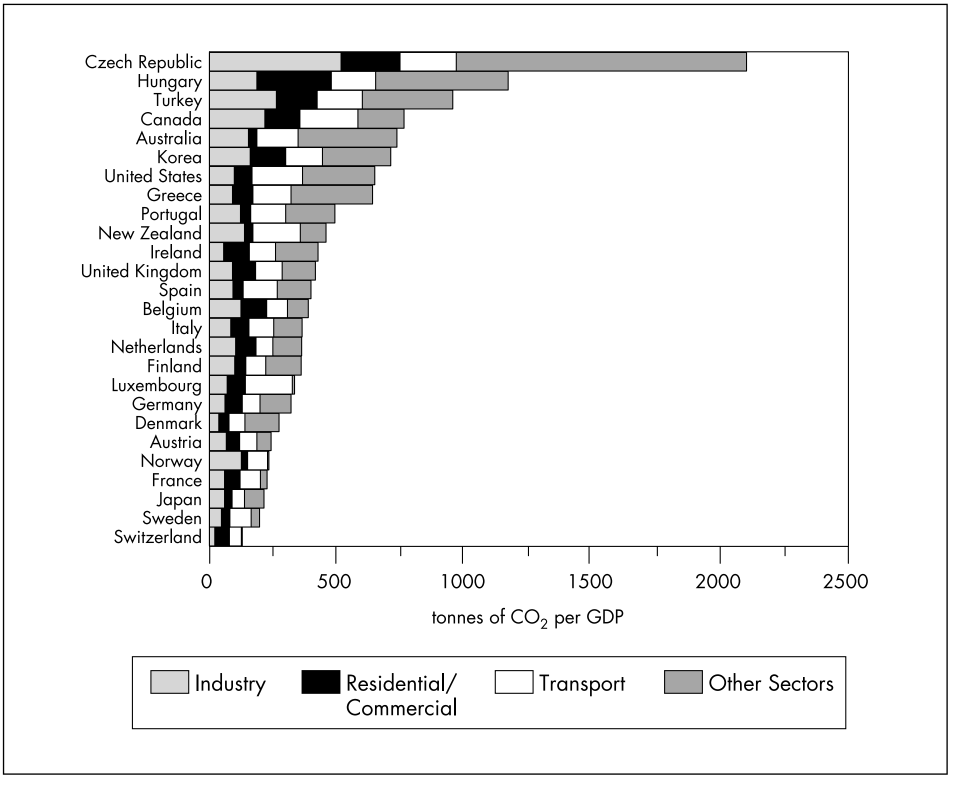
(b) corresponds to the second twin oil shock (early 1979 and end 1980) and the macro-economic recession induced by this double shock.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001; *National Accounts of OECD Countries*, OECD Paris, 2001; and country submissions.

Figure 24

CO_2 Emissions per GDP by Sector in IEA Countries, 1999

(CO_2 emissions/GDP using 1995 prices and exchange rates)



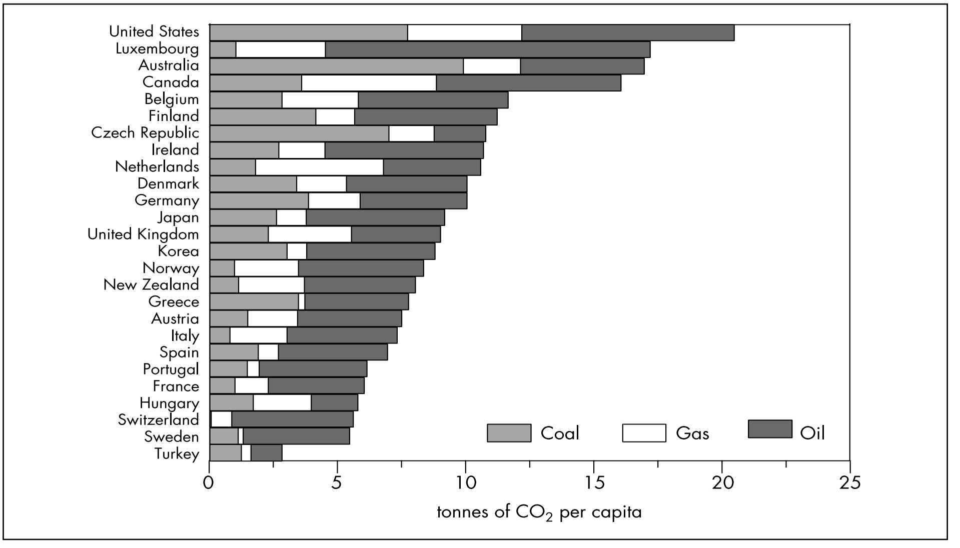
Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001 and *National Accounts of OECD Countries*, OECD Paris, 2001.

From 1990 to 1999, energy intensity dropped by 8.5% in the residential/commercial sector. The rate of decline is slower than that in industry. This reflects increased electricity uses in households and a structural change from industry to services. Energy intensity fell by some 15% in the last decade in the US and Germany but did not change significantly in France. Although intensity increased by 8% in Japan in the last decade, it remains low, at about two-thirds of the IEA average.

Energy use in the transport sector divided by total GDP was largely unchanged in IEA countries over the last decade. Intensity declined in the United States from 1990 to 1999, but was still 36% higher in 1999 than the IEA average. In contrast, energy intensity in Japan increased by 12% over this period, despite its weak economy. Consumer preference for larger cars and the increase in driving distance more than offset improvements in engine efficiency.

Figure 25

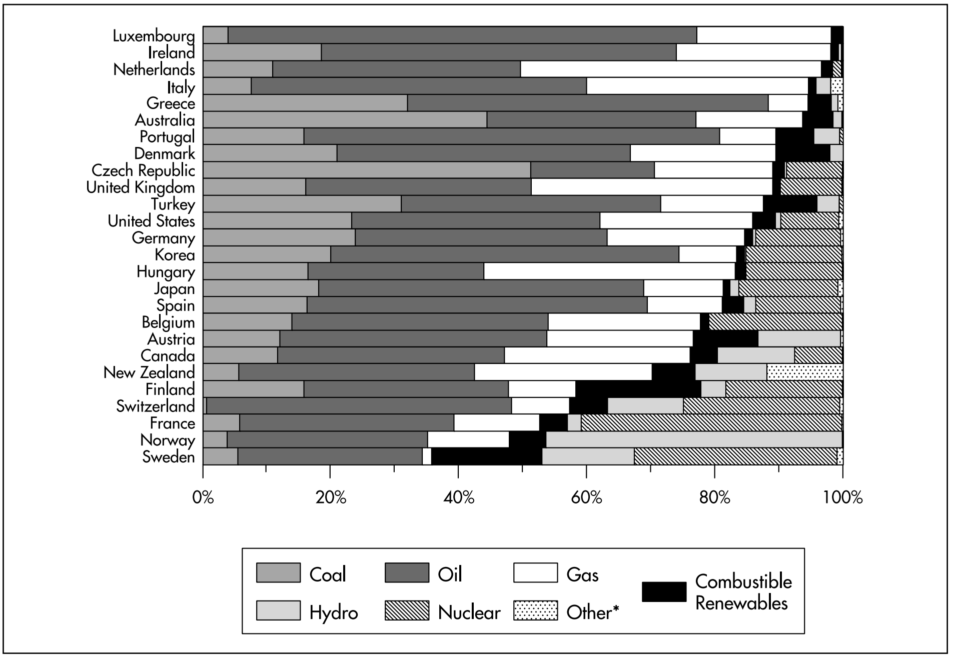
CO_2 Emissions per Capita by Fuel in IEA Countries, 1999



Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001 and *National Accounts of OECD Countries*, OECD Paris, 2001.

Figure 26

Total Primary Energy Supply in IEA Countries, 2000

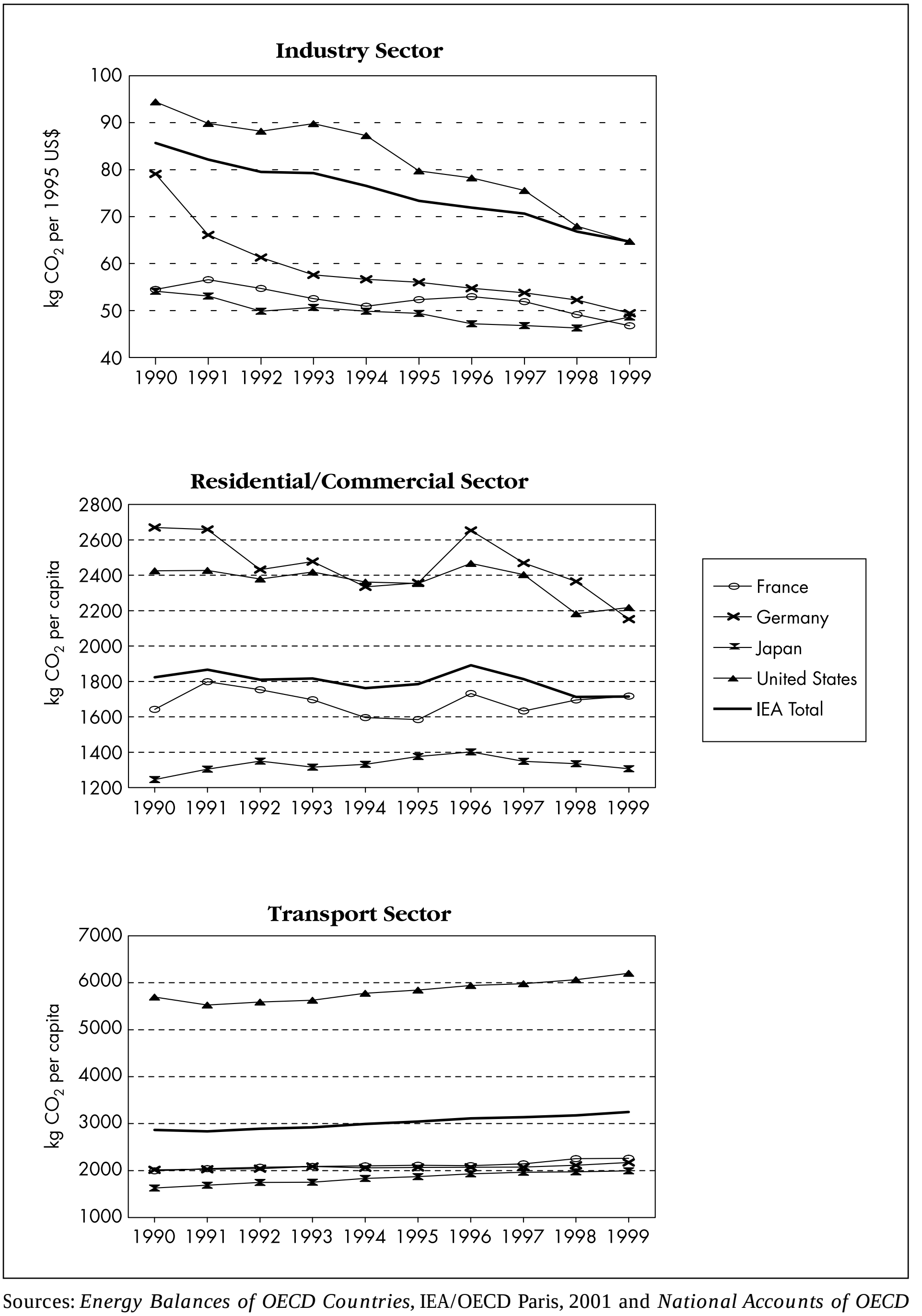


* Includes geothermal, solar, wind and ambient heat production.

Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001.

Figure 27

Energy-related CO_2 Emissions by Sector in Selected IEA Countries, 1990 to 1999



Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001 and *National Accounts of OECD Countries*, OECD Paris, 2001.

Table 9

Climate Change: Key Energy and CO_2 Emissions Data for OECD Countries, 1999

	Energy-related CO_2 emissions (Mt CO_2)	*Energy-related CO_2/capita (t CO_2/person)*	*Energy-related CO_2/GDP (t CO_2/1995 US$ 1 000)*	*% Total IEA energy-related CO_2 emissions*	*International marine bunkers (Mtoe)*	*CO_2 emissions from international marine bunkers (Mt CO_2)*	*International aviation bunkers (Mtoe)*	*CO_2 emissions from international aviation bunkers (Mt CO_2)*
Canada	489	16.04	0.74	4.24	1.08	3.45	1.04	3.09
United States	5,585	20.46	0.65	48.44	26.03	82.55	19.18	56.83
North America	**6,074**	**20.01**	**0.66**	**52.68**	**27.11**	**86.00**	**20.22**	**59.92**
Australia	322	16.95	0.72	2.79	0.79	2.52	2.41	7.15
Japan	1,158	9.14	0.22	10.05	5.22	16.66	6.36	18.86
Korea	410	8.76	0.72	3.56	6.51	20.71	0.48	1.43
New Zealand	31	8.02	0.47	0.26	0.28	0.89	0.66	1.96
Pacific	**1,921**	**9.78**	**0.30**	**16.66**	**12.80**	**40.78**	**9.92**	**29.39**
Austria	61	7.48	0.23	0.53	0	0	0.52	1.54
Belgium	119	11.61	0.39	1.03	4.40	14.00	1.53	4.53
Czech Republic	111	10.75	2.11	0.96	0	0	0.12	0.36
Denmark	53	10.01	0.27	0.46	1.31	4.11	0.79	2.33
Finland	58	11.20	0.37	0.50	0.56	1.76	0.37	1.09
France	361	6.00	0.21	3.13	2.90	9.17	5.33	15.78
Germany	822	10.01	0.32	7.13	2.09	6.56	6.91	20.49
Greece	82	7.74	0.61	0.71	3.12	9.84	0.96	2.85
Hungary	58	5.75	1.12	0.50	0	0	0.22	0.64
Ireland	40	10.66	0.42	0.35	0.17	0.54	0.52	1.54
Italy	421	7.30	0.36	3.65	2.45	7.64	3.39	10.06
Luxembourg	7	17.19	0.33	0.06	0	0	0.34	1.02
Netherlands	167	10.54	0.35	1.44	12.69	40.21	3.42	10.13
Norway	37	8.32	0.22	0.32	0.86	2.69	0.59	1.74
Portugal	61	6.13	0.49	0.53	0.59	1.86	0.55	1.64
Spain	272	6.90	0.40	2.36	5.88	18.68	2.62	7.75
Sweden	48	5.44	0.18	0.42	1.51	4.80	0.50	1.47
Switzerland	40	5.58	0.12	0.35	0.01	0.04	1.51	4.49
Turkey	183	2.78	0.96	1.59	0.28	0.89	0.51	1.52
United Kingdom	535	9.00	0.43	4.64	2.32	7.29	6.33	18.76
IEA Europe	**3,534**	**7.44**	**0.35**	**30.66**	**41.13**	**130.07**	**37.03**	**109.73**
IEA Total	**11,529**	**11.83**	**0.44**	**100.00**	**81.04**	**256.84**	**67.17**	**199.04**

Note: "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.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001; *CO_2 Emissions from Fuel Combustion*, IEA/OECD, Paris 2001; and *National Accounts of OECD Countries*, OECD Paris, 2001.

CO_2 Emissions

Energy-related CO_2 emissions in IEA countries reached 11.5 billion tonnes in 1999, up 11% from 1990. Emissions in some countries have been stabilised or reduced as a consequence of radical economic change (the Czech Republic, Germany and Hungary are particularly striking examples) or through fuel-switching in power generation (the United Kingdom in particular). On the whole, improvements in overall energy intensity, although sometimes accompanied by a reduction in carbon intensity, have not been enough to offset overall increases in energy demand. Increased power generation and the rapid growth of road transportation have been responsible for the vast majority of increased CO_2 emissions in the OECD.

Energy-related CO_2 emissions in the industry sector of IEA countries declined by 24.5% between 1990 and 1999 (Figure 27) although energy consumption grew by 9.2% over the period. Factors behind the decrease in emissions were the substitution of electricity and gas for oil and coal, as well as structural changes and energy efficiency improvements. The reduction in CO_2 emissions in the industry sector was over 30% in Germany and the United States. The structural changes in the former East Germany explains reductions in Germany as a whole. Substitution of electricity for more CO_2-intensive fuels is behind the decline in US industry emissions.

Emissions continued to increase in the transport sector in IEA countries, up 13.4% from 1990. Alternative fuels and vehicles (electric, hybrid or fuel cell) have not yet penetrated the automobile market to the point where overall CO_2 emissions would be affected.

Power generation remains a steadily growing source of CO_2 emissions in IEA Member countries. The majority of the increase has been in North America and the Pacific; emissions from power generation in Europe have remained roughly stable over the decade. Although overall generation has grown substantially, CO_2 emissions have not increased as rapidly. Coal-based generation (with the highest proportion of CO_2 per unit of energy produced) has declined in IEA Europe, while the contributions of natural gas, nuclear and, to a much lesser extent, renewable energy have increased. In the two other regions, coal use in power generation has been a growing source of emissions. Behind the trend in power generation is the rising demand for electric power for a variety of uses in industry, commerce and the residential sector.

Emissions declined modestly in the residential/commercial sector in IEA countries. However, much room for energy efficiency improvements exist, through improved insulation and the use of more efficient electric appliances. A recent analysis indicates that strongly growing demand for digital TVs and other electronic equipment could offset the net efficiency gains from other sectors. Firm new measures are needed to bring about sustainable improvements.

COMPETITION

ELECTRICITY

Status of Reform in IEA Countries

Following the implementation of electricity reforms in many OECD countries (Table 10), the spotlight has shifted from regulatory issues to market performance. The crisis in California's electricity market in mid-2000 and early 2001 focused renewed attention on the impact of reform on security of supply and prices. Although liberalised electricity markets are performing generally well, effective competition and well-functioning markets do not develop overnight. Relatively long transitions may be inevitable in some cases. Policy-makers and the general public need to reassess the importance of investment and security of supply in liberalised energy markets, to ensure that measures to prevent new crises from arising are built into the strategy of reform.

A second generation of reforms is being developed in many countries to cope with the perceived shortcomings of the first generation. The UK, the first country to establish a competitive electricity market in 1990, introduced the New Electricity Trading Arrangements in March 2001. EU member countries are considering changes to the electricity and gas directives. Australia and New Zealand are also conducting reviews of some aspects of their regulatory frameworks for energy.

California's Electricity Crisis

Two years after reforming its electricity market, California experienced an unprecedented power crisis. Wholesale electricity prices soared during 2000 and the first four months of 2001. Some electricity distributors were close to bankruptcy, and one of them actually went bankrupt, because they were not allowed to charge consumers the higher costs of energy. In the summer of 2000, prices during peak demand periods rose as high as $500 per MWh in the wholesale market. Power shortages resulted in some rationing of the power supplied to businesses. The California Power Exchange suspended trading on 30 January 2001 and filed for bankruptcy on 9 March 2001.

How did it Happen?

Investment in new generating capacity failed to keep pace with demand growth in California over the last five years. The deterioration in generating capacity reserves started well before market reforms were implemented and continued thereafter. Investment did not occur, in the first place, because electricity demand was not expected to grow significantly in California, which had suffered a severe recession

Table 10
Retail Electricity Market Opening in IEA Countries

	Partial opening	*Full opening*
United Kingdom	1990	1999
Norway	1991	1991
New Zealand	1994	1994
Australia	1994	
Finland	1995	1997
Canada	1996	
Sweden	1996	1996
Germany	1998	1998
Spain	1998	2003
United States	1998	
Austria	1999	2001
Italy	1999	
Denmark	1999	2002
Luxembourg	1999	
The Netherlands	1999	2004
Portugal	1999	
Belgium	2000	
France	2000	
Ireland	2000	2005
Japan	2000	
Greece	2001	
The Czech Republic	2002	2006

Note: Blanks in the third column reflect that either no final decision has been taken on the date for full market opening or that there are no plans for full market opening for the country as a whole or in some of the states.

Table 11
Comparison of Net Generating Capacity Additions and Load Growth, California, 1996 to 1999

	Net capacity additions (MW)	*Growth of peak demand (MW)*
1996	462	2,376
1997	153	2,005
1998	6	2,464
1999	51	–1,323
Increase	672	5,522

Source: California Energy Commission.

in the early 1990s. However, the California economy boomed in the 1995-2000 period, quickly eroding generating reserves. California's peak demand increased by 5,522 MW from 1996 to 1999, while generating capacity increased by only 672 MW (Table 11).

By the time investors realised the need to develop new generation capacity, they were faced with the significant hurdles that the licensing of new electricity assets poses in many developed countries and, in particular, in the US. Environmental concerns, local opposition and lengthy administrative processes impose increasingly long delays to the development of new generating plants. Expanding transmission capacity to bring electricity generated outside the state faces similar problems. High regulatory risk during the years immediately preceding reform may also have contributed to the investment shortage.

Prices

Wholesale electricity prices on the California Power Exchange have averaged $115/MWh in 2001, nearly four times those of the two previous years. The increase in wholesale electricity prices reflects the tighter balance between supply and demand in California, a sharp increase in the price of natural gas used to generate power and, to a still indeterminate degree, the exercise of market power by suppliers[2]. The tight market also increased price volatility. Plant outages or extreme weather conditions, as in December 2000, can have a large impact on prices when generating capacity is scarce.

Impact on Utilities' Finances

Under the transitional regulatory arrangements set up in 1998 in a large part of California, electricity retailers were required to buy electricity at market prices and to sell most of it at regulated prices. The regulated price included a charge on consumption that covered stranded costs borne by the utilities. This arrangement, aimed also to protect consumers, imposed a high risk on electricity retailers. Electricity companies often make use of financial instruments that hedge the risk of mismatches between wholesale and retail prices. This contracting approach, which is common in the UK and Australia, has not been used by California's utilities, which had to buy all their electricity from the spot market until 2002. The result has been that, while the revenue of generation companies has increased, electricity suppliers have made substantial losses.

Government Policies

Emergency actions by the federal government and courts obliged generators to go on supplying the California market. These actions prevented major supply

2. There were other factors, such as the increase in the prices of NO_x credits in 2000, from $3 per pound in January to about $45 per pound in August.

disruptions in the first months of 2001. In the meantime, the state government of California has adopted an active role in the procurement of energy supplies, negotiating long-term contracts with generators and marketers and establishing a state agency with responsibility for procurement. The state is also proposing to buy the utilities' transmission assets, a move which would allow electricity suppliers to repay a substantial part of their debts. But the details of the new procurement mechanisms and the rescue plan for the utilities have not yet been fully established[3].

Outlook

Investment is now flowing into the California market and priority has been given to speeding up licensing procedures for new generating capacity. Table 12 shows that planned net capacity additions in the period to 2005 are substantial, increasing generating capacity in California by nearly 60% in 2005 relative to 2000, if all planned plants were completed. This, combined with a more modest outlook for electricity demand growth, suggests that reserve capacity levels could recover over the next few years. The speed of the recovery depends on electricity demand growth, which is uncertain. The investment situation is similar. About 30,000 MW of new capacity came on line in 2000 and a similar addition is expected in 2001 throughout the country.

Table 12
Planned Generating Capacity in California
(MW)

	2002	*2003*	*2004*	*2005*
Planned plants	4,686	9,915	10,913	4,374
Of which, approved by California Energy Commission	1,630	1,970	–	–
Cumulative increase	4,686	14,601	25,514	29,888

Source: California ISO.

Security of Supply in IEA Electricity Markets

Could the problems experienced in California happen elsewhere? In assessing the risks, it is necessary to distinguish three different but related questions. First, what is the current situation in IEA countries? Second, with virtually all OECD countries now initiating power sector reform, how do market reform and competition affect security of electricity supply? And third, what other factors may have an impact on the evolution of security of supply in the near future?

3. As of June 2001.

Current Situation: Generation

In many IEA countries there is no immediate risk to the security of electricity supply, since the current supply market differs from that in California in significant respects. Table 13[4] and Figure 28 show that reserve margins across OECD countries were generally higher than in the US at the time reforms were introduced. Currently, electricity demand growth is, with some exceptions, also lower. This provides a cushion against electricity shortages in a majority of IEA countries. There are, however, some regions, both within the US and in other IEA countries, in which the supply and demand balance is tight and where investment in additional generating capacity will be needed soon.

Table 13

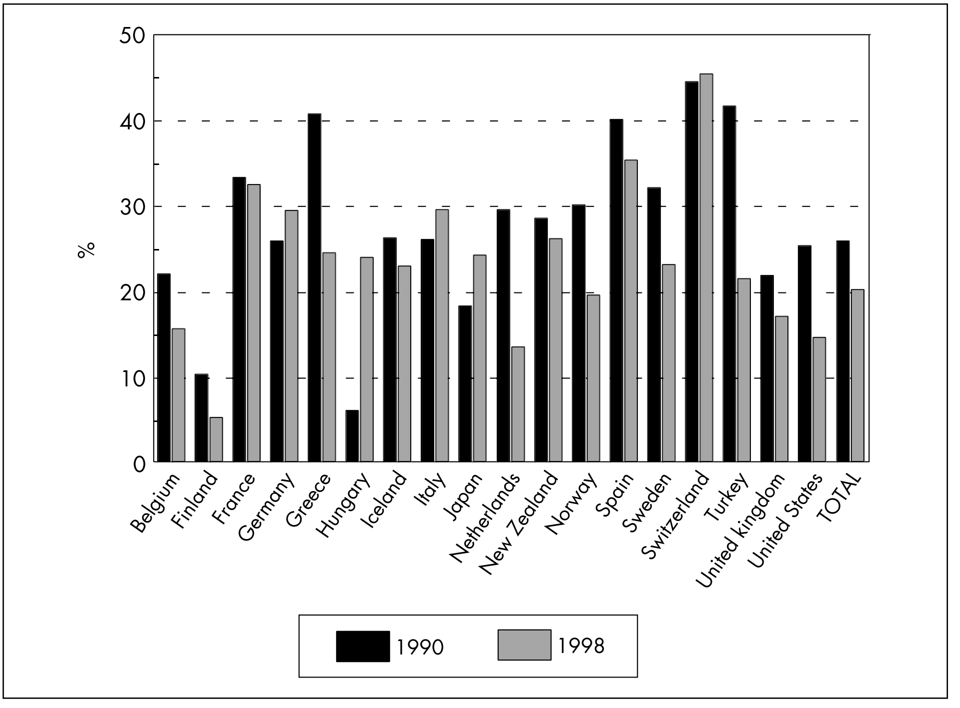
Generating Capacity Reserve Margins in IEA Countries

	1990	*1994*	*1995*	*1996*	*1997*	*1998*
Belgium	22.2	20.0	17.5	15.8	14.9	15.8
Finland	10.5	11.2	10.1	9.4	9.3	5.4
France	33.4	32.5	32.8	31.1	33.8	32.6
Germany	26.0	28.0	29.7	30.1	27.6	29.6
Greece	40.8	31.5	30.5	27.0	28.2	24.6
Hungary	6.3	21.9	20.6	21.2	22.0	24.1
Italy	26.2	31.1	30.6	32.8	30.1	29.7
Japan	18.4	16.5	17.4	20.0	23.1	24.4
The Netherlands	29.7	31.7	32.3	26.7	23.0	13.7
New Zealand	28.7	31.4	31.8	27.2	22.9	26.3
Norway	30.2	17.9	20.6	16.1	24.0	19.7
Spain	40.2	41.9	41.0	42.9	39.5	35.4
Sweden	32.2	25.7	24.1	19.8	24.3	23.3
Switzerland	44.6	46.5	46.0	47.0	46.4	45.5
Turkey	41.7	37.6	31.2	26.8	20.8	21.6
United Kingdom	22.0	19.2	15.4	17.7	16.6	17.2
United States	25.5	24.0	20.1	20.8	16.0	14.8
TOTAL	26.0	24.8	22.7	23.2	21.1	20.3

Source: *Electricity Information 2000*, IEA/OECD Paris, 2001.

4. Reserve margins are defined as (generating capacity – peak demand)/generating capacity. These figures must be interpreted with caution as the definition of generating capacity varies by country depending on which units are considered to be connected to the grid and available to supply power. In addition, available capacity may be smaller than installed capacity particularly for hydropower, which depends on meteorological conditions.

Figure 28
Reserve Capacity Margins in OECD Countries, 1990 and 1998



Note: Data not available for Australia, Austria, Canada, the Czech Republic, Denmark, Ireland, Korea, Luxembourg, Mexico and Portugal.

Source: *Electricity Information 2000*, IEA/OECD Paris, 2001.

Current Situation: Transmission

Transmission capacity has become a focal point in electricity markets. Episodes of price volatility and problems with reliability in some US markets, including California, have been attributed, in part, to insufficient transmission capacity during peak demand periods. In the EU, the development of the internal electricity market is limited by the capacity of existing interconnectors. In Australia, stronger inter-regional links are crucially needed for the development of the National Electricity Market. In areas of strong economic growth such as California and Ireland, transmission within systems is also increasingly congested.

Existing networks are not well adapted to the emerging patterns of electricity transmission. The onset of competition and the regionalisation of markets are leading to a sharp increase in cross-border and inter-system electricity trade that cannot be accommodated by existing links. The result is congestion of transmission lines and, where such lines are used to provide a backup for energy supply, a less reliable supply.

Building new lines to resolve this kind of bottleneck is becoming increasingly difficult. Investment in many OECD countries is subject to stringent environmental criteria, reflected in licensing procedures. There is often local opposition to the construction of new lines. Technical solutions exist to meet these challenges, such as underground lines, but they can be prohibitively expensive. The result is weak investment in new transmission assets in many OECD regions.

Under current policies, the development of transmission networks is likely to proceed slowly. Additional transmission capacity will be procured mainly by upgrading existing lines. Congestion in some critical links will remain or even increase.

Current Situation: Financial Issues

The financial aspects of the Californian crisis are related to a unique element of the Californian reform – the fact that suppliers were committed to sell electricity at a fixed price but did not hedge the risk of higher energy costs. In most countries, the combination of long-term contracts, bilateral electricity trade and vertical integration between generation and supply provides a virtually automatic hedge against wholesale price risks.

Impact of Reform and Competition on Security of Electricity Supply

In the longer term, security of supply in the liberalised electricity markets will depend on sufficient and timely investment. Competitive electricity markets have been in operation for several years in some OECD countries such as the UK, the Nordic countries, Australia, New Zealand and Spain, and in other areas of the US. These markets share several of the main elements of the Californian approach, including competition in generation and a choice of supplier by the end-user.

Reserve capacity decreased in the 1990s across IEA countries, but reliability problems have been localised and rare[5]. Unexpected outages have, however, occurred, causing blackouts during peak demand periods. This was the case, for instance, in Victoria (Australia) in the winter of 2000. A labour dispute resulted in the unexpected unavailability of a number of generating plants, at the time of highest annual demand. There have also been occasional accidents, like the distribution breakdown caused by fire that resulted in the Auckland blackout in 1998.

While the precise events and regulatory decisions that unleashed the Californian crisis are unlikely to recur in other systems, they demonstrate that the new markets may face serious challenges related to investment and security of supply, particularly during the transition to competition.

Reforms are having an impact on the way the market provides secure supply. The liberalisation of investment in generation, for instance, has accelerated the deployment of distributed generation systems. Distributed generation – generating capacity located

5. Evidence on investment is still quite limited. Investment in new generating capacity has remained strong in some electricity markets, such as the UK market, where more than 14 GW of gas-fired generating capacity has been built over the last decade.

near consumption centres – reduces transmission requirements. It reduces the dependence of end-users on the network, thus increasing reliability. It is, in general, more expensive than centralised generation, but costs are declining. Distributed generation used in combination with centralised generation can already be made cost-effective, as it can be used at times of peak demand, when power is most expensive.

Other Factors Affecting Investment and Security of Supply

The problems experienced in California highlight other factors, notably regulatory processes, such as licensing and siting procedures, which affect investment in both generation and transmission assets. Regulatory uncertainty may have a large detrimental impact on reliability.

Government policies concerning the choice of fuels for power generation can affect power generation investment developments. Most IEA countries aim to increase the share of power generation from renewables. Policies on nuclear power, which vary widely among IEA countries, may also have a significant impact on investment choices. A review of recent developments in nuclear power policies of IEA countries is provided in the box below.

Nuclear Power in IEA Countries: Recent Developments

In the Czech Republic, construction of the first of two units at the Temelin plant has been completed and the units are expected to go into service during 2001.

In Canada, plans have been announced to restart six of seven nuclear units that had been laid up since 1998. The units are planned to return to service during 2002 and 2003.

In Germany, the government and the electricity industry agreed in June 2001 to limit the future use of existing nuclear power stations. The agreement ensured that waste disposal operation would continue for the allowed time. For each plant a maximum of allowed nuclear power generation was fixed on the basis of an assumed standard lifetime of 32 years. The quantity allocated can be transferred among plants, thus providing operators with some flexibility.

In Finland, the power company TVO has applied to the government for the right to build a fifth reactor. The Council of State must decide in principle, in accordance with the Nuclear Energy Act, whether the project is "in line with the overall good of society". The council's decision must be ratified by the parliament.

In Sweden, the closure of a second reactor under a government phase-out plan has been delayed. Under the plan, the unit was to have been closed in mid-2001. However, the plan also requires that generation losses from the closure be compensated by a reduction in electricity demand or by new generation, conditions which have not yet been satisfied.

Other Recent Developments

In March 2001, the European Commission presented several measures aimed to speed the development of the EU internal electricity market. These include a draft directive amending the directive 96/92/EC on electricity and a draft regulation "On Conditions of Access to the Network for Cross-Border Exchanges in Electricity". Negotiation on the package of measures was continuing as of July 2001.

The draft electricity directive proposes:

- Liberalising EU electricity markets so that all non-domestic users are given a choice of supplier by 2003, and all users by 2005.

- Requiring regulated third party access (TPA) as the basic framework for network access in EU countries, thus eliminating the other access models contemplated in the electricity directive (negotiated TPA and single buyer).

- Requiring legal and management unbundling of transmission system operators.

- Requiring legal unbundling of distribution systems by 2003.

- Establishing independent national regulators with powers over tariffs.

The draft regulation on the adoption of common rules for cross-border electricity transmission will cover cross-border trade, not previously covered in EU legislation. Despite long-standing consultation on cross-border trade in the context of the EU regulatory forum for electricity, known as the Florence Process, consensus has not yet been reached.

In the UK, after some delays the New Electricity Trading Arrangements (NETA) were implemented in March 2001. NETA, which was approved by government in 1999, establishes a voluntary wholesale power market with more demand-side participation than the previous England and Wales Pool. NETA has functioned smoothly. Although prices in the electricity balancing market were fairly volatile at first, they have since decreased in volatility to levels that were originally predicted. The balancing market constitutes only a fraction of the overall amount of electricity traded under the NETA system. The majority of trading is carried out in bilateral contracts, the prices of which have remained stable.

Alberta (Canada) opened its electricity market in January 2000, while Ontario (Canada) decided to postpone market opening until May 2002. In the US, many states and the federal government are reassessing plans for reform following the Californian crisis.

NATURAL GAS

Status of Reform in IEA Countries

Reform of the natural gas markets in OECD countries is now well under way, and competition is spreading in all three regions. It will bring more choice to consumers, and a more efficient and transparent market, and it will eventually lead to lower prices for consumers.

Market liberalisation started in Europe in August 2000 with the transposition of the EU Gas Directive into national laws, but prices on the European market increased in 2000. Natural gas supply in continental Europe remains almost entirely covered by long-term take-or-pay contracts, with prices indexed to a basket of competing fuels, mainly crude oil products. Most border prices for gas follow oil prices with a six-month lag, although the impact is smoothed somewhat by the presence of other competing fuels (coal in particular) in the indexing formula.

In OECD Europe and in Japan, the current supply situation is one of growing import dependency and relatively few producers. The challenge is to introduce effective competition while sustaining short- and long-term security of supply.

Implementation of the EU Gas Directive[6]

In OECD Europe, the year 2000 will remain a key date for the gas industry. EU member states had to transpose the Gas Directive into national law by 10 August 2000. Except for France and Germany, all states met the deadline for implementing the directive. The directive set out basic principles for reform and gave countries some flexibility in defining the regulatory framework. The choice of access regime, unbundling and tariff-setting were key aspects of reform.

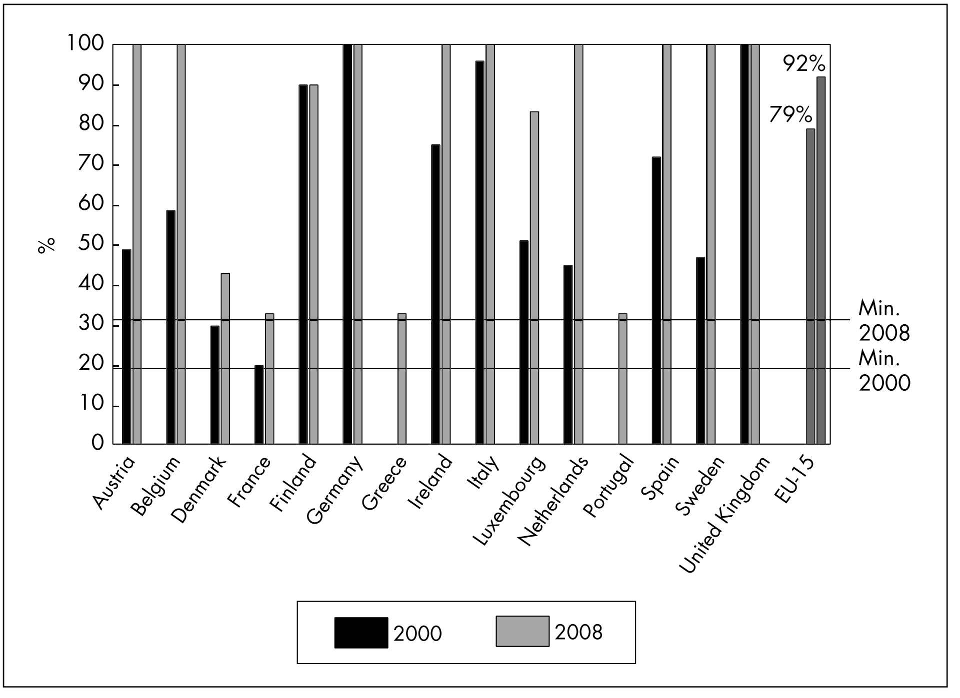
Market opening. The directive required member states to open at least 20% of their national consumption to competition from 10 August 2000. Many countries have gone far beyond this requirement (Figure 29). On average about 80% of total EU gas demand (on a volume-weighted basis) is nominally open to competition. According to the European Commission, this is likely to increase to more than 90% by 2008. A distinction should be made, however, between eligible customers and real opening. Competition on the supply side and non-discriminatory access regimes will determine how much of the market is really "open".

Access systems. The directive allows either "negotiated" third party access (TPA) with the publication of the main commercial conditions, or "regulated" TPA, based on published tariff structures. Most member states have opted for regulated, rather than negotiated, TPA.

6. *Opening up to choice, launching the single European gas market,* European Commission, August 2000.

Figure 29

Current and Planned Gas Market Opening in the European Union, 2000 and 2008



Source: European Union, DG TREN/Gas Unit.

- Nine states (Belgium, Denmark, Finland, Ireland, Italy, Luxembourg, Spain, Sweden and the UK) have chosen regulated TPA. In most cases, the publication of network access conditions includes the publication of standard conditions and tariffs.
- The German and Austrian governments have applied negotiated TPA. In the case of Germany, new entrants to the market have to negotiate with the pipeline operators under the framework of an Association's Agreement.
- Belgium initially opted for negotiated TPA, but is moving to regulated TPA.
- France and the Netherlands have opted for a hybrid form of access between negotiated TPA and regulated TPA.
- Portugal and Greece have not yet decided as they qualify as "emerging markets".

Unbundling. National approaches are quite mixed. Some countries are moving towards complete unbundling, rather than simply unbundling the financial accounts.

- Denmark, Ireland, Italy, the Netherlands, Spain and the UK have chosen to separate transportation and trading activities of integrated companies more sharply than is required by the directive.

- The other states have opted to comply with the minimum requirements, unbundling of accounts.

Regulatory authorities. Thirteen countries have established, or plan to establish, authorities responsible for both gas and electricity regulation. In Germany, no energy-specific regulatory authority is to be established. In Austria, Denmark and Spain, the ministry responsible for energy will continue to play an important role in energy regulation.

New Proposals

While European gas transmission companies are adapting their corporate strategies and structures to the new regulatory environment, the European Commission has proposed new measures. The commission is responding to a call for action from the European Council Meeting in March 2000 in Lisbon to speed up the liberalisation of the electricity and gas markets.

The draft gas directive proposes:

- Liberalising EU gas markets so that all non-domestic users are given a choice of supplier by 2004, and all users by 2005.
- Requiring regulated third party access (TPA) as the basic framework for network access in EU countries.
- Requiring legal and management unbundling of transmission system operators.
- Requiring legal unbundling of distribution systems by 2004.
- Establishing independent national regulators with powers over tariffs.

North America[7]

The US wholesale market for gas is already highly competitive. Thousands of producers, independent marketers, pipeline affiliates, local distribution companies (LDCs) and end-users compete to buy and sell gas at the well-head and at market centres, or "hubs", located across the country. In recent years, the retail market has become more competitive, as various states have initiated retail unbundling programmes to allow residential natural gas users to select their gas suppliers. The nature of these "customer choice" programmes varies widely from state to state. New Mexico, New Jersey, New York and West Virginia allow all residential consumers to choose their own gas suppliers, and seven states have begun to implement similar statewide programmes. Another eleven states and the District of Columbia have pilot or partial unbundling programmes in place. Ten more states

7. This section is based on the *International Energy Outlook*, Energy Information Administration, March 2001.

are considering action on customer choice, while eighteen states have thus far taken no action. Two states changed their unbundling status in 2000. New Jersey has allowed customer choice statewide since 1 January 2000, while Kentucky has approved a five-year pilot programme of customer choice beginning 1 February 2000.

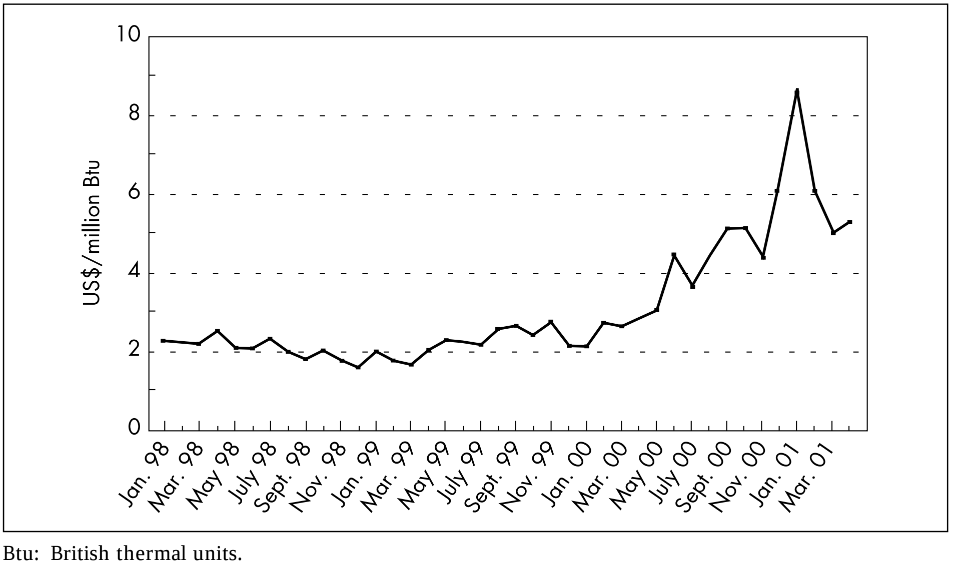
Consumer reaction to these programmes has been mixed. In some states, such as Nebraska and Wyoming, all of the eligible residential and commercial customers have decided to choose their suppliers. In other states, such as New Mexico and West Virginia, virtually no one is participating.

Partly as a result of the increasing demand for natural gas from new gas-fired power plants and partly because of tight gas supply, North American natural gas prices rose sharply in 2000. Prices at the US Henry Hub more than quadrupled from those of just a year earlier. Consumers have seen substantial increases in natural gas costs. In California, where insufficient pipeline capacity both at the border and within the state has severely limited the availability of supply, border prices shot up to six times those on the New York Mercantile Exchange (NYMEX).

In 2000, the most dramatic change in the Canadian market was the large increase in gas prices, following similar price rises in the US. While Canadian gas producers have benefited greatly from higher prices and have increased export capacity through the opening of the new Alliance pipeline, gas consumers were affected by the price increases. Temporary federal and provincial subsidies were set up to help offset the effect of the price rise on small consumers.

Figure 30

Evolution of Spot Prices in the United States (Henry Hub), January 1998 to April 2001



Btu: British thermal units.
Source: World Gas Intelligence.

Japan[8]

In Japan, as in Europe and the United States, deregulation is changing both the gas and electricity industries. Gas companies are moving into the power sector, and power companies are pursuing gas ventures. The gas industry is undergoing major changes in the domestic market as a result of power sector deregulation and emerging competition in domestic gas distribution. The Japanese market has been divided among over 240 city gas companies with 30% of the market and 10 power utilities with 70% of the market. Now, the restraints dividing these two groups have been removed and each side can enter the other side's territory. The most active area for competition is Kansai, where Osaka Gas and Kansai Electric are competing for consumers.

Security of Gas Supply

Security of gas supply is a key element in IEA energy security. The projected growth in OECD gas demand should not in itself constitute a security problem, provided that the security of gas supply is embedded in national energy policy and security measures are strengthened. Most IEA countries are well placed to withstand physical disruptions in supply, whatever the origin. However, recent trends have brought new challenges and uncertainties of a more economic nature. In particular, gas market liberalisation leads to the emergence of spot and trading markets that are more volatile than the traditional contract system. Gas markets have to adapt to this volatility.

Security of supply has a price that consumers must be ready to pay. As competition intensifies, gas operators will be less willing to maintain expensive precautionary systems to avoid interruptions. They will be willing to invest in new flexibility for short-term security and in new infrastructure only if such investments are rewarded by the markets. Markets themselves have to internalise security of supply.

Until recently, the three major regional gas markets were not linked. Prices diverged in the three markets, and there was very little physical gas trading among them. Today, markets are becoming more global, and events in one country can affect other countries. The LNG market, for instance, provides major opportunities for the globalisation of gas trade. At the end of 2000, high LNG prices in the US market and low prices in Europe created the first opportunities for trans-Atlantic arbitrage. Although such trade has been limited to a few LNG cargoes so far, it has established a bridge between two major gas consuming regions.

Outlook

In all OECD regions, regulatory reform will continue over the medium term, and gas markets will become more competitive, putting pressure on costs and

8. This section is based on "Japan's Gas Market: Emerging Trends in International and Domestic Markets, Gas Alert Number 20", *FACTS Inc*, 23 February 2001.

margins. The new regulatory framework will modify the traditional gas landscape, in particular in Europe and Japan. The speed of change is still uncertain, but the likely evolution of the structure and operation of the European gas market is quite clear.

Gas markets will become progressively more open and competitive. This will attract more participants, put downward pressure on profit margins, lead to the development of new products and services, and perhaps favour the emergence of energy service companies. As the new regulations allow more consumers to buy directly from suppliers, new actors will appear on the market: producers supplying gas directly to end-users; transporters carrying gas without owning it; traders and marketers offering new services and competing with existing suppliers; and wholesalers and power companies diversifying into the gas business.

In sectors open to competition it is inevitable that some companies will lose market shares. Profit margins are likely to erode quickly, as the most profitable customers will be the first targets of competitors. Pressure for cost reductions will be extremely high.

The focus of take-or-pay (ToP) contracts will evolve with market liberalisation. Long-term contracts will continue to play a key role in the future, but increased flexibility will be required. The pricing of long-term ToP contracts is sure to change.

Spot markets will eventually emerge and more intermediaries will be used for such purposes as hedging against risks.

Interconnection is one of the driving forces for gas-to-gas competition in Europe. It has already introduced limited supply-side competition and it has created the possibility of arbitrage activity between the UK and continental Europe. With low oil prices in 1998 and the beginning of 1999, arbitrage possibilities were limited. But the high price of oil combined with liberalisation created arbitrage opportunities between the UK and the Continent in 2000. This has led to a doubling of UK spot prices, as high oil-indexed gas prices spread from the Continent.

The development of gas trading at the Zeebrugge hub is another key element in the new European situation and is certainly the precursor of more hubs bringing new trading and swapping possibilities all around Europe.

Finally, trans-Atlantic arbitrage of LNG could eventually lead to the emergence of a global gas market.

COAL

Abundant hard coal resources are geographically widespread, with economically accessible reserves held by a number of IEA Member countries. International trade in hard coal is well established and highly competitive. A large number of market players move sizeable quantities of hard coal, principally by sea. The risk of a lasting interruption is minimal.

A number of hard coal-producing countries give subsidies to their indigenous producers. The IEA considers that undistorted energy prices enable markets to work efficiently, as stated in the *Shared Goals*. Member countries' views differ however as to whether subsidies can be justified. The IEA considers that the current coal market offers reasonable supply security. Where Member countries justify aid on social and regional grounds, the IEA believes that there are other, more efficient, methods of targeting scarce financial resources to regions affected by the decline of the indigenous hard coal industry.

Coal production subsidies have come under particular scrutiny because of the potential environmental impact of coal mining and use. Removal of coal subsidies could contribute to a reduction in greenhouse gas emissions, if the removal led to decreased coal use rather than substitution by imported coal. The Annex I Expert Group of the UNFCCC and others have attempted to assess the impact of removing coal production subsidies on the emissions of greenhouse gases[9]. Removal of coal subsidies in IEA countries may have a limited direct impact on global carbon emissions. But it might encourage other countries to reform energy prices[10]. Recent work by the IEA shows that energy price subsidy removal in large countries outside the OECD would produce a very substantial decrease in greenhouse gas emissions and improvements in economic efficiency[11].

Since 1987, the IEA has used the Producer Subsidy Equivalent (PSE) methodology to estimate the amount of financial assistance to indigenous hard coal production in IEA countries. With this standardised indicator, the IEA has been able to measure the state aid and its evolution over time. PSE analysis has focused on IEA countries with relatively large subsidised industries. Countries examined are Germany, Japan, Spain, Turkey, the United Kingdom and France. Subsidised production in other IEA countries (Canada, Norway and Hungary) is on a much smaller scale. The Czech Republic, a new IEA Member, also has a significant subsidised industry.

Trends

In 2000, the Member countries of the IEA produced 1,128.4 million tce (tonnes of coal equivalent[12]) of hard coal. Of this, 79.6 million tce, around 7 %, received

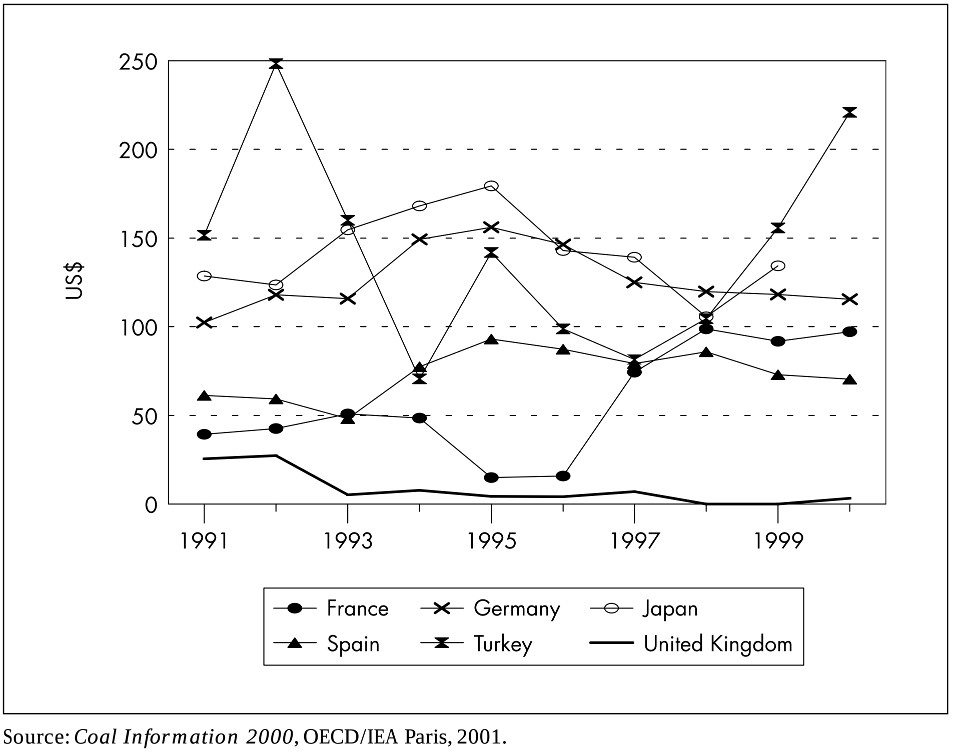
9. See, for example, UNFCCC Annex I Expert Group Working Paper no. 2, *Reforming Coal and Electricity Subsidies*, L. Michaelis, OECD, July 1996.
10. See, for example, B.E. Okogu and F. Birol, *Market-Based Carbon Abatement Policies: the Case of Coal Subsidy Phaseout*, OPEC Review, Autumn 1993.
11. IEA, *World Energy Outlook 1999 Insights: Looking at Energy Subsidies – Getting the Prices Right*, 1999.
12. Tonne of coal equivalent (tce) is a standard unit of measurement in the international coal industry. One tce is equal to 0.7 toe (tonne of oil equivalent). The actual relation between physical tonnages and tce differs for each producing country, and averages for each year are published in *IEA Coal Information*. By way of example, in 1996, one tce amounted to 1.19 physical tonnes of indigenous steam coal in Germany.

state aid as measured by the PSE, in six IEA countries (France, Germany, Japan, Spain, Turkey and the UK).

The amount of IEA hard coal production receiving government assistance declined over the 1990s, both in absolute and in percentage terms. Subsidised production fell by 66% from 1991 to 1999. The main reasons for the reduction were programmed decreases in domestic production and the elimination of subsidies for the remaining tonnage of UK production. In 2000, the UK decided to resume financial aid for some coal mines producing in the period 17 April 2000 to 23 July 2002. Aid is being approved in three tranches. Approved aid under tranche-1 amounted to £ 86 million for 16 mines. To mid-October 2001, eight tranche-2 applications were approved totalling just under £ 46 million.

Total PSE assistance dropped at the same speed as the decrease in production, falling nearly by 55% in nominal terms from 1991 to $5.8 billion in 2000. Thus, average PSE per tce actually grew during the early 1990s, and remained at a level of about $100/tce from 1994 to 1999. Due to the reintroduction of state aid in the UK, average PSE per tce was close to $70/tce. Aid per tonne of coal equivalent in US dollars for IEA countries with subsidised production is shown in Figure 31.

Figure 31
Aid per Tonne of Coal Equivalent, 1991 to 2000



Source: *Coal Information 2000*, OECD/IEA Paris, 2001.

The Future of Coal Subsidies

Subsidised coal production is expected to fall in IEA countries over the next few years. Canada is aiming to close the Cape Breton Development Corporation's (DEVCO) Prince Mine, the last federally-sponsored coal mining operation, by the autumn of 2001. All the remaining coal mines in Canada will then be entirely commercially operated. France plans to close its domestic industry by 2005. Japan now plans to phase out subsidies by 2006. Germany is expected to reduce subsidised output by a third and subsidies by a similar amount by 2005. Even though the UK decided last year to reallocate aid to its coal industry, this aid only covers the period from April 2000 to July 2002. Spain is expected to reduce production a further 20% by 2005. Thus, by 2006, only Germany, Spain and the relatively small industry in Turkey will continue subsidising production of hard coal.

Despite this trend to reduced subsidies, the complete elimination of coal production subsidies in IEA countries will not occur in the foreseeable future. New mechanisms appear to have been developed to provide support to the coal industry. Security of supply is the primary rationale for this. Both Spain and France have transposed Article 8.4 of the EU Electricity Directive into their national electricity legislation; this article permits member states to give priority to indigenous fuels in electricity production. Spain has introduced a further transitory provision to pay utility companies a premium to use domestic coal. Japan has extended the subsidy regime for its two remaining mines. In Germany, access to the power network could be refused until 2003 to competitors who might displace the demand for electricity generation from lignite produced in the former East Germany.

In the European Union, the expiry of the Coal and Steel Community Treaty in 2002 will force EU states to review the case for continued subsidies of the coal industry. In a recent Green Paper, "Towards a European Strategy for the Security of Supply", the European Commission proposed that subsidies could be used to keep effective access to coal reserves as an option for the future. Coal production in the EU might thus be maintained within the framework of the European Union's security of supply. The cost of such a decision is uncertain. Proposed regulation is expected to emerge from the Commission and the Council of Ministers before the end of 2001, to be in place before July 2002.

ENVIRONMENT AND SUSTAINABLE DEVELOPMENT POLICIES IN IEA MEMBER COUNTRIES

The last year has seen major developments in the energy and environment arena. The Intergovernmental Panel on Climate Change (IPCC) published its Third Assessment Report. The Sixth Session of the Conference of the Parties to the United Nations Framework Convention on Climate Change was held in November 2000 in The Hague, and ended in a suspended session as lack of agreement stymied progress. The conference reconvened in Bonn in July 2001, and finally reached political agreement on key aspects of how to implement the Kyoto Protocol. The year 2000 also marked the date set for meeting the initial aim of the climate convention (stabilisation of greenhouse gas emissions in developed countries at 1990 levels). Issues related to sustainable development also took a higher profile. The Ninth Session of the UN Commission on Sustainable Development, which focused on energy and transport, was held in early 2001, and preparations were initiated for work leading up to the tenth anniversary of the Rio de Janeiro Earth Summit.

CLIMATE CHANGE

The science of climate change was given an injection of certainty with the publication of the Third Assessment Report of the IPCC. This report, prepared by three working groups – on the science of climate change, its impacts and possible response strategies –, confirms the severity of the problem, and notes that:

- The climate is changing as a result of human activities.
- Socio-economic and natural systems are vulnerable to these changes.
- Mitigation is possible, and costs can vary significantly depending on the policy choices made.

In spite of the new scientific conclusions, the international negotiations on the Kyoto Protocol made slow progress through most of 2000. A three-year effort to negotiate the details of the Kyoto Protocol was intended to close with an agreement at the Sixth Session of the Conference of the Parties in The Hague, the Netherlands, in late 2000. That did not happen. The meeting ended inconclusively, with no agreement, and a suspension of the discussions until mid-2001.

Negotiators resumed discussions with the knowledge that the United States would not be party to the agreement (the US announced in March that it believed the Protocol to be flawed and that it would not ratify). Discussions in Bonn focused on four key elements: (1) how to use "sinks" (forest and other land use related activities that remove GHGs from the atmosphere), (2) the rules for implementing the market mechanisms of emissions trading and project-based crediting; (3) the future support to be provided to developing countries, and (4) how to address non-compliance with the agreement.

A number of countries expressed concerns over the cost of meeting the commitments agreed in Kyoto. Some countries, particularly those in which emissions have grown only slightly since 1990, argued that the Kyoto targets could be met at relatively low cost. Other countries, in which emissions had risen substantially in the decade between 1990 and 2000, and in which emissions were projected to rise further by 2012, felt that the price of compliance would be too high. To partially offset the cost concerns, countries focused on the use of the flexibility mechanisms contained in the agreement – sinks, emissions trading, the Clean Development Mechanisms and Joint Implementation.

The political decision reached in Bonn allows countries to offset more of their emissions through sinks, and prepared the way for the conclusion of a detailed operating framework for the market mechanisms. In concert, these actions will substantially reduce the compliance costs for some countries. These costs may be further reduced so long as the US is not a party, and thus not a large purchaser of "credits" on the international market. The main elements of a compliance system were settled. On the issues of support to developing countries, the EU, Canada, New Zealand, Norway, Iceland and Switzerland pledged to contribute more than $400 million.

The Bonn agreement increases the likelihood that the Kyoto Protocol will be ratified and will enter into force. Technically, the US cannot block entry into force. Countries representing 55% of Annex I emissions must ratify the agreement for it to become binding – and the US represents only 36%. National decisions to ratify must now be taken – and for some countries, these may still depend on the outcome of ongoing negotiations. The negotiations are set to continue in October 2001 when the Seventh Session of the Conference of the Parties (COP7) is to be held in Marrakech, Morocco.

IEA Member countries took significant action in 2000-2001 to address greenhouse gas emissions in the energy sector. New policies clustered mainly in three categories: regulatory policies (standards, regulations including voluntary agreements); fiscal policies (taxes or tax breaks, subsidies, grants and incentives) and policy processes (strategic planning, consultations, outreach). In addition, IEA countries developed programmes in the area of market-based instruments (such as emissions trading and green certificates) and continued or refocused funding for energy research, development and demonstration projects.

Regulatory Policies

Regulatory approaches involving mandates and standards comprised approximately one-quarter of all energy-related climate change policies and measures adopted or planned by IEA Member countries in 2000. Adjustments or additions to existing regulatory or voluntary programmes have been part of more than 15 Member country programmes over the past year. New actions include energy performance standards, especially for appliances, with new measures passed or announced in the Czech Republic, New Zealand and the US as well as by the European Union. New laws promoting energy savings in buildings were promulgated or entered into force. The Spanish law on construction requirements became effective in 2000; new laws were promulgated in France; existing requirements in the Netherlands were tightened and new energy conservation ordinances were prepared in Germany.

The majority of the policies and measures involving mandates and standards are aimed at raising the share of renewable energy in the energy mix. During the past year, policies requiring electricity suppliers to purchase a minimum share of electricity generated from renewable sources have been adopted in several countries, including Australia, Austria, Belgium and the UK.

In addition to mandatory policies enacted during the past year, nine IEA Member countries and the European Union have adopted or planned "voluntary" approaches to reduce national emissions. Three-quarters of such voluntary agreements (VAs) have been negotiated with manufacturing industries to reduce CO_2 emissions. Over the last year, agreements have also been passed in the transport sector in Canada and Sweden, as well as by the EU.

Among the agreements negotiated, some contain regulatory requirements and/or legally-binding objectives. In the classification system the IEA developed in 1999 (IEA, *Dealing with Climate Change*), such agreements can be classified as "strong". The "strong VA" approach has been used particularly in the Netherlands where two new "covenants" were signed in 2000 with the rubber and plastic industry, and with the meat-packing industry. A similar approach has also been adopted in Germany, which has reached an agreement with industry on a reduction of CO_2 emissions – if such targets are voluntarily met, the government has promised to postpone regulations to reach the goals. A regulatory threat in the event of non-compliance is also present in the voluntary agreement initiated by Switzerland in 2000. In this case, if the targets are not achieved, a CO_2 emissions tax will be introduced after 2004. However, most voluntary agreements adopted or planned by IEA Member countries during 2000 did not contain legally-binding consequences for non-attainment of goals. In the UK, companies receive an 80% discount on the Climate Change Levy if they belonged to a trade association which negotiated legally-binding emissions reductions. Continuation of the discount set in the Negotiated Agreement is conditional on performance. Moreover, few agreements of the "co-operative" type, involving the development and implementation of new technologies, were negotiated over the past year. But this lack of new programmes may not be very significant, as a considerable number of VAs were adopted in previous years and remain in force.

While the combination of VAs with regulatory back-stops was relatively common in the past year, a number of countries also considered combining VAs with other instruments. For example, Germany proposed combining a voluntary approach with a system of tradable permits.

Voluntary approaches continue to offer a way to involve and motivate the private sector in efforts to mitigate climate change. The advent of a set of new VAs combined with other policy instruments suggests that the voluntary approach is likely to continue to be used in the future. But the question remains whether voluntary agreements can, in fact, spur measurable emissions reductions.

Fiscal Measures

European countries and Japan account for the majority of fiscal measures adopted in the past year, although other countries such as Canada also include fiscal elements. Two-thirds of these consist of various forms of subsidies (grants, soft loans, guaranteed minimum prices) to support and encourage renewable energy or more environmentally-benign technologies. Tax exemptions, tax reductions or tax credits are another popular approach. A number of tax credit schemes are specifically designed to promote new R&D. Such policy efforts may be increasingly important as the development of basic research in non-commercial technologies by the private sector continues to decline.

Most fiscal measures are aimed at encouraging technology improvement and diffusion, with an emphasis on fostering the deployment of commercially available technologies and fuels which have very low or zero emissions of greenhouse gases, but are currently not fully competitive with conventional fuel sources. Such price support is categorically different from that granted for technology research, development and demonstration, because it acts on technologies that are already available on the market, but face difficulty in widening market share. This focus is consistent with analyses which suggest that in the near term, GHG reductions will be brought about through the enhanced use and improvement of already existing technologies rather than through technologies now at the laboratory stage. The average time needed for a technology to be adopted commercially (from the theoretical or even the laboratory breakthrough to the establishment of the technology in the market) is rarely shorter than thirty years. So, entirely new technologies cannot, by definition, make a measurable impact in GHG emissions in 2010. Rather, governments can use a variety of support measures to expand deployment of existing technologies. Besides direct and indirect subsidy schemes and tax incentives, support measures include government procurement, information campaigns and the provision of free consulting services on energy efficiency and conservation. All these exploit the reduction of costs that follows increased output volumes – known as the "technology experience curve".

Among the measures introduced in 2000, new taxes or increases in existing taxes were the least frequently applied measure. The few that have been adopted focus on discouraging technologies and fuels with high CO_2 or other pollutant emissions. In that sense, they seek to “internalise” the environmental costs of the taxed technologies and fuels, although the tax measures themselves often reflect these costs only in a very crude way. In some countries (Germany, Hungary, the Netherlands, Norway, Poland, the United Kingdom), excise taxes on oil products kept increasing through most of the year 2000. However, conventional fuels, especially oil products, are already heavily taxed in Europe and Japan for reasons independent of their environmental impact, so further tax increases are becoming very unpopular. In late 2000, European lorry drivers set up numerous road blockades to protest against high fuel prices. Some of those protests succeeded, at least temporarily, in forcing governments to ease the fiscal pressure on oil products or to delay planned increases in excise taxes.

It is no surprise that the prevailing fiscal policy rewards environment-friendly technologies rather than forcing polluting fuels and technologies to bear the full costs of environmental damages. This approach encounters much less resistance from the public – although it does have some potential drawbacks. Subsidies tend to stay in place beyond their “useful” lifetime, and they may even discourage more appropriate technology development.

Market Instruments

Market instruments are becoming increasingly important in IEA Member countries’ strategies to deal with climate change. In 2000, policies and measures involving this type of instrument were adopted or planned by seven countries and by the EU.

The year 2000 marked an advance in the use of emissions trading, with a number of new systems becoming operational, and other regimes proposed or planned – even in countries that had until recently rejected these ideas. The EU launched its scheme through a Green Paper on GHG Emissions Trading that was intended to stimulate a wide debate on how the system would be implemented. Emissions trading schemes are becoming operational in the UK and in Denmark. Systems are under discussion in other countries as well. Proposals are being developed by the Australian government. The national strategy to reduce greenhouse gases under elaboration in Norway includes a national system of tradable quotas. And the Swedish government is elaborating an Emissions Trading Scheme as part of the national GHG emissions reduction programme. In addition, Germany has established a working party to evaluate the possibilities for the implementation of an emissions trading scheme, and the Netherlands has formed an independent commission to prepare a proposal on a domestic trading scheme.

The further development of emissions trading appears to depend in part on international developments, especially the ratification and entry into force of the Kyoto Protocol or similar agreements on a regional basis. Australia has suggested its own domestic regime will not be adopted without an international agreement on trading. Finland wants its system to be part of a scheme that would also include the

EU, all the Nordic countries and the countries around the Baltic Sea. As discussed above, the UNFCCC agreed core rules for implementations of the Kyoto Protocol. This may promote the more rapid implementation of national trading programmes.

Tradable renewable certificates (TRCs) systems have received increasing attention over the past year, and green certificates schemes have been enacted in several IEA Member countries including Belgium and Australia. The Australian Renewable Energy Act, passed in December 2000, provides for renewable energy certificates as a way for power retailers to buy electricity from renewable sources by 2010. The retailers were required by law to buy 2% of their power from renewable sources – for a total of 9,500 GWh. In Sweden, the government has been investigating the possibility of using green certificates to encourage electricity production from renewable energy sources. And a group of European countries, including Finland, Germany, Italy, the Netherlands, Norway, Sweden and the United Kingdom, plans to start trading renewable energy certificates in April 2001 as part of an experimental scheme.

Green certificate programmes have led governments to establish rules on such key issues as eligibility and coverage. In Australia, fossil fuels and waste products derived from fossil fuels are excluded. In Denmark, the definition of renewables excludes large hydro. The Australian scheme applies to all wholesale purchases of electricity on grids of more than 100 MW of installed capacity. In Flemish and Walloon legislation in Belgium, energy distributors have quota obligations. In Wallonia, the green certificate will apply to co-generation (CHP) on the basis of the avoided CO_2 emissions. Other implementation issues concern the registration of certificates. In Australia, renewable energy certificates are created and controlled by the renewable energy regulator and must be registered by this body before they are valid. Incentives for compliance are still another issue. The Australian programme, as well as the tradable green certificate programme approved by both the Flemish and the Waloon regions in Belgium, apply price penalties to non-compliant participants.

Research, Development and Demonstration (RD&D) Policies

One traditional area of government intervention is funding for energy research and technological development. Research, especially in the early stages, is risky and has long payback periods. As a result, the private sector tends to shun basic research and to concentrate on commercial and pre-commercial activities. Governments often make up part of the shortfall directly with public money or indirectly with tax incentives.

In the context of climate change mitigation, development of new, more energy-efficient and less polluting technologies can satisfy the need for economic growth and can increase energy services without damaging the environment. Government expenditures on energy R&D have fallen over the past decade. Protracted periods of reduced spending, especially in the early stages of R&D may have already slowed the speed of technological improvement, at least judging from the scarcity of significant innovations in the energy sector.

Climate and energy-related RD&D funding schemes in 2000 were mostly directed at the development of renewable energy sources, including offshore wind, solar (both photovoltaic and high-temperature), biofuels and advanced technologies that use fossil fuels in a cleaner way, such as fuel cells, clean coal technologies, CO_2 storage and disposal. Governments have provided funds for laboratory research and for demonstration or pilot applications. These are often distributed as tax credits on R&D investments. In some cases, the research effort has involved the development or promotion of government or industry partnerships. RD&D funding measures are particularly popular in the United States, Japan, Australia, Sweden and Denmark.

Denmark, Japan and Germany are committed to wind power. Japan concentrates R&D on solar photovoltaics. Italy concentrates on power production from high-temperature solar technologies. The US and Australia are committed to energy production from biomass and from biofuels. Sweden is active in the development of more environment-friendly vehicles. Studies on energy efficiency and on conservation in the industry, residential/commercial and transport sectors are carried out in Switzerland, the United Kingdom and the US; in the UK, the Energy Efficiency Best Practice Programme is currently the primary national source of independent authoritative information and advice on energy efficiency. Clean coal technologies attract interest in Spain, the UK and the US.

In 2000, there was a slight decline in the number of new RD&D policies in IEA countries compared with 1999. RD&D measures in 2000 represented a smaller share of the total number of measures implemented or planned. Countries focused on technology deployment and on market penetration through changes in the tax structure.

Policy Processes

Approximately one-third of the new policies adopted in 2000 were targeted on consultations, outreach and advisory efforts. From the descriptions of national programmes in this area, consultation processes play a significant role in the elaboration of national strategies. For example, following the presentation of the UK proposal for a greenhouse gas emissions trading scheme in March 2000, the government launched a broad consultation on the design of a domestic trading scheme, before formulating detailed rules. The proposed programme was prepared in 1999 by a group comprising representatives from industry and from the administration. Similar consultations are under way in New Zealand. The country is developing a national Climate Change Programme. In Canada, a series of public discussions (called "Tables") were held to solicit input for 16 different aspects of the national climate policy initiative, including emissions trading, voluntary agreements with the private sector, and the design and implementation of new regulations. The process concluded in 2000 and resulted in the establishment of the National Implementation Strategy on Climate Change in October 2000. The strategy contains over 300 concrete federal/provincial and territorial government actions and measures to address climate change.

Consultative programmes have been especially popular in the design of tradable permits, because countries tend to have less experience in their design and domestic political concerns may be higher. Australia, Finland and the UK have launched consultation processes with industry on the elaboration of emissions trading schemes, and initial reports were provided in 2000. Though the forms of consultation vary among countries, they tend to involve a wide range of stakeholders, including representatives of national and local government, members of private companies and associations, public interest groups and non-governmental organisations (e.g., environmental NGOs, consumer organisations), and experts from academic institutions.

It is difficult to assess the efficacy of such efforts: if policies are subsequently enacted, it is impossible to ascertain whether earlier consultations were a significant factor in their success. The success of policy developments may hinge on their capacity to identify promising alternatives that fit with national concerns and to build consensus around specific policy choices. In some cases, the final result of these consultative programmes seems to be delay – either in cases where no national consensus to act exists, or where political factions opposing any given course of action are sufficiently strong to block measures. However, they also may facilitate the ultimate adoption and implementation of national programmes.

ENERGY AND SUSTAINABLE DEVELOPMENT

Links between the energy sector and sustainable development assumed considerable prominence in IEA Member countries during 2000. The three main components of sustainability, the economy, social welfare and the environment, affect and are affected by energy. Energy is crucial for economic development; energy services help to fulfil basic needs such as food and shelter and contribute to improving education and public health; and, unless they are properly managed, energy production and consumption can diminish environmental sustainability.

The important role that energy plays in sustainable development was widely discussed in international forums in 2000, culminating in the IEA's ministerial level discussions in May 2001 and in the adoption of an IEA Statement on Sustainable Development (see Annex D). The UN Commission for Sustainable Development, which assesses progress on commitments made at and since the 1992 Rio Earth Summit, chose energy and sustainable development (SD) as a main theme for its ninth session in April 2001. A group of experts from national governments and international organisations – including the IEA – met several times to deliberate on this theme as it relates to developed and developing countries. Issues addressed included: providing access to modern energy services to the 2 billion people lacking them, the rate of energy demand growth and the implications of that growth for investment. The World Summit on Sustainable Development (Rio + 10), to take place in September 2002 in Johannesburg, has as its overall focus issues related to eliminating poverty and to promoting economic development – and energy plays a key role in both.

The OECD Initiative on Sustainable Development, launched in 1998, engaged all OECD directorates as well as the IEA in an effort to evaluate the various aspects of

SD, particularly as they relate to OECD countries. The three-year programme produced an Analytical Report – including a chapter on energy drafted by the IEA – and a Policy Report which outlined some of the main conclusions and recommendations arising from the cross-cutting effort. The results of this exercise were presented to the OECD Ministerial meeting in May 2001.

The Role of Governments and Industry

Governments have traditionally played a major role in energy matters. Long-term uncertainties, the failure of markets to adequately address environmental and social objectives, and the monopoly nature of gas and electricity transmission grids are all factors leading to government involvement. The question is: what kind of government intervention is appropriate?

In May 2001, the IEA Energy Ministers recognised the importance of energy to the three pillars of sustainable development. They foresaw growing pressures on the global economy and on the environment. They called for prompt action to bring their countries onto a path to a sustainable energy future. The IEA Statement on Sustainable Development, issued in April 2001, suggested some ways to provide the world with a secure and reliable energy supply without despoiling the environment.

These included:

- Safeguarding energy supplies.
- Promoting improvements in energy efficiency along with further development and diffusion of non-fossil fuel technologies.
- Ensuring competitive, transparent and undistorted markets.
- Creating a stable framework for decision-making.
- Continuing market liberalisation in ways that protect the environment and social welfare.
- Encouraging introduction of the most climate-friendly technological solutions where energy investments are made.
- Participating in the global effort to provide electricity to those currently without access.
- Ensuring high safety standards.
- Sponsoring energy research and development, information exchange and dissemination, with a view to encouraging commercial applications and changes in consumer behaviour.

Many IEA governments are developing and implementing domestic plans and strategies on sustainable development, some of them with a strong energy dimension. A few examples can help illustrate the general nature of the initiatives.

- The Canadian government has long sought to integrate sustainable development concerns into its decision-making process. Since 1995, each federal department has been required to prepare a sustainable development strategy. A commissioner of the environment and sustainable development has been appointed to monitor the departments' strategies. *Energy and Sustainable Development: A Canadian Perspective* (http://nrcan.gc.ca/es/epb/eng/international.htm) was submitted by the Canadian government at the Commission on Sustainable Development 9.

- Ireland issued a green paper on sustainable energy late in 1999. It indicates how Ireland will work to meet its energy requirements in an environmentally and economically sustainable way. Drawing on a 1997 strategy paper, the new green paper concentrates on ways to limit Ireland's energy-related CO_2 emissions, while noting the importance of other environmental issues related to energy.

- In March 2001, Denmark released a draft document that aims to promote sustainable development over a 20-year period. It will be formally made available at the World Summit on Sustainable Development. The document calls for decoupling economic growth and industrial emissions, creating integrated national policies that promote sustainable development, and developing new economic structures such as tax policies promoting more environmentally sound energy use.

- In the UK, an independent, non-profit company has been set up by the government to help the UK move towards a sustainable, low-carbon economy while maintaining competitiveness. Known as the Carbon Trust, it was launched in March 2001 and will support the take-up of low-carbon technologies and measures. It receives funding from the receipts of the Climate Change Levy. In the short term, it will help businesses save energy and money and, in the longer term, will develop the UK's capacity to meet the problems of climate change, considering not only commercial and technological factors but wider socio-economic factors which hinder the move towards a low-carbon economy.

- The European Commission is developing an EU strategy for sustainable development. In early 2001, the Commission released its *First Review Report of the Integration of Environmental Aspects and Sustainable Development into Energy and Transport Policies*. The report calls for new policies and measures, including enhancing energy efficiency, supporting the development of new and renewable energy sources, securing domestic EU energy supply, and finding common solutions to common problems, notably the completion of a single electricity market and a more coherent energy tax regime.

Energy companies and heavy users of energy are also beginning to evolve sustainable development strategies and to incorporate sustainable development into their operations. Many of these companies have been working for some time in industry groups such as the World Business Council on Sustainable Development.

An examination of individual corporate initiatives suggests that the majority of the business actions are being taken because the sustainable development agenda makes good business sense. For example, DuPont announced in late 1999 plans to reduce its greenhouse gas emissions to 65% below 1990 levels by the year 2010; to stabilise its total energy use at 1990 levels; and to obtain 10% of its global energy requirements in 2010 from renewable energy sources. TotalFinaElf has also published detailed plans for integrating sustainable development into its planning and operations.

ENERGY POLICIES IN NON-MEMBER COUNTRIES

Energy reform, including price deregulation and privatisation, is high on the policy agenda in many non-member countries. Energy reform is crucial in order to meet rapidly rising energy demand in these countries. The key driver for reform in most countries is the need to attract foreign and, sometimes, domestic investment. Energy prices that fully reflect costs are a prerequisite for increased investment flows.

Energy security is also high on the agenda, although the ways in which this security is achieved differ from country to country. Different countries favour different fuels in the energy mix. For example, while most countries favour using natural gas, Russia seeks to reduce the share of natural gas in domestic energy use in order to raise revenue from gas exports.

CENTRAL AND EASTERN EUROPE

Market reform has progressed significantly in many Central and Eastern European countries, as part of the preparation for their accession to the European Union. The reform process generally includes the harmonisation of national legislation with the EU directives on internal electricity and gas markets, building oil stocks to meet security obligations, adjusting prices and making them more transparent, increasing energy efficiency and establishing pollutant emission standards. All countries in the region will establish an energy regulatory authority by the end of 2001. For some, improving nuclear safety performance and phasing out unsafe reactors are important targets.

In Poland, the largest energy consumer of the EU candidate countries, restructuring of the coal sector continued in 2001. Some 25% of the total installed capacity has been privatised. A second electric distribution company is expected to be transferred to private ownership by the end of the year. The single-buyer model based on long-term purchase agreements will probably be progressively replaced by a contract-based system to promote competition.

Slovakia has advanced its preparations for the privatisation of three electricity distribution companies and of SPP, the main gas company. An independent energy regulator is to be established by mid-2001.

Romania plans to divide the national electricity distribution company into eight regional companies. Around 15% of the electricity market is now open to competition. Bulgaria completed the unbundling of the national electric company and prepared for privatisation of its main operators and for market opening.

Slovenia prepared the legislative framework for the liberalisation of electricity markets in 2003 and for privatisation of its main energy companies. Croatia has been restructuring its state-owned electricity company and is planning to privatise its state oil and gas company. In October 2000, international sanctions against the Federal Republic of Yugoslavia, including an oil embargo, were lifted after the establishment of a democratic government in Belgrade. Nonetheless, the country experienced an energy crisis during the winter, caused mainly by obsolete equipment and pricing below cost. International aid was granted in the form of electricity and fuel imports and spare parts. Rehabilitation of capital stock and electricity price adjustments were initiated in 2001. Regional co-operation has been reactivated, opening the possibility of regional and international energy transit projects.

RUSSIA

In 2001, the IEA published an in-depth review of Russia's long-term energy strategy to 2020. The key findings of the review are summarised below.

The sustainability of Russia's economic recovery will depend on the government's ability to follow through on legal, fiscal and price reforms. This is especially the case in the energy sector, which must now meet increased demand after a decade of under-investment. Improving energy efficiency will be a critical step towards coping with rising energy demand. Removing energy subsidies and raising prices so that they cover costs are both key elements in promoting more efficient energy use. Joint Implementation projects could enhance the attractiveness of energy efficiency investments.

Increasingly, the energy security of Russia and its export markets are dependent on the creation of a stable and competitive investment environment, energy price reform, corporate transparency and a dramatic improvement in energy efficiency. In the 1990s, investment barriers in Russia hampered the energy sector's ability to maintain capacity and to replace hydrocarbon reserves, and to increase generating capacity and production. Despite the investment needs in the Russian energy sector, many barriers remain which reduce the sector's competitiveness within Russia *vis-à-vis* other sectors. These barriers reduce Russia's overall ability to attract private investment, both domestic and foreign.

One of the most important reforms needed to improve the investment climate is the completion of a comprehensive, clear and stable legal framework for petroleum licensing and operations. This should cover both Russian and international companies and should be co-ordinated at both the federal and regional levels. One of the key tasks needed to complete the production-sharing (PSA) regime and provide for its efficient implementation is passage of the so-called "normative acts" and the PSA chapter of the Tax Code. This will provide a mechanism to attract investment and to bridge the gap while the Tax Code and investment laws are put in place and tested over time.

The major policy tool to stimulate the efficient use of energy is an increase in energy prices, so that prices fully cover costs. The *Russian Energy Strategy to 2020* sets immensely challenging targets for raising natural gas prices by up to 350% by 2005 and to move to parity with European import prices by 2007. It stresses the need to realign relative energy prices to regain the desired balance in energy demand and the share of fuels in total primary energy supply (TPES). Plans to end cross-subsidies in the electricity sector by 2002 should be commended, and their implementation throughout all energy sectors should be strongly encouraged. Targeted welfare assistance to vulnerable sectors of society is more effective and economically more efficient than wholesale energy price subsidies.

For effective implementation of energy price increases, the government should strengthen the role and ensure the independence of the Federal Energy Commission, its regional counterparts and the Anti-Monopoly Ministry. This would ensure a level playing field in all natural resource sectors and in the electricity and heat sectors. An effective price increase should also focus on third party access, establishing transparent tariff-setting methodologies based on costs (including a reasonable profit, as well as funds for reinvestments, taxes and maintenance). Transparent and efficient licensing rules for new players in the market are also needed.

The planned decrease of the share of natural gas in the Russian fuel mix has raised questions about the ability of coal or nuclear power to fill the gap. These questions go to the issues of energy security, economic growth and protection of the local and global environment. Within the next eight years, all first-generation nuclear power plants, which were designed before the issuance of the basic safety regulations in 1973, will reach their design lifetime of 30 years. Targets for expansion of nuclear power generating capacity are very ambitious and include plans for extensions beyond design lifetime. This will require major investments in repair and upgrades and the special attention of the independent safety regulator, GosAtomNadzor (GAN). Particular attention will be required for the units of the first generation, should extensions of such plants be seriously considered.

In May 2001, the Ministry of Economic Development and Trade put forward a plan to restructure the electricity sector in line with earlier proposals by RAO "UES", the Russian electricity monopoly. As of July 2001, a final decision on the proposals was not yet taken. Despite the outstanding issues to be resolved, the government's plan to restructure its electricity sector is similar in approach to many OECD countries, particularly in terms of unbundling activities. Restructuring of the sector over the 2001-2004 period should facilitate trade and exchange among regions and should increase competition. A key element to the success of the plan and to the viability of the restructured companies is the effective implementation of planned increases in electricity tariffs. These tariffs will need to cover all costs and payments should be enforced.

SAUDI ARABIA

As Saudi Arabia's energy policy shifts towards increased foreign participation, the restructuring of the electricity sector is rapidly gaining pace. The ongoing consolidation of the main regional power suppliers into one entity, the Saudi

Electricity Company (SEC), marks a significant step in the liberalisation of the sector. For the first time, issues of cost-cutting and rationalisation of electricity use are being stressed, as is the understanding that government subsidies are to be reduced substantially. Because of low tariffs and irregular collection of bills, the government has suffered financial losses estimated to have reached 48% of total SEC revenues, as well as piling up outstanding total debt of $26 billion at the end of 1999.

Opening the electricity sector to private participation has been the catalyst for the launch of the “gas initiative” which seeks to bring international oil and gas companies back into Saudi Arabia for the first time in two decades. It is the cornerstone of the policy of reducing state involvement and creating jobs as well as of plans for substituting gas for oil in power generation and for petrochemical feedstock, while freeing up oil for exports. With plans to invest more than $100 billion, the focus so far has been on gas exploration, development of gas gathering and distributing gas, and the construction of power stations, desalination plants, refineries and petrochemical plants. Three core ventures have been designated in which international oil companies will participate.

The kingdom’s average annual growth in energy demand of 5.5% is relatively modest among its neighbours in the Gulf Co-operation Council, despite strong population growth and rapid industrialisation. Since government subsidies and extensive use of electric power for water desalination have drained state expenditure, international investment is now recognised as necessary in order to meet projected demand. Saudi Arabia’s long-term electrification plan forecasts that peak load demand will increase from the current 23,438 MW to almost 60,000 MW by 2023. New capacity additions are planned to exceed 2,060 MW per year. The Saudi government estimates investment in the electricity sector to reach $116 billion over the next 23 years, with only the generation part opened to international participation.

INDIA

In 2001, for the first time in its co-operation with the government of India, the IEA carried out a sectoral review of India’s electricity policy, focusing on the development of a power market in India.

For several years, revenues from sales have been insufficient to cover the costs of providing electricity, leading to a continuous deterioration of the financial situation of the State Electricity Boards (SEBs), the main power utilities. Ministers of the 29 Indian states gathered in March 2001 to decide on a common set of measures to improve this situation. The ministers called for further subsidy reforms and the implementation of minimum tariff levels. They also put forward the need to find a solution to the large outstanding payments by SEBs to central public generating units.

The financial situation of SEBs has become the focus of electricity policy. This situation hampers the mobilisation of investments, both public and private, in the whole electricity sector, including generation, transmission and distribution. For a decade, the Government of India has acknowledged that widespread reform of the electric supply industry is the only way to satisfy growing demand on an economically sustainable basis. It is also the only way to provide access for rural Indians who do not have access to electricity, more than half the population. The government aims to satisfy those demands by introducing competition in the electricity sector, favouring bulk power trade, opening the sector to private participation and rationalising electric power pricing.

In 2000 and 2001, the state governments pursued the implementation of new regulatory frameworks by setting up State Electricity Regulatory Commissions as mandated by the Electricity Regulatory Act (1998). The central government initiated a debate on systematising the previous measures within a single act, the Electricity Bill. If passed, this bill would pave the way for further competition in the electricity market and facilitate the development of a bulk power market in India. But the present focus of electricity policy is on accelerating reforms in electricity distribution in order to improve the financial situation of the whole chain. This development represents a shift of government priorities, at the expense of the debate on, and possible implementation of, the Electricity Bill in the first part of 2001.

Decades of public-sector administration, with the constant risk of interference from political circles in the management of the sector, have hindered the implementation of reforms. Consumers, mostly households and farms, are accustomed to final electricity prices that are directly and highly subsidised. The vested interests of these consumers make it difficult to reform the sector. Even if a large number of Indian consumers could afford to pay the full cost of the electricity service they use, a substantial proportion of the population still remains below the poverty line, with very limited ability to pay for electricity.

CHINA

Energy-policy developments in China are embodied in its Tenth Five-Year Plan for National Economic and Social Development (2001-2005), which was approved by the National People's Congress on 15 March 2001. The new energy policy as stipulated by the plan is to "ensure energy security, rationalise energy structure, improve energy efficiency, protect the ecological environment, open the energy sector wider to the outside world, and accelerate the development of the western part of the country."

For the first time, Chinese energy policy calls for the building of strategic oil stocks to maintain the country's energy security[13]. Other energy security measures include the development of clean coal technologies, including coal liquefaction, and the development of oil substitutes such as alcohol fuel.

13. The IEA welcomed the decision by the Chinese government to build strategic oil stocks. A joint IEA-China workshop on emergency oil stocks was held in Paris on 23-24 April 2001.

The new policy also calls for an increased use of natural gas. To achieve this objective and to develop the western regions, the Chinese government is building a west-east natural gas pipeline of 4,200 kilometres. The pipeline is expected to transport 12 billion cubic metres of gas per year from Tarim basin to Shanghai and to other provinces along the east coast.

To promote efforts to build an interconnected national power grid, three large west-east power transmission lines will be built in the north, middle and south of the country. The lines will transport electricity from the western region, which has abundant coal and hydro resources, to the energy-consuming eastern provinces.

New and renewable energy sources such as coal-bed methane, wind, solar and geothermal energy are also actively promoted by the new policy.

On the regulatory side, the new energy policy calls for a gradual separation of power generation from transmission so that generators can compete on selling prices. It also calls for the improvement and rationalisation of the country's electricity pricing system.

LATIN AMERICA

In 2001, the IEA published a study on integration and liberalisation of the gas markets in South America. The study found that Latin America has emerged in the last few years as one of the most attractive regions for natural gas investments, in exploration and production, pipelines and others forms of transportation, LNG facilities and gas-fired power generation. There are several factors that converge to encourage natural gas developments in Latin America:

- Abundant natural gas reserves, with large undeveloped fields expected to be brought on stream over the next decade.
- Rapidly growing gas demand for power generation driven by the need for large generating capacity additions and the wish to diversify the hydropower-dominated fuel mix.
- A favourable investment environment, resulting from a decade of democratic and market-oriented reforms.
- The converging interests of gas-rich countries with limited markets and large energy-hungry markets with no gas resources.
- A trend towards regional co-operation and integration, which facilitates cross-border projects.

Proven natural gas reserves in Latin America have increased by 160% in the last 20 years; this is the largest increase rate among all world regions. Aggressive exploration motivated by expected growth in demand has yielded large new gas discoveries. Petroleum companies have geared up the development of existing fields. The majority of the continent's gas resources are located in Venezuela, but the Argentinian and Bolivian gas fields are much better situated to supply the large cities and industrial centres of southern Brazil, Argentina and Chile. Even so, the distances from producer to consumer are enormous and the development of gas resources often involves large investments in infrastructure across several countries.

Gas consumption began accelerating in the 1990s and is expected to grow rapidly in the next two decades. In emerging gas markets, such as Brazil and Chile, the main drivers for growth in natural gas demand are the rapid increase in power generation and the wish to substitute gas for imported oil in the industrial sector. Hydropower seasonality and its environmental drawbacks add to the attractiveness of gas-fired generation.

Following the early example of Argentina, many countries have undergone substantial reforms of their electricity and gas markets, often as part of wider economic reforms. Privatisation of state-controlled utilities and assets, as well as efforts to increase competition, have attracted private companies, both local and international. This, in turn, has contributed to lower costs.

The development of regional trade blocs such as Mercosur and the Andean Pact have not only facilitated cross-border trade through the gradual elimination of cross-border tariffs, but have also fostered stability and growth throughout the region, with consequent growth in energy demand.

While the potential for natural gas markets is very large in South America, the investments needed to bring projects to reality are enormous. Despite much progress, governments and regulators still have to win investor confidence by establishing clear, stable and harmonised fiscal and regulatory frameworks.

Power Shortage in Brazil

A combination of the worst drought in 70 years and insufficient investments in electricity generation and transmission capacity have pushed Brazil into widespread electricity rationing, a measure unknown in the country for 40 years. Launched at the beginning of June 2001, the government's strict rationing programme aims at avoiding rolling blackouts by reducing electricity consumption by 20% on average and will last for a minimum of 6 months. The measure will initially affect only the south-east and central-west regions, which together account for 49% of Brazil's population and 64% of electricity consumption. Some economists predict that the power cuts will harm Brazil's recovering economy, lowering expected GDP growth by 1 to 1.5 percentage points from the previously expected 4% growth in 2001.

Hydropower plants supply more than 90% of Brazil's electricity needs. Reservoirs in the south-east and central-west regions are currently operating at 32-33% of capacity, whereas normally at the start of the dry season they operate at around 50% of capacity to avoid the risk of blackouts. The southern and northern regions are operating closer to normal capacity, but the transmission system is inadequate for significant power from these regions to supply the affected south-east and central-west. The situation precludes significant imports from neighbouring Argentina and Paraguay.

While the power shortage has been exacerbated by an exceptionally dry summer in the southern hemisphere, electricity demand growth has outstripped generating capacity additions for years. Over the past 15 years, electricity consumption grew, on average, by 5% per year, while new generating capacity grew by 3.3%, gradually eroding generating capacity reserve margins. In the last few years, the system operated too close to full capacity, and blackouts and brownouts were frequent. To sustain annual electricity demand growth of 5% to 6% in Brazil, some 3.5 to 4 GW of new capacity per year is needed. Average annual new capacity over the past 5 to 6 years was some 1.5-2 GW.

The roots of the current crisis extend back to the 1980s when a system of cross-subsidies constituted a strong disincentive to efficiency improvements, and budget problems delayed investments. Despite the introduction of new legislation in 1995, aimed at allowing and attracting private capital in the electricity sector, new generation and transmission investment have not materialised in the quantity necessary. While private companies now control 80% of the country's distribution system, few private investors have been willing to take the risk of building new capacity, because of the uncertainty created by incomplete implementation of the reform and of the 1999 financial crisis which has raised the country's currency risk. The situation is far from being resolved, as only a few of the 50 or so gas-fired power stations that the government is promoting under the "Thermoelectric Priority Programme" are likely to start by the middle of 2002. Meanwhile, state-owned Petrobras is been called upon to fill the gap, with some 2.5 GW of new gas-fired plants expected to be ready by the end of 2001.

2

PART

THE COUNTRY REPORTS

IN-DEPTH REVIEWS: SUMMARIES

Part 2 contains summaries of the findings and the full list of recommendations of the 2001 in-depth reviews. The full reviews have been published separately.

AUSTRALIA

Australia is a major energy producer and exporter. At current depletion rates, the country has 820 years of brown coal, 290 years of hard coal, 270 years of uranium, 36 years of natural gas and 13 years of oil. About half of Australia's energy production is exported. Australia is the world's largest coal exporter and coal is Australia's largest export industry, accounting for 1% of GDP and 10% of total exports. Australia ranks third in liquefied natural gas (LNG) exports to Asia.

Over the last decade, a major programme of market reform in the energy industries and beyond culminated in the onset of the National Electricity Market (NEM) on 13 December 1998, and the entry into force of the Commonwealth Gas Pipelines Access Act and related state legislation in 1997/98.

Competition in the power industry has existed for a number of years; competitive trading began in 1994 in Victoria and in 1996 in New South Wales. In May 1997 the NEM extended competition to the interconnected states in the south-east, i.e. South Australia, Victoria, New South Wales, the Australian Capital Territory and Queensland. Each of the five NEM states has a separate transmission company. Full privatisation has occurred only in Victoria. In South Australia, the state-owned generation, transmission and distribution companies are managed by private companies under long-term leases; in the other NEM states they remain in government ownership.

Liberalisation of the Australian electricity supply industry has resulted in large increases in labour productivity; between 1990 and 1999, the number of employees was nearly halved despite growing electricity output. Capital productivity also increased, with a 10% increase of plant availability. Average real electricity prices declined by some 14% between 1991 and 1998. Over the last three years, large demand growth and limited new investment eliminated excess capacity and caused prices to rise again. Prices are now 10% below 1991 values. Victoria experienced reliability problems in 2000, when an industrial dispute, generator outages and an extremely high summer demand peak coincided, with the situation exacerbated by Victorian government intervention.

The NEM is not yet strongly integrated; the amount of electricity traded is comparatively low and prices can differ across NEM regions, particularly when transmission constraints emerge. During periods of peak demand, the network can become congested and the NEM separates into its regions, potentially exacerbating reliability problems and market power of regional utilities. Solutions comprise more transmission interconnection, new generation and demand-side measures. In the IEA's view transmission augmentation is essential for better integration. Several private, unregulated ("entrepreneurial") interconnectors are under construction, but better signals for investment are needed.

The main challenge in the Australian power market is to complete the highly successful electricity reforms by reviewing transmission pricing with a view to strengthening interconnection, and by extending retail access to all consumers, using load profiling if necessary. A transmission price review was initiated in 2000. Full retail competition was initially foreseen by 2001 but will now be completed in 2003.

Liberalisation and integration of the Australian gas industry are key issues not only in their own right. They also improve the prospects for commercialisation of Australia's vast but remote gas resources and for a relatively environmentally benign increase in the role of gas in its energy market. Reform of the downstream natural gas industry is more recent than electricity reform. All states except Tasmania and the Northern Territory have submitted grid access regimes to the National Competition Council for approval, but by April 2001, only the regimes of South Australia, Western Australia and the Australian Capital Territory had been approved; the others are pending. Full retail competition is expected by 2002.

Among those customers already eligible, a sizeable number have switched suppliers, but it is too early to discern any clear effect on prices. To date, Western Australia is the only state with significant upstream reform. The National Competition Council estimated that this led to price reductions of 25-50%.

There is significant progress in network integration. In the last ten years, the transmission pipeline system doubled in length. Although there is still little interconnection, two new pipelines have just been completed, and some ten pipeline projects are at various stages of development, including the first-ever pipeline connection with a foreign country, the 2,500 km pipeline between Brisbane and Papua New Guinea. Furthermore, six major LNG projects under discussion could double Australia's exports from its existing LNG terminal to 15 million tonnes by 2020. One of these projects came closer to realisation in 2001, when a supply contract for 4.8 million tonnes of LNG as of 2005 was signed with the United States. Gas market reform and development have proceeded somewhat more slowly than anticipated, but appear sound and should be continued.

Market reform is also continuing in the coal and oil industry. In the coal industry, the main objective is increased productivity and less sector-specific regulation. In the downstream oil industry, where in some locations market power can be an issue, generalised price controls have been abolished in favour of sporadic "hot-spot" investigations.

Under the Kyoto Protocol[1], Australia is committed to limit its greenhouse gas emissions in 2008-2012 to 108% of their 1990 levels. Current forecasts predict that actual emissions could be as high as 123%. An important underlying factor is Australia's relatively energy-intensive economic structure, economic growth and the expectation of 30% population growth between 1990 and 2010.

1. The evolving US position on the Kyoto Protocol and climate change mitigation may change the context for developing energy-environment policy in IEA Member countries. The Australian government stated in May 2001 that its climate change mitigation policy as described in this report would not change in the light of these developments.

The Australian government's response measures comprise the Greenhouse Gas Abatement Programme (a competitive bidding programme that supports measures for greenhouse gas emissions abatement or sink enhancement), the Greenhouse Challenge programme (a voluntary energy efficiency programme aimed at industry), mandatory efficiency standards, energy labelling, and support programmes for energy efficiency.

The most important measure related to renewables is the new Mandatory Renewable Energy Target (MRET). It aims to raise the contribution of renewable electricity generation to 9,500 GWh by 2010. This corresponds to a 2% increase in the share of renewable generation. Overall, national government spending for greenhouse gas abatement in 1999-2004 amounts to nearly A$ 1 billion.

The government made a public commitment in August 2000 to adopt only greenhouse policies that are cost-effective, minimise the burden on businesses and allow Australian industry to remain competitive. With its current range of greenhouse gas abatement programmes and through use of the Kyoto flexibility mechanisms, the Commonwealth government believes it can reduce emissions growth sufficiently to meet the Kyoto target. But it also expects greenhouse benefits from energy market reform over the long term. However, because of the low cost of coal, electricity market reform has so far led to increased use of coal, especially Victorian brown coal, and increased carbon and air pollutant emissions. The reform of the gas market is expected to lower gas prices and lead to greater gas use in the power industry and beyond. It is too early to discern any significant effects in this sense.

RECOMMENDATIONS

The government should:

Energy Market and Energy Policy

- Maintain and build on its successful implementation of competitive energy markets, especially in the grid-based energy industries, while addressing remaining issues, such as reliability of supply.

- Maintain the basic regulatory structure, which appears to be sound, but undertake efforts to streamline regulatory processes and interaction between the individual organisations, especially at the state-Commonwealth interface.

- Provide innovative approaches to reducing greenhouse gas emissions. Seek to design mechanisms for internalisation of externalities in such a way that they do not penalise those industries most exposed to international competition that is not burdened by environmental regulations. Implement these mechanisms swiftly to gain experience.

- Give special attention to crafting solutions to the problem of declining crude oil production, petroleum product security of supply, and effectively functioning and reliable energy retail markets

Energy Efficiency, Environment and Renewables

- Continue to use, and if possible expand, incentives within the regulatory reform process, such as the Mandatory Renewable Energy Target, to reduce adverse environmental consequences.

- Implement the Mandatory Renewable Energy Target rapidly, and review it periodically with a view to tightening it.

- Finalise as soon as possible the data collection on land-use and sinks in order to provide a reliable evaluation of the potential gap between the Kyoto commitment and the measures decided or set in motion under the National Greenhouse Strategy. If necessary, set up an action plan to address the gap, in co-ordination with all stakeholders.

- Define a coherent national energy efficiency strategy with clear and firm objectives, measures, implementation and evaluation. Foster market-oriented approaches to meeting energy and electricity efficiency targets by 2010.

- Rapidly develop programmes to increase automotive fuel efficiency and pursue the introduction of mandatory fuel efficiency standards.

- Participate in international efforts to reduce dramatically the cost of renewable energy equipment through market aggregation and large-scale manufacturing. Support IEA Implementing Agreements to meet this objective.

- Expand opportunities for manufacture of wind turbines, bagasse-fired high-pressure turbines, photovoltaics and biomass gasification units.

- Place greater emphasis on measures to reduce emissions from burning coal (e.g. clean coal technologies, power station efficiency standards).

- Consider whether policies favouring increased use of gas would provide least-cost solutions to meeting greenhouse gas targets.

- Consider measures to reflect the full environmental costs in the price of different fuels so that gas can compete on a fairer basis with coal.

- Continue to provide a favourable environment for renewables in niche markets, such as the "dispatchable wind power" in Tasmania.

Coal

- ☐ Complete the reform of the coal industry. In particular:
  - Continue its efforts to remove over-regulation.
  - Implement the recommendations of the Productivity Commission, especially those relating to work practices and industrial relations, where this has not already happened.

- ☐ Monitor the progress made in the states regarding third party access for coal freight services in the coming months, and if necessary, work with the state governments to ensure that effective, non-discriminatory and transparent access regimes are developed and implemented.

- ☐ Encourage state governments to set prices for port services in a transparent manner. Ensure that rates of return used for port pricing reflect those of a representative basket of Australian industries.

- ☐ Encourage the shift towards *ad valorem* royalties.

Oil

- ☐ Continue to implement the measures under its 1999 Offshore Petroleum Strategy, especially those relating to pre-competitive surveys and data and information dissemination.

- ☐ In parallel, continue to review and adapt its upstream regime, especially the fiscal regime and the licensing process. This should be done with a view to maintaining the international competitiveness of the Australian oil industry and in order to attract new investment, especially in exploration.

- ☐ In the downstream oil sector, implement those recommendations of the last in-depth review that are still valid, notably:
  - Implement all reforms proposed by the Australian Competition and Consumer Commission (ACCC) to eliminate remaining market power in oil product retailing.
  - In particular, re-submit the legislation repealing the Petroleum Retail Marketing Acts and replacing it by the Oilcode at the earliest convenient moment. Prepare this action by further negotiation with the industry, as well as by devising an alternative legislative solution.
  - Take a proactive role to ensure that deregulation of the downstream sector at Commonwealth level is supplemented at the state level.

- ☐ Maintain the current approach to the refining industry, and continue to inform the sector about future policies affecting it in a transparent manner and with ample notice.

Natural Gas

☐ Continue its policies to promote fully competitive gas retail markets, with special emphasis on the upstream business.

☐ Lend continued support to pipeline infrastructure investment, to enhance competition and provide benefits to consumers and traders alike.

☐ Create conditions to supply domestic gas demand from indigenous resources as well as through imports from neighbouring countries.

☐ Pursue its plans to create conditions for significantly increased LNG production to supply the growing demand in the Asian market and elsewhere.

Electricity

☐ Consider measures to promote investment in interconnectors taking into account the potentially large benefits of reinforced interconnections for reliability and competition.

☐ Invite the states to consider the added value that privatisation might bring about and, for as long as the industry remains in public ownership, set measures to promote competitive neutrality with a special emphasis on ensuring that publicly-owned companies operate and compete under the same terms and conditions as the private companies.

☐ Ensure that small end-users share the benefits of reform. To this end, encourage the states to:

- Introduce full retail contestability promptly.
- Review tariffs for distribution and domestic end-users, and establish a clear benchmarking of these tariffs across Australian states.
- Ensure that the right to choose supplier can be effectively exercised by small end-users.

☐ Review policies concerning investment in transmission and generation and market design, including greater demand-side participation, to ensure security of supply.

☐ Monitor reliability and, if needed, consider measures to promote investment in additional capacity.

☐ Identify options to streamline and simplify regulatory processes and to improve co-ordination among regulatory bodies.

☐ Encourage the states and the relevant institutions to finalise plans for the reform of transmission pricing and to implement them.

- Review trading arrangements in the wholesale electricity market, especially the need for a mandatory pool, in the light of international experience.

Technology Research and Development

- Implement the key recommendations of the Chief Scientist's report.
- Expand R&D collaboration with major centres of energy and power research, focusing on priority areas of modern power technology.
- Implement or participate in RD&D programmes on coal production, transportation, utilisation and carbon sequestration. Collaborate with major vendors to bring coal-gasification technology into the global market-place.
- Support public-private partnerships to integrate information technology into electricity and gas networks.
- Place greater emphasis on measures to reduce emissions from burning coal (e.g. clean coal technologies).

BELGIUM

Because of the country's strategic location, cross-border trade of electricity and gas and the energy policies of neighbouring countries affect Belgium's energy policy in such different areas as energy supply security, competition in energy markets and the battle against climate change. Belgium's role as a transit country will become more important in the future.

With the division of responsibilities between the regions and the federal government in Brussels, energy policies involve many different players. Policy-making is inevitably complex. This has been compounded by the need to address sustainable development issues, including the mitigation of global climate change.

In recent years, Belgium's energy supply has been diversified. Its capacity as an energy transit country has been expanded. Competition in both the electricity and gas markets has been introduced. Belgium has moved to meet the emissions reduction target it accepted in the Kyoto Protocol. The federal government has to ensure co-ordination among the many players involved in all the issues. Cellule CONCERE/ENOVER is a formal and important body for discussion between the federal and regional governments on all energy matters. Other advisory and co-ordinating bodies for energy policy are the Federal Council for Sustainable Development (FRDO/CFDD) and the Inter-departmental Commission for Sustainable Development (ICDO/CIDD).

Belgium is trying to open its electricity and gas markets at a faster pace than required by the relevant European Union directives. Market liberalisation is very important for Belgium. It is expected to augment social benefits and provide a competitive advantage for the nation. In light of progress being made in neighbouring countries, Belgium should pursue market liberalisation promptly and effectively. Implementation has been delayed and is currently being defined. Because of the country's administrative and political complexities, there is concern that it may take some time for the necessary details to be worked out.

In the electricity market, the federal government is responsible for generation, transmission and pricing, while the regional governments are in charge of distribution, energy efficiency and promoting the use of combined heat and power production, and of renewables. Some progress has been made. The time-frame for liberalisation is mostly set, the federal regulator has been established and the unbundling of supply transmission and distribution activities has been planned for. The necessary legislation and regulation have not, however, been completed. The electricity Transmission System Operator has not been named, and regional regulators have not been established.

Both the electricity and gas markets are dominated by single companies, and there are no clear prospects for new entrants. Market segmentation is also a major barrier to new entrants. There will be two regulators at the federal level during the transition phase. One will be responsible for regulating the liberalised market, and the other for regulating the captive market that remains. In addition, each of the three regions will have its own regulatory bodies. There will be independent regulators in Flanders and Wallonia, but in Brussels-Capital the energy administration will carry out regulatory activities. The situation may be further complicated if the regions do not co-ordinate the timetable for opening their markets or establishing their regulatory regimes for distribution. Close co-operation or even integration of these regulatory bodies should be sought.

Internally, the energy sector presents several structural problems. There is no plan now to break up incumbent monopolies. As a result, international competition is the only apparent path to real competition in Belgium. But the prospects for such international competition are not clear. Cross-shareholding among companies in the electricity and gas sectors may become an obstacle to competition.

Captive consumers throughout the country pay a single price for gas and electricity. This single price does not necessarily reflect real cost. In fact, the distribution company with the highest cost defines the price for all captive consumers. Regulation does not provide proper incentives for distributors to make their operations more efficient and reduce prices. The government should consider replacing this system with one that encourages each distributor to reduce its prices.

Because of Belgium’s complex market structure and lengthy decision-making process, many participants find it hard to follow recent developments and to foresee future situations. Effective communication among all concerned parties is essential.

Achieving the Kyoto target for emissions reductions is a great challenge. In Belgium, energy-related greenhouse gas emissions continued to grow significantly during the 1990s, and are currently about 15% more than in 1990. The Kyoto commitment to achieve a 7.5% reduction of emissions by 2008-2012 compared to 1990 was made at the federal level. But real reduction will depend on actions by regions. ICDO/CIDD has presented the first Federal Plan for Sustainable Development. The plan provides a general framework for a number of federal schemes, including a National Climate Plan that has yet to be worked out. Some cost-effectiveness analyses have been made for different policies, but no quantitative policy goals have been set for any sector.

One of the major reasons for falling behind schedule has been Belgium's reliance on the implementation of a carbon tax by the European Union but such a tax is not foreseen in the immediate future. The Federal Plan for Sustainable Development contemplates the possibility of introducing national taxation in such a case. Impact studies on a national carbon tax have been done and first steps towards implementation have been announced for 2002.

Many Belgian authorities believe that significant improvements in energy efficiency can be made. The Federal Plan for Sustainable Development calls for reducing energy consumption by 7.5% in 2010 compared to 1990. But energy intensity grew in the 1990s. In 1999, energy consumption was 20 to 30% above its level in 1990. Because all the regions are not committed to the same target, harmonisation and strong policy measures will be needed.

Neither renewable sources of energy nor combined heat and power (CHP) generation, which could limit carbon emissions, can be easily introduced in Belgium, because they are more expensive than electricity supplied through the grid. The barriers to increased use of CHP should be removed. For example, back-up power requirements and buy-back tariffs should be set at a level that does not distort competition between CHP and other generation methods. CHP producers should be able to choose their gas supplier, and to sell their production to consumers freely. Such devices as green certificates should be developed to promote both renewables and CHP. After the barriers have been identified and removed, financial incentives for CHP could be phased out.

The Belgian government sets price ceilings on oil products. These reflect the market price but also avoid sharp price increases caused by speculation. In an emergency situation, ceilings could encourage hasty buying both by Belgians and foreigners. Fraud linked to the quality of oil products has decreased significantly as a result of more quality checks in the markets. Monitoring the markets remains important to identify quality problems and stop fraud.

Belgium has committed itself to phase out nuclear power. The declared nuclear plants shut-down is planned to begin only after 2014, and so it will not create additional difficulties for reaching the national Kyoto target. But it will be a challenge for the years afterwards. The AMPERE Commission, which was established by royal decree to investigate policies for future electricity generation, recommended that the government keep its nuclear options open. It advised maintaining nuclear expertise through participation in national and international research on new nuclear choices. The commission also noted that closing down fully depreciated nuclear power plants will be more costly than extending their lives. The findings of the AMPERE Commission are under peer review that will be completed by the end of 2001.

RECOMMENDATIONS

The government should:

General Energy Policy

- Strengthen the capacity of CONCERE/ENOVER to develop detailed conditions for market liberalisation, and to set quantitative targets and concerted measures to reduce greenhouse gas emissions.

- ☐ Increase co-operation between CONCERE/ENOVER and the new federal institutions established to support sustainable development.

- ☐ Consider the possibility of employing consultants or other outside help to assist the federal and regional governments to efficiently carry out present and future activities.

- ☐ Maintain close co-operation between the federal and regional governments so that they can take concerted action to liberalise markets. Measures taken by the regions should be consistent.

- ☐ Review the need for five independent regulators in the electricity and gas sectors. If multiple regulators are needed, Belgium should ensure strong co-ordination among them.

- ☐ Ensure that CREG (the Commission for Electricity and Gas Regulation) has enough regulatory power and resources to discharge its increasing responsibilities.

- ☐ Ensure that cross-shareholding in the electricity and gas sectors does not distort competition.

- ☐ Ensure that industry is well informed about future market developments through participation in policy discussion with the federal and regional governments.

- ☐ Develop effective tools for timely monitoring of developments in energy markets, including the prompt availability of high-quality energy data.

- ☐ De-couple price-setting for captive markets from prices in neighbouring countries.

- ☐ Phase out subsidies to low-income consumers and instead use social policy instruments to tackle fuel poverty. Energy should not be provided free of charge in order to avoid inefficient energy use.

Energy and the Environment

- ☐ Give priority to environmental aspects of the national energy policy, bearing in mind the large gap between Belgium's Kyoto target and current greenhouse gas emissions.

- ☐ Speed up the development of a national plan for reducing GHG emissions.

- ☐ Consider introducing co-operation agreements between the federal and regional governments for sector-specific projects on the rational use of energy, renewable energy sources, CHP, and on research technology, research and demonstration.

- ☐ Initiate a consultative procedure involving federal and regional authorities and industry to define a set of concerted actions to reach the national Kyoto target.

- ☐ In the National Climate Plan, give precedence to measures – on both the supply and demand sides – according to their potential to help meet the Kyoto target in a cost-effective manner.

- ☐ Ensure that future policy measures, including green certificates, standards for energy efficiency improvement, subsidies, tax abatement and energy taxes are effective in meeting their policy objectives. The green certificate system should be introduced in the different regions at the same time as a nationwide trading system. Tools should be developed to monitor the performance of these policies.

Energy Efficiency

- ☐ Promote better co-ordination between the regions and with the federal government in all areas of energy efficiency.

- ☐ Establish an effective monitoring system, in collaboration with the regional governments, to achieve national energy policy objectives, in particular energy efficiency targets.

- ☐ Review the policy of promoting energy efficiency through subsidies or tax abatements.

- ☐ Promote effective measures for reaching energy efficiency targets in all end-use sectors, including industry, the public and private sectors, and transport.

- ☐ Reduce the number of building code violations.

- ☐ Define more clearly the role energy industries can play in the implementation of energy efficiency policies. Ensure that industry carries out its duties effectively.

- ☐ Eliminate obstacles to increased use of third-party financing for improving energy efficiency.

- ☐ Ensure that those who have the best knowledge in particular areas are chosen to improve energy efficiency in their respective areas.

Electricity

- ☐ Set a clear time-frame for electricity market liberalisation.

- ☐ Consider further liberalisation, to include all customers and to ensure that the market is fully opened in all regions.

- Actively pursue competition, encourage new entrants by increasing cross-border competition, limit the dominance of existing players and possibly establish an electricity trading pool.

- Set up as soon as possible the necessary regulatory institutions, including court and arbitration systems.

- Nominate the national grid operator as soon as possible; ensure its independence by effective unbundling.

- Ensure that the planned unbundling is effectively carried out in generation, transmission and distribution.

- Ensure that distribution companies do not misuse their monopoly position by cross-subsidising.

- Ensure transparency and efficiency in electricity price-setting. Assess the possible benefits of price differentiation for distribution companies in different geographical areas while they are still part of the captive market. Also ensure that the captive market, especially residential consumers, benefits from increased competition and the expected reduction of prices.

Co-generation

- Phase out financial support to CHP. Establish instead a more sustainable back-up capacity pricing scheme and ensure that buy-back tariffs for electricity are set at a level that does not distort the competition between CHP and other generation methods.

Nuclear

- Act to preserve the nuclear option until reliable quantitative analysis can be conducted comparing the various technological options to replace nuclear energy -- including their environmental and economic aspects. The quantitative analysis should be conducted promptly, bearing in mind the long-term nature of investment in power generation.

- As liberalisation of the electricity market progresses, review the availability and security of funds currently administered by Electrabel and its subsidiary Synatom to pay for decommissioning nuclear power plants and spent fuel management.

Natural Gas

- Set a clear time-frame for completion of pending legislation.

- Set up as soon as possible the necessary regulatory institutions, including court and arbitration systems.

- ☐ Take steps to develop cross-border competition in gas supply. Facilitate the arrival of newcomers by ensuring that licensing procedures and technical regulations are not barriers to entry.

- ☐ Ensure that the commercial conditions governing access to the grid and the licensing systems are transparent and non-discriminatory.

- ☐ Ensure that the planned unbundling is effectively carried out in transit, transmission and distribution.

- ☐ Make sure that the distribution companies do not misuse their monopoly position by cross-subsidising other activities.

- ☐ Ensure transparency and efficiency in gas price-setting. Assess the possible benefits of price differentiation for distribution companies in different geographical areas while they are still part of the captive market. Also ensure that the captive market, especially residential consumers, benefits from increased competition and the expected reduction of prices.

Oil

- ☐ Continue regular checking of oil quality to avoid fraud and develop methods to reduce fiscal fraud.

- ☐ Consider eliminating the remaining price ceiling mechanism to achieve full liberalisation of oil prices.

Renewables

- ☐ Study carefully the costs of renewables. Develop policies for promoting renewables that are cost-effective, market-oriented and consistent (as much as possible) with policies in neighbouring countries.

- ☐ Ensure that the environmental costs of energy use are adequately reflected in final costs, with a view to promoting environmentally and economically sustainable energy options, such as renewables.

- ☐ Study the possibility of using biomass as a supplementary fuel in CHP.

Research and Development

- ☐ Clarify the objectives of R&D so that they are consistent with federal and regional energy policies, and ensure that R&D programmes are adequately planned and implemented to meet these objectives.

- ☐ Develop tools to assess the performance of R&D activities in this regard.

THE CZECH REPUBLIC

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.

NEW ZEALAND

New Zealand faces challenges in several major areas of energy policy. Energy policy has been innovative and strongly market oriented: New Zealand has shown leadership.

To date, energy policy has been developed as part of a wider economic development strategy, with a particular focus on regulatory reform. These reforms have possibly contributed to the recent marked improvement in New Zealand's economic performance, which appears likely to be sustained at a steady rate of economic growth of about 3% per year. Energy policy is now placing more emphasis on energy efficiency and environmental objectives that are primarily the responsibility of the Ministry for the Environment and the Energy Efficiency and Conservation Authority. It will be important to ensure that energy policy continues to achieve economic efficiency objectives as well as environmental objectives, and that the agencies involved continue to work towards common goals. Energy security objectives might be given more attention, in light of both the importance of gas depletion in the energy outlook and the experience of the Auckland power failure in 1998.

Energy-environment policies have made rapid progress. A timetable for ratification of the Kyoto Protocol has been set and there is now an urgent need to agree on a cost-effective package of policies and measures; but crucial decisions may not be possible before the ratification deadline because of the need for international agreement on emissions trading and credits for sinks.

By undertaking to ratify the Kyoto Protocol by mid-2002 New Zealand has taken a significant step ahead of many other IEA countries. New Zealand is the only OECD country to make such a commitment outside the European Union, where individual countries have a degree of protection from adverse impacts as all members must ratify together. New Zealand has a commitment to achieve 1990 level emissions by 2008-2012. Total greenhouse gas emissions are currently estimated to rise to 9% above 1990 levels by 2008-2012 unless new policies and measures are introduced. In 1999, carbon dioxide emissions, primarily from the energy and transport sectors, were 19% higher than in 1990.

Growth in carbon dioxide emissions is primarily from transport and thermal electricity generation. Emissions of methane from agriculture are also important and must be taken into account in developing a cost-effective package of response measures based on emissions from all sectors and all gases.

In electricity generation, the share of hydro and gas are currently projected to decline, and the share of coal could rise, even if new gas discoveries are made and additional gas is made available for power generation by closing the existing petrochemical plants. The outcome of gas exploration and development will be a crucial influence on the outlook for the energy sector.

The immediate focus of energy-environment policy is on information, advisory and some regulatory energy efficiency measures. These additional measures, agreed over the last year, are almost certainly insufficient to have a major impact, particularly on transport. Further measures are expected to come from the implementation of the National Energy Efficiency and Conservation Strategy and from targeted measures to address carbon dioxide emissions from transport. Further options under consideration include a carbon charge, binding negotiated agreements with industry, and domestic and international trading in emissions permits. International emissions trading and credits for carbon sinks are both crucial to New Zealand's future approach to emissions reductions.

Ratification will be subject to the establishment of a credible set of policies and measures, and full implementation is not expected before the Kyoto Protocol comes into force. Before ratifying the Kyoto Protocol, New Zealand should ensure that it has fully analysed the impacts and quantified the costs and benefits of its actions. Work is under way to define the credits attributable to sinks and the scope for emissions trading, where more information is needed.

Energy sector emissions are important, and should be addressed, but attention should also be given to emissions from transport and agriculture. The transport sector is responsible for 34% of total carbon dioxide emissions and is the main source of growth in carbon dioxide emissions. Methane and nitrous oxide emissions from agriculture are currently the largest source of greenhouse gas emissions in New Zealand.

Electricity generation offers little scope for action because of the already high proportion of generation from hydro and geothermal sources. The share of gas-fired power generation is growing and the share of coal-fired power may also grow if significant new gas reserves are not found. Fundamental change would be required in the transport sector, and possibly in electricity generation, if the Kyoto target is to be achieved by domestic measures alone. Emissions trading and credits for sinks will be crucial, and may possibly be sufficient, to achieve New Zealand's target. Nonetheless, the government is not expected to rely exclusively on credits from New Zealand's substantial carbon sinks, and domestic policies and measures are also being applied and further developed. Clearly there is a continuing need to quantify the contribution of each instrument and its cost-effectiveness in deciding the mix of policies and measures to use.

Energy efficiency is a priority for policy development as an early response to the Kyoto commitment.

Energy consumption per capita and per unit of GDP is low because of New Zealand's mild climate, the relatively low level of GDP per capita, the low share of manufacturing in GDP, and relatively short travel distances. Government "business-as-usual" scenarios to 2020 suggest that the growth rate of energy consumption will average 1.1% assuming GDP growth is 3% per year. These forecasts assume significant changes from the historical trend over the coming 20 years.

Stronger measures need to be put in place to improve efficiency if they are to make a substantial contribution to reducing greenhouse gas emissions. A recent IEA study of energy efficiency in New Zealand[1] shows that there is a need to improve the information base to assist in designing cost-effective measures and to monitor progress. The IEA's report suggests:

- There is potential for further improvements in domestic space heating, water heating and electrical appliances. Use of space heating is at a low level by international standards. Particular attention should be directed to avoiding a close correlation between growth in GDP and space heating.

- Per capita energy use for travel is high because of the large number of cars, but is offset by relatively short driving distances and fuel economy. The transport sector is by far the most important area to address because of its contribution to carbon dioxide emissions compared with the energy sector.

- New Zealand's manufacturing structure has become more energy intensive and efficiency of energy use is low.

- Performance in the commercial and services sector is already good, probably because of the mild climate.

The Energy Efficiency and Conservation Act 2000, the establishment of the Energy Efficiency and Conservation Authority (EECA) as a Crown entity, and the requirement to produce a National Energy Efficiency and Conservation Strategy by October 2001 are important developments since the last review. The Minister for Energy is responsible for the strategy which is being developed by EECA and the Ministry for the Environment with wide public and stakeholder input. There will be a process of formal consultation on a draft strategy to be notified by April 2001. The IEA's report suggests some points that might be taken into account in developing the strategy.

Electricity liberalisation policy has been successful in reducing wholesale prices and in improving efficiency in the sector. Further reforms are designed to strengthen industry self-governance and to bring the benefits of market reform to the retail market. Regulation remains an issue. Care will be required to avoid distortions that may arise from simultaneously seeking to achieve economic, environmental and social goals in the sector.

The electricity supply industry in New Zealand is based on large-scale hydro. Also important are gas, geothermal, and coal.

New Zealand has demonstrated that electricity market liberalisation can be successful in a small country. Since the last review, transmission and distribution have been successfully separated from generation and retailing. The previously dominant generator, Electricity Corporation of New Zealand, has been split into

1. "Energy Use and Efficiency in New Zealand in an International Perspective: Comparison of Trends through 1995", International Energy Agency and the Lawrence Berkeley National Laboratory (1999, unpublished).

four new state-owned enterprises, one of which (Contact Energy) was subsequently sold. Government shareholdings in generation and retailing remain high, and the government owns Transpower, the transmission network owner and system operator.

Further reforms announced in October 2000 are expected to lead to more robust industry self-governance under legislation expected in 2001. The reforms address the failure of previous reforms to reduce retail prices for domestic consumers, and weaknesses in information disclosure as a tool for industry regulation. The reforms have been developed in a manner typical of New Zealand: the government has established broad guidelines for the industry to develop and implement. The guidelines continue the light-handed regulatory regime already established, but they also propose some firm goals that may carry cost. These include offering consumers a tariff with fixed charges limited to 10% of the typical consumer bill, encouraging renewables, and keeping changes in rural tariffs in line with urban tariffs.

The government proposes to regulate the monopoly parts of the sector (transmission and distribution) by requiring the Commerce Commission to target under-performing companies and to impose price controls in these cases. Other IEA countries place these activities under the price control of an industry-specific regulator. Critical to acceptance and effectiveness of the new regime will be the implementation of independent monitoring and enforcement.

Disposal of the government interest in the electricity sector could be beneficial for the further development of competition.

Gas discoveries are particularly needed to replace depleting supplies from the Maui field. Convergence of the gas and electricity markets may call for market reforms in the gas sector consistent with those in the electricity sector. At present, gas prices are limited by competition with electricity. The small size of the gas sector is not thought to justify possibly costly regulation.

The gas market in New Zealand is small relative to the electricity market, but gas is growing in importance for power generation. Convergence of the electricity and gas markets may give rise to some difficulties, such as reduced inter-fuel competition and cross-subsidisation. This could particularly be the case where single companies have interests in both sectors. Consistency of the gas and electricity regimes will be increasingly important as the markets become more closely integrated.

Although the Maui gas field is expected to decline significantly from around 2005, some encouraging discoveries have been made, although these are not as large as Maui. There is a high rate of exploration. Exploration companies are confident that gas supply will be maintained at levels sufficient to meet present demand and future growth.

Industry sources have suggested that procedures for issuing petroleum leases could be improved, although they also commend the flexibility of the current system. It would be desirable to review procedures in the context of the wider review of the Minerals Programme for Petroleum required by 2005. Industry proposals for encouraging exploration in remote and hostile offshore areas might also be considered.

Coal may grow in importance for power generation. It is a competitive export industry; government participation in the industry is no longer justified.

New Zealand is a small coal producer and exports 41% of its production. Should new gas supplies not come on stream to replace Maui production, coal could be the least-cost alternative for power generation depending on the competitiveness of new renewables.

The government-owned Solid Energy of New Zealand Ltd (formerly Coal Corporation of New Zealand) is the main producer. Earlier attempts to sell the government's interest in the industry were postponed pending improvements in market conditions. Unlike the electricity sector, there would appear to be no public interest considerations involved in the sale of this asset.

Renewables already play a major role in meeting energy demand. Hydro and geothermal are the basis of electricity production. Further encouragement of renewables should be compatible with energy market reforms.

Renewable energy already accounts for about one-third of total primary energy supply, primarily from hydro and geothermal electricity production, but also from wood. Some proposals were announced in the government's recent Power Package to complement low-key renewable energy industry facilitation and information provision to consumers. Renewables are nevertheless expected to play a greater part in helping New Zealand reduce greenhouse gas emissions. The National Energy Efficiency and Conservation Strategy is expected to propose further measures to encourage greater uptake of renewable energy.

Priority should be given to developing a more commercial focus in the industry, and to developing means for closer integration into electricity markets. A forthcoming "green" pricing initiative is expected to test consumer interest in small-scale renewable energy at a small premium on current prices.

Energy research and development efforts could be enhanced by a more focused organisation of government research and development generally.

The government makes a substantial contribution to research and development generally, but energy-related activities are spread across a number of programmes and undertaken in many institutions. The present structure of research and development may impede its full potential contribution to achieving the government's objectives for the energy sector. There may be a need to increase funding for energy research and development, possibly by transferring funds from areas that now have a lower priority in the present government's objectives.

The time-frame for meeting the Kyoto target is relatively short. Consideration might be given to setting energy research and development priorities for the pre- and post-commitment periods. For the pre-commitment period, in particular, efforts should be made to encourage the take-up of the results of energy research and development.

RECOMMENDATIONS

The government should:

General Energy Policy

- ☐ Ensure effective mechanisms are in place to closely co-ordinate the work of the Ministry of Economic Development, the Ministry for the Environment, and the Energy Efficiency and Conservation Authority, to balance economic, environmental and social goals. Achieving this balance will be challenging because of the determined thrust the government has made into several areas simultaneously: regulatory reform, energy efficiency and ratification of the Kyoto Protocol. Measures might include:
  - Using an energy scenario agreed by all areas of government involved in energy policy and programme design as a reference point in presenting policy options to the government.
  - Preparing an annual energy report to encourage departments to work towards a proper balance of economic and environmental policies.

- ☐ Update outlook assumptions in light of recent encouraging gas discoveries and establish a new baseline scenario based on more positive assumptions on gas production.

- ☐ Review policies on security of energy supply generally, noting in particular the impact of depleting oil and gas reserves, and the management of supply security in the energy network industries.

Environment

- ☐ Agree on a cost-effective package of policies and measures based on the full range of technically feasible options to achieve New Zealand's target for greenhouse gas emissions; the package should be agreed with stakeholders and announced before ratifying the Kyoto Protocol.

- ☐ Quantify the contribution to be made by each group of policies and measures (such as for energy efficiency, domestic emissions trading, a carbon charge, negotiated greenhouse agreements, international emissions trading including credits for sinks, and investment in renewable energy).

- ☐ Ensure that methane emissions from agriculture and carbon dioxide emissions from transport are addressed, as well as emissions from the energy sector.

- ☐ Evaluate and announce the impact on the energy sector of the proposed package of climate policies and measures, in particular the impact on international competitiveness; clearly identify policies and measures which require international agreement, such as emissions trading and credits for sinks.

☐ Contribute to the international development of a policy on allocating and trading credits for sinks; develop a domestic policy on these issues that addresses the treatment of windfall gains.

End-use Efficiency

☐ Support data collection on energy end-use by funding and regulation.

☐ As far as possible, quantify the greenhouse gas emission benefits and associated costs of the components of the National Energy Efficiency and Conservation Strategy.

☐ Take particular note of the requirements of the Energy Efficiency and Conservation Act 2000 to establish only targets that are measurable, reasonable and practicable; take into consideration the findings of the IEA's study on energy efficiency in New Zealand; ensure adequate means to enforce compliance with the strategy.

☐ Ensure that the National Energy Efficiency and Conservation Strategy is based on cost-effectiveness and is integrated into existing and proposed policies on competitive energy markets.

☐ Give priority in the National Energy Efficiency and Conservation Strategy to improving efficiency of energy use in transport, domestic space heating, water heating and electrical appliances. Energy use in manufacturing should be addressed only after data deficiencies are corrected and the underlying causes of relatively low energy efficiency are better understood.

☐ Determine the nominal (test) fuel economy of cars purchased new, and of cars purchased used, to see how the two groups compare; develop policies to encourage purchase of more efficient cars from either group.

Electricity

☐ Specify in legislation that the overarching goal of electricity market reform is the creation of the conditions for full and free competition wherever possible.

☐ Ensure clarity and co-ordination in the respective roles of the Electricity Governance Board and the Commerce Commission with respect to:

- Industry self-governance, including regular consultation between the Minister of Energy and the chairman and members of the Electricity Governance Board to monitor the performance of self-governance.
- Promoting competition in the market.
- Regulating natural monopoly areas (transmission and distribution).
- Achieving energy efficiency and environmental goals at least-cost.

- Ensuring accountability and transparency through regular public reporting, including by the Commerce Commission on its interpretation of its statutory duties and intended activities in the electricity sector.

☐ Ensure that the Commerce Commission has the authority and capacity for evaluating performance and regulating prices of transmission and distribution to support the intention of intervention should self-regulation fail.

- Consider the need for establishing an energy group within the Commerce Commission in view of the specialised and ongoing task the Commission is likely to face.

☐ Monitor performance of the transmission and distribution companies; establish incentives for continuing improvement in transmission and distribution prices and services to electricity consumers.

☐ Ensure that consumer representatives participate in the development of final proposals for self-governance of the electricity sector; ensure that domestic, commercial and industrial consumer interests are fully represented on the Electricity Governance Board.

☐ Define social goals contained in the Power Package and consider options for achieving these goals with a view to removing any distorting impact on the electricity market of the policy on rural tariffs and arbitrary limits on fixed charges; promote the evolution of cost-reflective pricing for all consumers.

☐ Consider privatising remaining government interests in the electricity sector to improve credibility and transparency in the market, as well as efficient operation.

☐ Monitor measures to allow switching between suppliers in the retail market; ensure genuine customer choice.

Renewables

☐ Consider how small-scale renewable sources of energy can efficiently participate in the competitive electricity market.

☐ Encourage small-scale renewable energy generators to address problems of reliability and to improve overall operational efficiency through innovations in industry organisation and management.

Oil and Gas

☐ Review policy and invite industry submission on the regime necessary to encourage exploration in the Great South Basin and in other remote areas, and on further improving administration of petroleum exploration generally.

- Investigate the benefits of regulatory reform in the gas market and publish a paper on possible options for reform; in particular, review the implications of the close relationship between the gas and electricity sectors.

Coal

- Review the rationale for government shareholding in the coal industry; reconsider the postponement of the privatisation of the Coal Corporation of New Zealand Ltd (Solid Energy) in view of recent improvements in international coal prices, but also the generally flat outlook for growth in coal prices expected in the long term.

Research and Development

- Review the structure of government research and development in light of government priorities for the energy sector; enhance co-ordination of existing energy research and development in supporting the government's National Energy Efficiency and Conservation Strategy and climate change policy programme.

- Continue to assess the government's overall research and development priorities in light of policy goals with a view to reallocating available funds to increase funding for energy research and development.

- Further develop effective mechanisms for monitoring and assessing the performance of government-funded energy research and development to improve energy efficiency and to meet the Kyoto target.

- Further improve the conditions for commercial application of the results of energy research and development activities; consider, at the outset, alliances of industry/government/universities to develop the knowledge base and technologies of strategic importance.

SPAIN

The Spanish energy sector changed fundamentally during the 1990s. Energy demand grew rapidly, together with the economy. Because Spain has limited energy resources, which cover only 25% of total primary energy supply, security of supply is an important aspect of Spanish energy policy. The government has made the diversification of fuels and their supply sources a priority. The electricity, gas and oil markets have been liberalised. The main challenges facing Spain in the coming decade will be to ensure that the energy supply can satisfy growing demand, to curb CO_2 emissions to meet the country's Kyoto target and to introduce full liberalisation and true competition in the electricity, gas and oil markets.

Sharply growing energy consumption complicates the government's efforts to address environmental issues. Spain's greenhouse gas emission objective under the European Union "burden-sharing" agreement is set at 15% above 1990. But Spain's CO_2 emissions were 21% higher in 1998 than in 1990.

At present, there is neither a national plan nor a package of effective policies and tools for achieving the Kyoto target. Prompt action is needed to develop an effective national policy. In the industrial sector, for example, the feasibility of emissions trading should be studied. Industry has shown interest in greenhouse gas emissions trading and other Kyoto "flexible mechanisms". But the government has not taken a position on them. Since some forms of energy are cheaper in Spain than the EU average, a new tax on CO_2 emissions in the transport and residential/commercial sectors should not be excluded. The current government policy is, however, against introducing a carbon tax or modifying energy taxes to reflect environmental costs.

The government sees real potential in energy efficiency improvements, a belief that underpinned the Energy Saving and Efficiency Plan for 1991-2000. While some progress was made in energy efficiency, the country's energy intensity increased slightly over the same period, and the government has not yet prepared a follow-up plan. Additional strong measures are needed to slow the growth of energy consumption.

Noteworthy progress has been achieved in the liberalisation of electricity, gas and oil markets. It is encouraging that the government has decided to liberalise fully the electricity and gas markets by 2003, at a faster pace than required by the European directives. In the electricity sector, the transmission system and market operations have been separated out from the vertically-integrated utilities following the establishment of a Market Operator and Transmission System Operator (TSO). A TSO has been established also in the gas sector but arrangements for separating it from the vertically-integrated incumbent have not yet been completed. In the oil sector, the oil transport and storage company CLH and other small operators grant third party access to their facilities. But the separation of CLH from other oil market interests has not been completed. With powerful existing companies present in all the energy markets, there is still work to be done to ensure that effective competition will happen. Many details still need to be set if the electricity and gas markets are to be fully liberalised by 2003. The National Energy Commission, an advisory body, deals with some of the regulatory issues in the electricity, gas and oil sectors, but the main regulator remains the Ministry of Economy.

Tariff-setting for the captive market is a problem, as is the effort to ensure that the tariffs for the different consumer groups fully reflect cost. The government appears, in fact, to be using the tariff-setting process to transfer to captive consumers the efficiency gains from market liberalisation. On the other hand, captive consumers clearly bear a greater share of energy policy costs than eligible consumers. Some elements in tariff-setting, which are at the discretion of the government, are stranded cost payments, the cost of transition to competition or CTCs, and incentives under the "special system" introduced to promote market penetration of co-generation and renewables.

The introduction of natural gas in Spain has been successfully managed, and the government is making continuous efforts to diversify the supply sources of natural gas, including increasing connections to EU grids. In both electricity and gas, however, interconnection to neighbouring countries remains complicated. In order to improve security of supply, gas imports from a single country and by a single agent are limited to 60% of the total. This policy objective may be valid, but the measure needs to be scrutinised to ensure that it has no adverse impact on competition.

More work remains to be done on the liberalisation of the gas market. Current tariffs do not fully reflect costs, and the cost of connection to the grid is too high. Even though new companies have emerged, the incumbent still dominates the market and retains advantages, including secured access to relatively cheap gas from Algeria through long-term contracts. A quarter of the supplies from Algeria, which pass through the Maghreb-Europe pipeline must, by law, be sold into the liberalised part of the market.

Natural gas is subject to lower taxes than are oil products and, without explicit justification by reference to defined externalities, this distorts the market. Lower taxes on gas were earlier seen as incentives to invest in new infrastructure. Now the gas infrastructure covers wide areas of the country, reaching four million consumers, and there is less need to provide such incentives. Another tax distortion is the differential between gasoline and diesel taxes. This discrepancy is hard to justify since there are no environmental or other externalities that favour the use of automotive diesel over gasoline.

There has been steady progress in restructuring domestic coal mines. While subsidies are still paid to domestic coal producers, direct state aid for coal production is decreasing by 4% every year. In 2000, the subsidies approved by the EU totalled Pta 186 billion. The government should be encouraged to continue restructuring the industry to reduce subsidies further.

The government has strongly promoted combined heat and power generation (CHP) and renewable energy sources. In its plan to promote renewable energy, it has set the ambitious target of meeting 12% of TPES by renewables by 2010 as compared to about 6% today. But concrete policy measures have yet to be defined. Renewables can contribute considerably to the diversification of energy. They may also be important in reaching environmental objectives. It is important, however, to find cost-effective means for promoting the use of renewables. There is an ongoing debate in Spain on the amount of subsidy to be paid for power generation from renewable energy installations. With regard to CHP, subsidies should be phased out, and the installation of efficient CHP units should be encouraged. The subsidies for co-generation are also currently under discussion. A decision has been taken to phase out subsidies for units larger than 10 MW_e by 2007.

Nuclear power is an important energy resource. It covers about 30% of total electricity generation and 13% of the country's TPES, thus making an important contribution to the diversification of energy supply. Spain should be commended for the excellent safety record and efficient operation of its nuclear plants. There is a moratorium on completing five partially-built nuclear units. The 1997 Electric Power Act confirms that the reactors will never be put into operation, but Spain has not ruled out nuclear power as an option for future capacity needs. With rapidly rising energy consumption and CO_2 emissions, and the enormous challenge of meeting the Kyoto target, the nuclear option remains very important. To keep this option viable, appropriate nuclear waste management is essential. Progress on, and timely implementation of, the current Spanish nuclear waste plan is necessary.

Science and technology policies and priorities are defined in the National Plan for Scientific Research, Development and Technological Innovation for the period 2000-2003. It is the task of the new Ministry of Science and Technology to manage, evaluate and follow up on national policy in science and technology, including energy. The strategic objectives for R&D in the energy field are defined by the National Energy Programme (PROFIT-Energia) within the National Plan. The Programme has been prepared with the co-operation of the former Ministry of Energy and Industry (now the Ministry of Economy) and the major actors in the energy R&D sector. For energy research and development to be effective, close communication among governmental organisations and other stakeholders is essential. Currently, no instrument exists to evaluate the performance of energy research projects. There are areas in energy where continuous and long-term R&D is necessary, such as developing new technologies for renewables. In the energy field, international co-operation can bring significant benefits.

RECOMMENDATIONS

The government should:

General Energy Policy

- ☐ Continue to review supply-demand projections, especially in light of the sharp growth of demand and progress in liberalisation.

- Enhance co-ordination of energy-related policies among different ministries and regional authorities in order to improve the coherence of energy policies. Consistency should be sought in the measures taken by the autonomous regions.

- Ensure that the National Energy Commission can collect all necessary information to carry out its regulatory task independently.

- Consider how to increase the number of energy market players to stimulate competition further.

- Ensure that the conditions set for foreign ownership of energy companies do not limit effective competition.

- Review tax policies to prevent possible market distortion and send the right signals to consumers. For example, address oil market distortions by increasing taxes on diesel fuel to reduce the price differential between gasoline and diesel.

Energy and the Environment

- Speed up the development of the national Kyoto implementation plan; the plan should identify priority measures based on their potential contribution towards meeting the target in cost-effective ways.

- Consider using the flexible instruments under the Kyoto Protocol and encourage private initiatives to do so; study the feasibility of using economic instruments, such as introducing a CO_2 tax and restructuring the energy taxes, to reach the Kyoto target and to address external costs, particularly environmental costs.

- Monitor emission reduction policies closely.

- Encourage autonomous regions to formulate their policies for CO_2 emissions reductions in line with national policies.

- Promote the use of alternative transport fuels for energy efficiency and environmental benefits.

Energy Efficiency

- Establish a new, coherent and comprehensive energy efficiency programme to help slow growth in energy demand in all sectors; ensure that the measures are cost-effective and consistent with their objectives, and that the programme sets priorities, on both the supply and demand sides.

- Regularly verify compliance with building codes, in both new and retrofitted buildings.

- Monitor systematically the performance of measures taken.

Electricity, Co-generation and Nuclear Power

- ☐ Encourage efforts to build new interconnections with neighbouring countries and increase the capacity of existing ones.
- ☐ Ensure that alliances between the gas and electricity companies are fully in line with market liberalisation and do not prevent new entries.
- ☐ Ensure efficiency and transparency in electricity tariff-setting for the captive markets; efficiency gains in generation and network operation should be reflected in end-user prices.
- ☐ Make sure that capacity payments and subsidies under the special system function effectively to enhance efficiency.
- ☐ Review subsidies for co-generation with a view to phasing them out fully.
- ☐ Assist in defining technical details for opening the market for small consumers and help them prepare for full market liberalisation in 2003.
- ☐ Assess the impact that retiring nuclear reactors would have on energy security, diversity of energy supply, the economy and the environment.
- ☐ Assess the extension of the operating lives of existing nuclear reactors.
- ☐ Ensure that progress is made in defining options and formulating a plan for the final disposal of high-level radioactive waste; ensure timely implementation of the programme for siting and building a centralised interim storage facility for high-level radioactive waste that is needed by 2010.

Natural Gas

- ☐ Monitor the growth of the gas sector and investigate the possible effects of a major gas supply disruption, using cost-benefit analysis and taking into account the consequences to interruptible consumers and gas-fired power plants; set up an emergency plan.
- ☐ Encourage the construction of new liquefied natural gas terminals and gas network interconnections with neighbouring countries, and augment the capacity of existing interconnections and terminals.
- ☐ Complete promptly the regulatory framework for third party access to gas networks, liquefied natural gas terminals and storage facilities.
- ☐ Ensure that the enforcement of the 60% cap on natural gas imports from a single country does not become an obstacle for new entrants.

- ☐ Assist in defining the technical details for opening the market for small consumers and help them prepare for full market liberalisation in 2003.
- ☐ Ensure transparency and efficiency in gas tariff setting for captive markets during the transition period; efficiency gains should be reflected in end-user prices.

Oil

- ☐ Set a clear time frame for implementing legislation for increasing competition.
- ☐ Consider steps to facilitate new entries in the distribution of liquefied petroleum gas.
- ☐ Continue monitoring compliance with oil product standards to avoid tax fraud and quality problems.

Coal

- ☐ Continue restructuring the coal industry, cut subsidies, eliminate other distortions and progressively decrease the industry's size, while limiting welfare and regional effects by industrial restructuring in the affected regions.

Renewables

- ☐ Elaborate and implement co-ordinated initiatives and measures, including adequate public funding as proposed by the Plan for the Promotion of Renewable Energy in Spain.
- ☐ Co-ordinate efforts of the different actors in the sector, while respecting the role of the autonomous regions and local governments in the implementation of the Plan for the Promotion of Renewable Energy in Spain.
- ☐ Study the benefits of developing a nation-wide green certificate system, as part of a least-cost strategy to achieve the Kyoto objectives.

Energy Research and Development

- ☐ Ensure co-ordination among the Ministry of Science and Technology, the General Department for Energy and Mining Policy, and research organisations.
- ☐ Continue adequate support for the development and demonstration of clean coal technologies, and for research on final management of high-level radioactive waste and on renewable and alternative energy sources.
- ☐ Develop tools to assess and evaluate the performance of R&D activities.
- ☐ Increase participation in IEA Implementing Agreements, particularly in the energy end-use programmes, and continue involvement with the research activities of the European Union.

TURKEY

Turkey has dynamic economic development and rapid population growth. It also has macro-economic, and especially monetary, instability. The net effect of these factors is that Turkey's energy demand has grown rapidly almost every year and is expected to continue growing, but the investment necessary to cover the growing demand has not been forthcoming at the desired pace.

Several waves of liberalisation have been launched since 1983, leading to a gradual opening of the Turkish energy market and improving the situation. Turkey has made early and extensive use of financing models such as build-own-operate (BOO) and build-own-transfer (BOT). As yet, however, no decisive breakthrough has been achieved.

In the last two years, several encouraging steps have been taken towards greater liberalisation. The notion of privatisation has been introduced into the Turkish constitution for the first time. Legislation was adopted in February 2001 to allow competition in the electricity market and adapt Turkey's legislation for European Union membership. A new Gas Market Law was adopted in May 2001 for the same purposes.

Although the details of gas and power market operation are not yet clear, the IEA commends these initiatives and recommends pursuing them. The renewed macro-economic crisis of 2000/2001 should not be allowed to slow down the reform efforts. Reform will contribute to greater stability and prosperity in the long run. It will help avoid a situation in which energy supply imbalances hamper economic growth.

Meeting energy demand is of high importance in Turkey. But exploiting the country's large energy efficiency potential is also vital. Air pollution is a significant problem and, as the government's projections show, carbon emissions could rise sharply if current trends continue. The government's reference scenario projects a fourfold increase in coal use between now and 2020. Although there is reason to be sceptical about these figures, they provide graphic illustration of the environmental effects that Turkey's population growth and its anticipated leap towards full industrialisation could have if demand trends continue unbroken.

Turkey is striving to make good use of its geographic location as a transit country linking the oil- and gas-rich Caspian area to the Mediterranean and to the demand centres of the West. Several pipeline projects are under way. They could have a positive effect on the diversity and security of supply in many consuming countries. They could also help avoid further environmental strain on the maritime routes through the Bosporus. Several of these pipelines, including the Baku-Tbilisi-Ceyhan crude oil pipeline and the "Blue Stream" gas pipeline under the Black Sea, are gradually nearing completion, but some additional attention to committing resources to these lines may be warranted.

Turkey suffered several severe earthquakes in August and November 1999, with severe damage at the Körfez (Izmit) refinery and loss of oil stocks. The IEA commends Turkey for swiftly repairing and rebuilding its oil stocks.

RECOMMENDATIONS

The government should:

Energy Market and Energy Policy

- ☐ Continue the process of liberalisation, restructuring and privatisation in the energy sector. Prevent any delays in the introduction of competition. Create a favourable environment for investment and ensure that the regulation of the gas and electricity markets is co-ordinated.

- ☐ Ensure that energy prices reflect full costs and eliminate subsidies and cross-subsidies, both direct and indirect. Take measures to increase transparency in energy regulation and in price setting.

- ☐ Closely monitor energy supply and demand and revise the forecasts to take account of the progress of liberalisation, energy efficiency improvements, structural changes in industry and other major factors in order to better inform all players' investment decisions.

- ☐ Continue and expand co-operation with neighbouring countries in all major energy policy areas.

Energy and the Environment

- ☐ Increase the resources for the Ministry of the Environment and strengthen collaboration with the Ministry of Health on air quality issues.

- ☐ Strengthen the mandate and the capability for inspection and verification of compliance of the agency or agencies responsible for the application and enforcement of air pollution legislation. Establish additional regional branches to address environmental issues in the provinces.

- ☐ Accelerate retrofitting of existing coal power plants with flue gas desulphurisation and electrostatic precipitation equipment, and make efforts to increase the energy efficiency and the environmental performance of new coal plants through early adoption of advanced clean coal technologies.

- ☐ Continue harmonising standards and regulations for environmental quality with those of the EU and other international bodies.

- ☐ To reflect its respect for the spirit of the United Nations Framework Convention on Climate Change, Turkey should continue striving to limit the growth of greenhouse gas emissions, and, where possible, take additional measures. In particular, the government should develop an implementation strategy that allows it to assume a greenhouse gas emissions target no later than the second commitment period of the Kyoto Protocol.

- ☐ Strengthen collaboration agreements with neighbouring countries to limit energy-related pollution. In particular, seek agreements with countries bordering the Black Sea to reduce marine pollution, increase the inspection and verification of safety and environmental regulations in tankers, consider raising standards and increase resources for port authorities.

Energy Efficiency and Renewables

- ☐ Consider enacting appropriate energy conservation laws and establish or tighten efficiency standards for industrial boilers and electric motors. Increase the resources of energy efficiency organisations.

- ☐ Enhance Turkey's participation in international co-operation programmes on energy efficiency, in particular on efficiency standards and labels for household appliances and motor vehicles.

- ☐ Consider establishing fiscal and economic incentives for conservation measures in all sectors.

- ☐ Expand energy auditing programmes for industry, commercial enterprises and homes, information campaigns and training of energy managers.

- ☐ Promote the formation of energy service companies to invest in such opportunities.

- ☐ Carefully assess the potential as well as the costs of renewable sources. In particular:
  - Consider steps to accelerate construction of economic hydro projects consistent with the protection of the riverine environment. Periodically re-evaluate the economic potential of hydropower.
  - Evaluate the extent to which wind power resources might be economically expanded.
  - Evaluate the market potential for solar-thermal heating and cooling technologies.

- ☐ Establish competitive bidding procedures for the selection of renewables projects that are to benefit from government support.

Coal

- ☐ Continue the restructuring process of the coal mining sector and the privatisation of viable mines. Consider outright privatisation of the mines that have not been transferred through the transfer of operating rights procedure.

- ☐ Clarify the process by which the prices for hard coal and lignite are determined. Eliminate all subsidies on hard coal and eliminate residual subsidies on lignite, both explicit and implicit, as well as any purchasing requirements or preferential treatment. Social issues should be considered independently from energy prices.

- ☐ Promote the adoption of clean technologies for coal use in electricity generation.

Oil

- ☐ Pursue the strategy of more transparent, stable and efficient regulation and greater private participation in the oil sector. In particular:
  - Ensure full transparency of oil product price setting, and refrain from any intervention besides the automatic pricing formula.
  - Enforce the existing provisions for Third Party Access to the oil pipeline system and the gas grid.
  - Complete the privatisation of the oil sector. Complete the privatisation of TUPRAS, the Turkish Petroleum Refining Company. To reduce its dominant role in the refining market, refrain from building new refineries under TUPRAS's ownership before privatisation. Ensure that the Turkish Petroleum Corporation (TPAO) can integrate vertically into the upstream and downstream market and that it can eventually be privatised.

- ☐ Accelerate upgrading of existing refineries to increase the production of oil products that meet international standards including those for sulphur and lead content.

- ☐ Pursue the possibilities of crude oil transit through Turkey. Redirect attention to the commercial feasibility of the projects. In particular, seek to ensure further supplies for shipping. Give high priority to security of supply when establishing new pipelines.

Natural Gas

- ☐ Attach greater priority to the commercial and financial side of international gas supply and pipeline projects.

- ☐ Continue along the path of liberalisation of the natural gas market. Prevent any delays in the introduction of competition. Create a favourable market environment for investment. Take measures to ensure a smooth transition to competition.

- ☐ Unbundle the Turkish Pipeline Corporation (BOTAS), as foreseen. Ensure that BOTAS's transmission and marketing activities are fully separated and that its trading activities can eventually be privatised. Establish clear, transparent, non-discriminatory prices for grid services, and similar conditions for grid access.

- ☐ Ensure that the regulator is effective and fully independent from business interests and from government, that it has clearly defined rights and responsibilities and that it is insulated from political pressure. The regulator should be given the necessary means to carry out its tasks.

- ☐ Strive to make natural gas available to smaller gas consumers via extended distribution grids.

Electricity

- ☐ Take all necessary steps as soon as possible to implement the new competitive power market. In particular:
  - Separate the Turkish Electricity Generation and Transmission Corporation (TEAS) vertically as soon as possible. Unbundle distributors' accounts for distribution and retailing, and separate the State Hydraulic Works' (DSI) accounts for hydropower activities from irrigation activities, to enhance cost transparency.
  - Establish an independent regulator and independent system operators. Prevent any delays in the introduction of competition. Take measures to ensure a smooth transitional period. Separate the competitive market from the captive market during the transition period.
  - Establish transmission tariffs based on a clear, transparent and non-discriminatory price formula. These tariffs must provide effective incentives for the establishment of production and transmission capacity, including interconnections, to meet future demand.
  - Allow the market to determine when, where and what type of power plants are built without government interference. Base the choice of nuclear power on sound and clear economic criteria, including all related externalities. Clearly define nuclear technology choices and waste disposal options before building nuclear power plants. Increase transparency in communication with the public on these issues.
  - Clarify the mechanism by which the generating assets of TEAS, and possibly DSI, will be privatised over time, and establish a clear timetable for doing so. In particular, clarify whether the assets are to be placed under private control through transfer of operating rights or through outright sale.
  - Take measures to ensure that the development of the electricity sector and its transition to competition lead to improvements in security of electricity supply, productive efficiency and environmental performance of power plants.

- ☐ In parallel with implementation of the new Electricity Act, consider expanding access to the competitive market beyond the limits currently set in the act, according to a clear timetable.

- ☐ Expend all possible efforts to facilitate and enhance international co-operation in the area of electricity trade and interconnection. Create a favourable market environment for investment.

Technology and R&D

- ☐ Strengthen R&D activities aimed towards the adaptation of new and advanced technologies to Turkey's specific needs, and concentrate efforts on a more limited number of activities, particularly in the following areas:
  - Clean coal technologies.
  - Flue gas desulphurisation.
  - Fluidised bed combustion.
  - Fossil fuel combustion efficiency.
  - Wind and solar thermal.
  - Energy efficiency and conservation in all sectors.

- ☐ Co-operate more closely with industry on R&D.

- ☐ Increase efforts to demonstrate and deploy new technologies that are relevant to the Turkish market.

- ☐ Gradually increase the funds for research, demonstration and deployment as the economy grows.

- ☐ Exploit more fully the opportunities for bilateral and multilateral international co-operation.

STANDARD REVIEWS

Finland

Hungary

Ireland

Italy

Japan

Switzerland

FINLAND

GENERAL ENERGY POLICY

The Finnish government's energy policy objectives are based on the Energy Strategy elaborated and adopted in 1997. These are:

- Developing the structure of energy production to reduce emissions of carbon compounds.
- Promoting free energy markets.
- Promoting the efficient use of energy and energy conservation.
- Promoting the use of bioenergy and other sources of indigenous energy.
- Maintaining high technological standards in the energy sector.
- Ensuring the diversification of energy supply.
- Ensuring the secure supply of energy.

The most important developments in the Finnish energy sector were the elaboration of the new National Climate Strategy and the application for a new nuclear power plant by the power company Teollisuuden Voima Oy (TVO). These are described in more detail below.

ENERGY AND THE ENVIRONMENT

Under the Kyoto Protocol and the European Union burden-sharing agreement built upon it, Finland is committed to stabilising its greenhouse gas emissions at 1990 levels in the first budget period 2008-2012. This stabilisation target takes into account that Finland has already realised much of its energy efficiency potential. Combined heat and power production (CHP), for example, accounts for as much as 32% of the country's electricity supply.

In 1999, Finland's total greenhouse gas emissions were 76.2 million tonnes of CO_2 equivalent, compared to 76.5 million tonnes in 1990. About 75% of 1999 emissions originated from the combustion of fossil fuels and peat in the energy sector. After 1990, Finland's greenhouse gas emissions fell until 1992, when they bottomed out at 71 million tonnes of CO_2 equivalent, well below the target. The decline was due to a sharp economic recession. As the economy rebounded, emissions rose again to 81 million tonnes of CO_2 equivalent in 1996. Since then, they have slowly declined.

Emissions in 1999 and 2000 were on par with Finland's greenhouse gas target. Since Finland now must only prevent increases, the target for 2008-2012 appears within reach. However, Finnish CO_2 emissions are strongly linked to the country's economic growth, so they are expected to grow once more. The government expects that emissions will grow and clearly exceed the target before 2010. The emissions gap is estimated to amount to about 14 million tonnes of CO_2 equivalent.

To address this expected emissions growth, the government issued a National Climate Strategy in March 2001. This strategy, which sets out objectives for various sectors of the economy, states that the Finnish government will continue to strive to meet its emissions targets through domestic action. Energy efficiency is to contribute savings of 3-4 million tonnes of CO_2 equivalent by 2010. Stronger promotion of renewables is to contribute 4-5 million tonnes, measures relating to the electricity supply industry 6-10 million tonnes, and measures relating to other greenhouse gases, one million tonnes. In the power industry, the savings are to be brought about by fuel switching from coal towards new gas or nuclear plants. Coal accounted for slightly under 14% of electricity generation in Finland in 1999, but its share is expected to increase to 23% by 2010. The Finnish government believes that the displacement of coal may require legislative measures. Additional measures to support energy efficiency and renewables are also envisaged. More detail on these issues is found in the following sections.

ENERGY EFFICIENCY AND RENEWABLES

Under its National Climate Strategy, the government intends to continue to implement existing energy efficiency measures, which are largely based on voluntary agreements with industry and energy auditing in buildings. Most of the voluntary agreements were signed in 1997, but two further important agreements were concluded in 1999. Most agreements run to 2005.

The agreements have been very successful in reducing energy consumption and now cover a significant part of the targeted industries. By 2001, the 1997 agreements covered 80% of industrial energy consumption, 90% of electricity generation, 77% of electricity distribution, 70% of district heating and 54% of energy consumed by municipalities. Agreements signed in 1999 cover 65% of energy used in commercial buildings and 10% of energy used for truck transport. The latest agreement, signed in 2001 with the bus transport sector, currently covers 5% of the sector's energy consumption.

Increased taxation on fossil fuels and electricity use is to give further impetus to energy efficiency and fuel switching. These tax increases would enter into force in 2003 at the earliest. The National Climate Strategy sets out the options for these taxation measures in the framework of two different electricity supply scenarios:

- Electricity supply scenario 1: Substitution of coal by natural gas in electricity generation and in CHP in the area covered by the natural gas network.

- Electricity supply scenario 2: Construction of additional nuclear power capacity.

Although the exact tax rates under both options remain to be determined, the tax would rise by 20% or more. In the framework of the strategy, the government intends to increase public funding for the development and commercialisation of energy-efficient technologies. The current level of spending is approximately Finnish markka (FIM) 380 million for technologies in energy production and end-use[1].

The government issued a new Action Plan for Renewable Energy Sources in November 1999. This replaces the action programme for the promotion of bioenergy (1994) and the wind energy promotion programme (1993). At 22.1% of total primary energy supply (TPES), Finland already has a large share of renewables in its energy sector. Most of this is biomass, especially wood and wood wastes from the country's large forestry industry.

The Action Plan sets targets and objectives for renewables by 2010 and by 2025. The 2010 target is a 50% increase in the volume of energy generated from renewables above 1995 levels. This increase would be 3 Mtoe, which is about 1 Mtoe more than previously targeted. The 2025 target is to double the use of renewable energy sources. Biofuels are to provide about 90% of the increase in the use of renewables by 2010. Wood-based fuels used in industry would account for half of that; fuels from forests a further 30%, and wastes the remaining 20%. The target for wind power is an increase in capacity from 12 MW in 1997 to 500 MW by 2010.

The main measure for bringing about this huge increase is an investment subsidy for large-scale demonstration plants. The overall subsidy shared among the participating projects would total FIM 100-200 million for a three-year period. The government's objective is to introduce this new subsidy into the budget as of 2003. In addition, the government intends to channel more monies than before to the development of renewables, from the approximately FIM 200 million a year that currently funds research and development of energy production technology.

The government estimates that these measures alone will reduce CO_2 emissions by 2 million tonnes compared to previous estimates. The remaining 2-3 million tonnes aimed for under the National Climate Strategy are also to result from tax increases for fossil fuels, subsidies for equipment, and strengthened support for research and development.

1. In 1999, one Finnish markka (FIM) was $0.181 and euro (€) 0.1682. In 2000, one Finnish markka was $0.154 and €0.168209.

FOSSIL FUELS

Finland's largest oil company, Fortum Oyj, dominates the domestic oil market. The company was created in 1998 by merger of Neste, Finland's largest oil company, and Imatran Voima Oy (IVO), its largest electricity supply company, both majority state-owned.

Through Neste, Fortum owns the two refineries in Finland and has a 100% market share in crude oil imports and refining. It also has a large market share in the oil product markets, including a 95% share of oil product exports. Other oil companies import oil products, mainly from Norway, and distribute them in Finland, so the downstream oil market is competitive. In 2000, Neste's share in the diesel oil market was 44%, followed by the Russian company Teboil (22%) and Shell (18%). In the gasoline market, Neste accounted for 32% of sales, followed by Shell (22%) and Esso (15%). Competition was sufficiently strong in recent years to keep the prices of oil products close to the European average.

However, at the time of the merger, Fortum-Neste owned 75% of Gasum, Finland's gas pipeline company. The remaining 25% was owned by RAO Gazprom. Therefore, the creation of Fortum led to a degree of vertical integration between electricity and natural gas, potentially excluding competing suppliers of power plant fuel. The merger was sufficiently large to require approval by the European Commission under EU competition rules. The European Commission approved the merger under the condition that Fortum-Neste reduces its 75% shareholding in Gasum to 25% by June 1999; 24% of the shares were to be offered to the Finnish government, and 26% were to be sold to Finnish or European companies independent of Neste, subject to the Commission's surveillance and approval.

The sale of Fortum's stakes proceeded on schedule, and by mid-1999, Fortum's shareholding in Gasum was reduced to 25%. Apart from Fortum, Gasum's shares are now held by Gazprom (25%), the Republic of Finland (24%), Ruhrgas (20%), and a consortium of Finnish forestry companies (6%).

As at the time of the last in-depth review, Finland is not interconnected with the European natural gas grid. The country has a pipeline connection with the Russian gas grid and imports all of its gas under long-term contracts from Gazprom. Gas sales in 2000 were 4 billion cubic metres. Owing to the lack of interconnection with other EU countries, Finland enjoys a derogation under the EU Gas Directive. It need not open up the gas network to other suppliers. The derogation will end once the infrastructure is put into place and competition is physically possible. However, other provisions of the Gas Directive, notably those on transparency and unbundling of accounts, had to be implemented. Therefore, the Finnish government developed a Natural Gas Market Act in 1999. This act, which implements the EU directive in Finland, entered into force in August 2000.

The Finnish government has long tried to promote interconnection with the Western European gas grid via Sweden and Denmark. Several proposals have been considered in the last five years, but have so far not resulted in any commitment to proceed with the projects. The related feasibility studies showed that the proposals were economic, provided that gas could be sold in all transit countries. However, no sales contracts could be secured in these countries. A new study for an interconnection between Finland and Trondheim in Norway via Sweden was begun in 2000. Several studies regarding an interconnection between Finland, the Baltic states and Central Europe are also under way.

Finland does not have any coal resources. Coal supply in 1999 was 3.7 Mtoe or about 11% of TPES in 1999. These figures were down to 3.1 Mtoe and 10% of TPES in 2000. All of this was imported. With 50%, Russia was the largest supplier; Poland supplied 40% and the United States 7%.

The country, however, has vast resources of peat. Peat production is highly variable as it depends on weather conditions. In 2000, peat land that could be used for harvesting fuel peat was 39,000 hectares and total fuel peat production was 11 million m^3 (0.9 Mtoe). In 1999, harvestable fuel peat land was 49,000 ha and total fuel peat production was 23 million m^3 (1.9 Mtoe). In 2000, consumption of fuel peat was 1.4 Mtoe; in 1999, it was 1.7 Mtoe. Peat is classified as a slowly renewable biomass fuel in Finland. Its use in small-scale CHP plants benefits from a tax subsidy on the same level as that of wood for small-scale electricity generation and small hydro power.

ELECTRICITY

Competition was introduced into the Finnish electricity supply industry in 1995 through a law requiring open access to electricity grids and establishing an electricity regulator, the Electricity Market Authority. The legislation was amended in 1998, extending the eligibility of consumers and clarifying regulation.

As the government considered the amount of competition that developed under the grid access system insufficient, the power industry was restructured in September 1997. The electricity transmission company Fingrid plc was created through divestiture of the transmission assets of IVO and TVO. Since then, Fingrid has operated as the national common carrier for electricity and has provided the important physical link to the other Nordic countries. Since June 1998, the Finnish power market has been fully integrated with the Nordic electricity spot market NordPool. NordPool is currently owned only by the Swedish grid company Svenska Kraftnät and the Norwegian network company Statnett. Negotiations are under way to allow Fingrid to take an ownership stake.

Although initially not very strongly interconnected with the remainder of NordPool, Fingrid has increased its transmission capacity across Finland's northern and western borders by more than 300 MW or by almost 30% between 1998 and 2001. In addition, the company plans to increase its interconnection capacity with Russia by another 400 MW in the near future. As a common carrier, Fingrid has an obligation to develop its network according to reasonable customer needs.

Competition has increased in Finland in the last three years, as foreign operators have entered the market. Sweden's state-owned company Vattenfall bought several distribution companies (Hämeen Sähkö Oy, Lapuan Sähkö Oy, Revon Sähkö Oy, Heinolan Energia Oy, Keski-Suomen Valo Oy and Hämeenlinnan Energia Oy). In 1999, Texas Utilities (TXU) bought a 40% stake in the distribution company Savon Voima, a 15% share of the generating company Pohjolan Voima Oy, and a 81% stake in TVO's subsidiary Teollisuuden Sähkönmyynti Oy (TSO). The name of the resulting new electricity trading company is TXU Nordic Energy Oy. Fortum, which is Finland's largest generating company through its subsidiary IVO, has acquired several distribution companies (Lounais-Suomen Sähkö Oy, Hanergia Oy, Megavoima Oy, Jyllinkosken Sähkö Oy, Tuusulanjärven Energia Oy and Koillispohjan Sähkö Oy), which have been merged into its subsidiary company Fortum Sähkönjakelu Oy. Fortum also owns stakes in other distribution companies (i.e. 27% of Espoon Sähkö Oy and 50% of Uudenmaan Sähköverkko Oy). Fortum, TXU Nordic Energy and Vattenfall are now the largest suppliers in the market. The Swedish company Graninge has also acquired generating (Ahlstrom Oy) and distribution (Kainuun Sähkö Oy) assets.

Although at the beginning of 1997 all consumers were nominally free to choose their suppliers, 1999 was the first year of full *de facto* competition for residential customers. Prior to 1 November 1998, customers wishing to participate in the competitive market had to buy an expensive meter. Since that date, load profiling has been used to estimate consumption patterns. The regulatory authority for electricity, the Electricity Market Authority, was made responsible for gas regulation and was renamed Energy Market Authority in 2000. The enlarged responsibilities also led to a staff increase.

The Energy Market Authority has estimated that in 1999 about 50% of all electricity sold to smaller customers (i.e. those taking power from a local distributor) was based on competitive contracts or prices. The government has prepared a draft bill to tighten the provisions regarding unbundling in order to strengthen competition. According to the draft, electricity network business should be legally unbundled from other activities not relating to transmission or distribution.

NUCLEAR

Finland has two nuclear power plants, one owned by IVO near Loviisa and the other by Finland's second-largest electricity supplier, the private power company TVO, in Olkiluoto. The two plants together supply about one-third of all electricity generated in Finland.

On 15 November 2000, TVO applied to the Finnish parliament for permission to build a nuclear reactor. TVO's application is for a decision in principle to build a nuclear power plant unit, either a boiling water or pressurised water reactor. Depending on the plant type, the capacity would be 1,000-1,600 MW. The unit is to be located either at the site of TVO's existing, two-block, 1,680 MW plant in

Olkiluoto or near IVO's site in Loviisa. The cost estimate for the new unit is FIM 10-15 billion (around € 1.7-2.5 billion), depending on plant size. TVO expects that the reactor will take four years to construct. The company hopes to obtain a construction licence by 2003 or 2004, and to have the plant in operation by 2008. TVO made the application partly because its own forecasts show that some 2,000 MW of generating capacity, mainly based on imported coal, will reach the end of its operating life between 2010 and 2015.

This application represents the first proposal for new nuclear capacity in Western Europe since the mid-1980s, and the first-ever proposal to build a nuclear power plant in a competitive power market. TVO's application is subject to a three-stage licensing process. In May 2001, the Finnish Minister of Trade and Industry announced support for the proposal. The municipal council of Olkiluoto, a town on the country's west coast, has voted in favour of a new reactor constructed alongside the two existing ones. The entire Cabinet and the Finnish parliament now must approve it. Parliamentary proceedings will begin in November 2001 at the earliest, and the final decision is expected in 2002.

Another important development was the parliament's decision in May 2001 to build a test facility for long-term underground storage of high-level nuclear waste in Olkiluoto. If the test facility performs satisfactorily, expansion into a larger, permanent disposal site is planned. The government approved the plan to build the test facility at the end of 2000. In compliance with the Nuclear Energy Act, the parliament's ratification was required to implement the decision. This makes Finland the first European country to take decisive steps towards a permanent nuclear waste repository.

The responsibility for research connected with final disposal as well as for the implementation of the project rests with the private nuclear waste firm Posiva Oy, a company owned jointly by IVO and TVO. Their two nuclear power plants, at Olkiluoto and Loviisa, produce a total of some 70 tonnes of spent fuel per year. About one-fourth of the uranium fuel used in the reactors is replaced annually. The next stage in the project's approval process is likely to take place in 2010, when Posiva Oy is expected to submit an application for construction.

HUNGARY

GENERAL ENERGY POLICY

The energy policy of Hungary continues to be determined by "Hungarian Energy Policy Principles and the Business Model of the Energy Sector", a key document adopted by the government (Decision 2199/1999 VIII. 6.) whose main objectives are to:

- Develop diverse energy supplies and eliminate dependency on imports from the former Soviet Union.

- Improve environmental protection.

- Increase energy efficiency through the modernisation of the supply infrastructure and better management of electricity consumption.

- Attract foreign capital for investment in capital-intensive energy projects.

The most important developments in energy policy since the last IEA in-depth review in 1999 are related to market liberalisation and to energy efficiency. A new Electricity Act is being prepared that will introduce competition into the restructured power industry and to make Hungarian legislation in this area compatible with EU law. The government wanted the legislation to be in force by 1 January 2001. Prolonged debate in parliament, however, has led to a delay. The government believes that the legislation will be adopted in 2001 and become law in 2002.

In 1999, a new Energy Conservation and Energy Efficiency Improvement Action Programme with an annual budget of HUF 1 billion[2] was adopted (Decision 1107/1999). This programme, which started in 2000 and is scheduled to run to 2010, aims to cut energy demand by 7%-8% a year (about 1.8 Mtoe). Since it was very successful in 2000, the government increased its annual budget to HUF 5 billion in 2001. To facilitate the administration of this programme, two pre-existing organisations, the Energy Centre and the Energy Information Agency, were merged.

ENERGY AND THE ENVIRONMENT

Under the Kyoto Protocol, Hungary is committed to reducing its emissions of all six greenhouse gases by 6% by 2008-2012 from a 1985-1987 baseline. As an economy

2. In 1999, one Hungarian forint (HUF) averaged $0.004 and euros (€) 0.004. In 2000, one Hungarian forint averaged $0.004 and €0.003846.

in transition, Hungary was free to choose that baseline, which marked the country's highest level of energy consumption. By 1994, a sharp drop in economic activity had led to an 18% decline in emissions. In 1999, Hungary's emissions still were not substantially higher than in 1994.

Although Hungary almost certainly will meet its Kyoto commitments, the government is aware that the country has significant potential for energy efficiency and for reductions in greenhouse gas emissions. It is attempting to exploit this potential as much as possible in the given economic circumstances, partly through funding from international and domestic institutions.

In 2000, the government developed the country's first climate change strategy. Even though Hungary is almost certain to meet its Kyoto commitments, the government decided to set them out as paramount objectives. In particular, the strategy aims to:

- Meet the Kyoto commitment entirely though domestic measures.

- Use the flexibility instruments under the Kyoto Protocol only for additional emissions savings. A system for joint implementation and emissions trading is to be developed in the longer term. The conditions for the possible application of joint implementation in Hungary are currently under discussion. The government believes that the amount of tradable emissions rights must be limited to avoid that the country's entire surplus in emissions rights is sold. Selling off the whole surplus could leave Hungary with insufficient reserves to comply with the Kyoto Protocol. Another objective of limiting saleable emissions rights is that emissions trading must lead to improved environmental performance in Hungary itself. To ensure effective implementation and transparency, the government supports the development of a monitoring and reporting system. In the framework of the flexibility mechanisms, projects must be cost-effective, especially in terms of government outlays.

- Address or resolve several environmental problems, especially emissions of greenhouse gases and air pollutants.

- Develop and select measures in a process of dialogue with the different economic and social interest groups in the country.

Among the strategy's concrete objectives, the share of renewables in primary energy consumption is to be raised from the current level of 3.6% (1.6% according to IEA figures)[2] to 5%-6% in the next ten years.

The strategy's most important individual initiative is the new Energy Conservation and Energy Efficiency Improvement Action Programme 2000-2010 (Energiatakarékossági és energiahatékonyság-növelési Cselekvési Program), which is detailed in the following section.

2. The figures differ because most of the renewable energy used in Hungary is non-commercial firewood, which is not included in energy balances.

ENERGY EFFICIENCY AND RENEWABLES

Energy demand remained flat in 1999 and 2000; electricity demand increased only slightly. On the other hand, gross domestic product (GDP) grew by around 4% a year in the last three years. As a result, country's energy intensity declined in the same order of magnitude.

Based on the principles in "Business Model of the Energy Sector" and related policy decisions, the government adopted the new Energy Conservation and Energy Efficiency Improvement Action Programme (Decision 1107/1999) that began in 2000 and is to run for ten years until 2010. Despite its name, the programme also includes initiatives related to renewables. The programme lists 15 sectors and areas for financial support. It targets a 7%-8% reduction in energy consumption per year (approximately 1.8 Mtoe) until 2010 in those sectors and areas, to be achieved through conservation and increased use of renewables.

The action plan estimates that HUF 200 billion is needed to finance this programme over its duration, of which HUF 50 billion will come from the State. The decision earmarked HUF 1 billion in state support a year in 2000 and 2001 from the budget of the Ministry of Economic Affairs. Afterwards, funding was to increase to HUF 5 billion a year, to accelerate the programme. However, because of its success in 2000, the government increased its support to HUF 5 billion in 2001 and to HUF 6 billion in 2002. Support for the residential sector mainly involves grants of up to 30% on new and additional investments. Other sectors are offered a variety of measures ranging from loans with favourable interest rates to full grants.

The body in charge of running the programme is the new Energy Centre, created from the merger of the Energy Centre and the Energy Information Agency (Government Decision 1031/2000). The Energy Centre is responsible for domestic energy efficiency projects and for co-ordinating Hungary's international energy efficiency efforts.

Energy conservation projects in several areas can apply for funding from the programme. These include:

- Energy-efficient modernisation of household equipment and buildings. Funding is limited to HUF 200,000 per flat. HUF 100 million was earmarked for this area at the start of the programme, but because of massive interest, the amount was increased to HUF 150 million. In 2000, 3,850 flats received programme support for energy efficiency improvements such as the application of thermal insulation. In 2001, the government increased the maximum support to HUF 500,000 per flat and the total available budget to HUF 500 million. A further HUF 3 billion is available throughout 2001 for energy-efficient modernisation of flats built with industrial technologies (housing estates, etc.).

- Modernisation of district heating systems in the medium to long term, through financial assistance by the Ministry of Economic Affairs. Suppliers can take advantage of loans at preferential interest rates and consumers can benefit from one-time grants. This part of the programme began on 1 October 2000. In 2001, the supply-side part of the programme continued with a budget of HUF 315 million, whereas the demand-side refurbishment programme was combined with the programme segment for energy-efficient modernisation of flats built with industrial technologies.

- In addition to these initiatives, the Ministry of the Environment and the Ministry of Economic Affairs plan to begin a further rehabilitation programme for Hungary's derelict district heating system. The government has already set aside the financial resources in the ministries' budgets for this purpose.

- Increased use of renewable energies, for which HUF 100 million is available. In 2000, almost 200 solar thermal installations, mostly for hot water production, received support through this project. The government estimates that total thermal energy produced by solar thermal installations will increase by 4% in 2001, based on preliminary data for 2000. This project also funded the first Hungarian wind power plant in Kulcs, and the second one in Inota, which came on stream in 2000. The government increased the budget to HUF 350 million in 2001.

- Biomass projects. Energy from biomass is used mostly in wood processing, and is expected to be increasingly used as wood-processing technology is modernised. The construction of an 8 MW boiler fuelled with waste wood and wood chips is to be completed in 2001. This is expected to substitute for 120 terajoules (287,000 tonnes of oil equivalent) of fossil fuel.

FOSSIL FUELS

Most of the developments in the Hungarian oil market in 1999 and 2000 were related to high oil prices. Since the prices for crude oil and oil products are set freely by the market, the government has only limited influence on these prices, except for taxation. In 2000, the Hungarian government introduced a regular information service based on print media and the Internet, quoting world and European oil prices and adding some analysis. Hungary's oil and gas company MOL acquired a minor ownership stake in the Slovakian oil company Slovnaft in 2000.

The Hungarian gas market also confronted large price increases. Since the gas industry is not competitive yet, most consumer prices remain regulated and are adjusted four times a year. In the July 2000 round of price revisions, consumer prices rose by 12%. In the November 2000 round, industrial prices rose by 43%. Despite these large increases, private Hungarian gas supply and distribution companies demand higher increases because they consider that their costs of purchasing gas from MOL, the country's gas producer, importer and wholesaler, are not being fully covered. This situation has generated some conflict among the suppliers, MOL, the Hungarian Energy Office as the relevant regulator, and the Ministry of Economic Affairs, and has led to a lawsuit currently in court.

Hungary has 4 billion tonnes of coal of low-grade quality. Of this, 0.7 million tonnes of hard coal, 6.5 million tonnes of brown coal, and 7.7 million tonnes of lignite were produced in 1999. Almost 90% of this coal was still used for power generation; one quarter of electricity is generated from coal.

The programme of mine closures initiated in the early 1990s continued through the last three years with the closure of hard and brown coal underground mines. Today, only one hard coal mine is still in operation. The government will soon have to take a strategic decision on its future role as it was scheduled to be shut down within the next two years. The production of lignite, the only coal resource that is economic, has stabilised at 7.5-8 million tonnes a year. Its customer, the Mátra power plant, has invested heavily to reduce sulphur emissions.

ELECTRICITY

The Hungarian power industry was restructured in the early 1990s in preparation for the introduction of competition. However, the introduction of competition itself has been deferred to a later date.

Hungarian electricity consumers spend about 3.8% of GDP on electric energy, which is far more than consumers in most other IEA countries. In the absence of competition, efficient price regulation therefore plays important microeconomic and macroeconomic roles. As in the gas market, electricity price regulation is currently based on price caps. Following the partial privatisation of the electricity supply industry in the mid-1990s, prices have increased about $1^1/_2$ times, gradually reaching cost-covering levels and approaching prevailing prices in the European Union.

In late 1999, the government began to develop a new Electricity Act to introduce competition into the electricity industry and make legislation in this sector compatible with EU law. Hungary aspired to join the European Union by 1 January 2002, and it was the government's plan to establish the EU-conforming electricity market by 1 January 2001. The government adopted a draft bill in 1999 and submitted it to parliament at the end of the year. Parliament began discussing the bill in spring 2000, but suspended discussion soon after, because detailed economic, social and environmental impact studies were requested by several parliamentary groups. The discussion resumed in April 2001. The government is confident that the new law will be adopted in 2001. If so, 25% of the retail market will open to competition on 1 January 2002.

The delay in the adoption of the act has had some implications for the electricity market. It was meant to replace the Electricity Act of 1994, which expired in July 2000. This eliminated the legal basis for Hungary's system of electricity price regulation as it was used after 1997. The Hungarian Energy Office, the regulator for the electricity and gas industries, has extended the use of the system for four years, but has underpinned price regulation for the coming period with a comprehensive review of utility costs and a slightly revised regulatory mechanism in 2000.

The revised system of price regulation began on 1 January 2001 and will end 31 December 2004. During these four years, regulation will continue to be based on price formulae whose main elements continue to be monthly consumer price indices (excluding energy products), inflation adjustment and fuel price indices. If competition begins in early 2002, as currently anticipated, the price caps will apply only to network pricing and captive consumers in the following.

RESEARCH AND DEVELOPMENT

Under the Szechenyi Plan, developed by the government in 2000, € 136.4 million will be earmarked for research and development in energy, the environment and sustainable development between 2000 and 2002. The funds are to be allocated through tenders for general research and development, information diffusion, co-operative research, and personnel training. The deadline for bids was 31 October 2000. The government received numerous bids, many of which are related to energy or the environment. The government is reviewing them and selecting proposals that will be eligible for support.

IRELAND

Responsibility for energy policy rests with the Department of Public Enterprise. The Minister for Public Enterprise represents the interests of the government, as shareholder, in five state-owned energy companies.

- The Electricity Supply Board, the main generator and supplier, monopoly distributor, and owner of the transmission system.
- Bord Gáis Éireann owns and operates the natural gas transmission system and has an effective monopoly in natural gas distribution.
- Bord na Móna is effectively a monopoly for commercial peat production.
- The Irish National Petroleum Corporation. A subsidiary of the corporation, the National Oil Reserves Agency, is responsible for the maintenance of Ireland's strategic oil stocks.
- EirGrid is the licensed electricity transmission system operator.

The Irish Energy Centre is responsible for implementing energy efficiency policy, and initiatives on sustainable and renewable energy.

The economy is small and very open to international trade. Rapid economic growth has had an important influence on the development of energy policy. Energy security is a central issue because peat, some gas and renewable energy are the only domestic energy resources, and the single gas interconnector is close to full capacity.

ENERGY AND ENVIRONMENT

Under the Kyoto Protocol, and EU arrangements, Ireland has agreed to limit the net increase in emissions of greenhouse gases to 13% above 1990 levels by 2008-2012. Carbon dioxide is the largest component of Ireland's greenhouse gases (60% in 1999). Energy use is responsible for 95% of emitted carbon dioxide.

The Green Paper on Sustainable Energy was published by the Department of Public Enterprise in September 1999. The paper outlines policies and measures for energy efficiency and renewable energy to assist meeting Ireland's Kyoto target.

The National Development Plan 2000-2006 allocated IEP 146 million[1] for the promotion of energy efficiency and renewable energy initiatives, of which:

1. On average in 2000, one Irish pound (IEP) = US$ 1.164 or € 1.269036.

Strengthening the activities of the Irish Energy Centre	IEP 33.6 million
Built environment	IEP 23.2 million
Research and development	IEP 45.9 million
Renewables and grid	IEP 43.0 million

The National Climate Change Strategy was published in October 2000. Its objectives are to meet Ireland's commitment under the Kyoto Protocol and prepare Ireland to meet potentially more ambitious targets. Key energy-related initiatives include the following:

- Introducing greenhouse gas taxation from 2002, giving priority to carbon dioxide.
- Participating in international trading in emissions.
- Ensuring that measures to improve energy supply would permit the closure or conversion of the Moneypoint coal-fired power plant by 2008, which would be the largest single contribution to reducing greenhouse gas emissions.
- Measures on fuel efficiency, demand management and modal shift.
- Measures to reduce emissions from the built environment, including improved land-use planning, further review of building regulations to promote better insulated and more energy-efficient new building, and restructuring grants for new houses to favour more energy-efficient houses.

The Irish Energy Centre, established in 1994, is to be restructured as a statutory body. The Green Paper on Sustainable Energy gave the centre responsibility for implementing sustainable and renewable energy initiatives. The National Climate Change Strategy gave the centre a major role in concluding negotiated agreements.

ELECTRICITY

The Electricity Supply Board owns almost all of the power stations in Ireland. The board also owns Ireland's transmission system and distribution system. EirGrid is the independent transmission system operator. Electricity consumption has been rising rapidly with strong economic growth. New capacity is becoming necessary. Tariffs rose by an average of 2% in 1996 and 1.5% in 1997, as part of the cost and competitiveness package agreed with the Electricity Supply Board in 1996. The Commission for Electricity Regulation has been given responsibility for the approval of tariffs for franchise customers, and is currently reviewing tariffs for public electricity supply customers

The Electricity Regulation Act 1999 was the first phase of implementation of the EU Electricity Directive. Ireland opened 31% of its electricity market with effect from 19 February 2000. Market opening will rise to 40% in 2002, and to 100% in

2005. The market for "green" electricity has been fully liberalised since February 2000. The market for electricity produced by combined heat and power was fully liberalised in April 2001.

The act also provided for the establishment of a Commission for Electricity Regulation responsible for licensing the generation and supply of electricity, and overseeing access to the transmission and distribution systems and related charges.

The European Communities (Internal Market in Electricity) Regulations, 2000, complete the implementation of the Electricity Directive. The regulations were signed by the minister on 20 December 2000. They established EirGrid as an independent transmission system operator.

The regulations include provisions on:

- The functions and licensing of EirGrid.
- The establishment, functions and licensing of a distribution system operator.
- The unbundling of accounts of electricity undertakings.
- The EU directive's provisions regarding autoproducers.
- Empowering the Commission for Electricity Regulation to approve the Electricity Supply Board's franchise electricity tariffs.

The Commission for Electricity Regulation is an independent regulator of the electricity industry. The minister retains the authority to decide the level of market opening and public service obligations. The commission:

- Issues licences and authorisations.
- Oversees conditions for access to the transmission and distribution systems and related charges.
- Makes regulations for the trading system.
- Regulates the Electricity Supply Board's franchise electricity tariffs.

EirGrid is licensed by the commission to carry out the functions of transmission system operator.

The Electricity Supply Board will invest IEP 500 million (€634 million) in the transmission grid over the next five years. This investment, which will be carried out in accordance with EirGrid's development plan, is expected to fully modernise Ireland's transmission system. The development plan will be subject to public consultation and to the approval of the Commission for Electricity Regulation.

The Green Paper on Sustainable Energy set a target for installed electricity generating capacity of 500 MW_e in the period 2000-2005. The target is to be achieved through a combination of support from the Alternative Energy Requirement programme, direct sales and successful EU Fifth Framework projects.

The expanded renewable energy programme is expected to avoid 2.4 million tonnes of carbon dioxide emissions compared with business-as-usual projections, at an estimated annual cost of IEP 40 million.

The National Development Plan 2000-2006 allocated IEP 37 million for investment in the electricity grid to accommodate renewable energy projects and combined heat and power projects.

In July 2000, the Renewable Energy Strategy Group published "A Strategy for Intensifying Wind Energy Deployment". Membership of the group included representatives from the Electricity Supply Board, planning authorities, the wind energy industry, the Irish Energy Centre, and government departments. The report concluded that three keys elements, the electricity market, the electricity network and spatial planning, need to be integrated into a planned approach to use of wind energy. A number of recommendations were made under these headings.

An Assessment of Offshore Wind Energy Resources in the Republic of Ireland and Northern Ireland was published in September 2000. The study was undertaken on behalf of the Department of Public Enterprise and the Department of Enterprise, Trade and Investment, Northern Ireland. The main finding of the report is that a significant wind energy resource exists in territorial waters and could provide up to 32% of the island's predicted energy consumption by the year 2005.

OIL AND NATURAL GAS

Ireland imports all of its crude oil requirements. In February 1999 the government requested the state-owned Irish National Petroleum Corporation to consider further commercial opportunities to underpin the continued operation of the Whitegate refinery. The corporation recommended that the Minister for Public Enterprise should accept an offer by the Tosco Corporation, a major US refiner and marketer, to purchase the Whitegate oil refinery and the corporation's other major commercial asset, the oil storage terminal at Whiddy Island, Bantry Bay. Heads of agreement were signed in July 2000 and the sale completed on 16 July 2001.

Under the terms of the sale, Tosco Corporation will operate the two facilities for a minimum of 15 years on a fully commercial basis for a consideration of $100 million. The mandatory regime, which required oil companies active in the Irish market to source a proportion of their overall white product requirements from Whitegate, has been terminated following the change in ownership.

The National Oil Reserves Agency will continue as a state-owned entity. The agency, which manages Ireland’s strategic oil stocks, will enter into 15-year commercially-based contracts with Tosco for the storage of reserve stocks at Whiddy and Whitegate.

Gas demand has grown rapidly over the 1990s for direct use and power generation. Gas is currently supplied from the Kinsale/Ballycotton fields and through an interconnector with the United Kingdom. About 28% of gas supply is sourced domestically, but production is declining. There are no gas storage facilities. Supply variations are met by deliveries from the Kinsale/Ballycotton fields, varying supply for power generation and other large customers by flexible imported gas contracts with UK suppliers and by substituting fuel oil for natural gas. The Corrib discovery could help replace declining production from the Kinsale/Ballycotton fields and a second interconnector between Ireland and Scotland has been proposed.

Bord Gáis Éireann dominates the gas market. By legislation introduced in 1995, 75% of the market is open to competition although the market is relatively small. The gas network serves the southern, eastern and north-eastern areas of Ireland. Network extensions have been proposed to connect the Corrib gas field to the west. The existing network serves more than 352,000 domestic customers and about 13,400 industrial and commercial customers. The Electricity Supply Board and a single fertiliser plant consume about 64% of the total gas supply.

The Gas (Amendment) Act 2000 introduced a scheme to allocate scarce capacity in the natural gas network for electricity generation. The scheme is the responsibility of the Commission for Electricity Regulation. Under the scheme capacity rights have been awarded for the construction of three additional power plants with a total installed capacity of 736 MW.

The act extends rights of access and compulsory acquisition of lands to persons other than Bord Gáis Éireann. This amendment essentially gives private pipeline developers the same rights as Bord Gáis Éireann to build and operate pipelines.

Gas demand has continued to grow with economic growth. While the Corrib discovery will help offset declining production from the Kinsale/Ballycotton fields, the field is not expected to commence operation until the second half of 2003. Ireland’s existing supply infrastructure will reach full capacity by the end of 2002. The government has therefore approved the construction by Bord Gáis Éireann of a second Scotland-Ireland interconnector to be operating by the end of 2002.

During 2000 Bord Gáis Éireann sought approval for the construction of a Dublin-Galway-Limerick pipeline. Approval was granted in 2001.

In July 2000, the minister published a report on natural gas transmission tariffs and pipeline authorisations prepared by the Brattle Group. The tariff review is to be completed in 2001.

The Gas (Interim) Regulation Bill for the transfer of responsibility for the gas sector to the Commission for Electricity Regulation was published on 13 July 2001. The bill is to be enacted as soon as possible after the Oireachtas reconvenes in October. The transfer of functions could take place in mid-November.

Third party access rights were extended in 2000 to cover customers with an annual consumption at a single meter installation of 25 million standard cubic metres, as well as all gas-fired power generating stations, including operators of combined heat and power plants, irrespective of their annual consumption rate. The Minister of State with responsibility for energy also announced his intention to achieve full liberalisation of the gas supply market by 2005 at the latest. Legislation is being prepared to this effect.

RESEARCH, DEVELOPMENT AND DEMONSTRATION

The National Development Plan allocated I£ 45.9 million for research, development and demonstration, including funding for the Irish Energy Centre's research, development and demonstration programme. The centre's energy research programme will focus on housing, renewable energy for power and heat supply, the industrial and commercial sector, and transport.

Projects in the four areas will take into account the need to balance shorter- and longer-term perspectives, ranging from near-market research and development in areas where markets are considered to have failed, such as in energy efficiency, to developing and applying technologies and building capabilities that have the prospect of bringing medium- and longer-term strategic benefits to Ireland.

ITALY

GENERAL ENERGY POLICY OVERVIEW

The major changes in the Italian energy sector since the last in-depth review in 1999 are the start of electricity and gas market liberalisation, the beginning of the restructuring and privatisation of the energy industry and the publication of the "Italian White Paper for the Valorisation of Renewable Energy Sources" in 1999. These are described in more detail below.

The energy sector has undergone considerable restructuring in recent years. The EU Directives for Electricity and Gas Market Liberalisation have been transposed into legislation. The privatisation of large state-owned energy companies, including ENI, the oil and gas conglomerate, and ENEL, the major electricity company, has begun.

New institutions, including a new energy sector regulator, have been established. Authority of Electricity and Gas (Autorità per l'Energia Elettrica e il Gas, AEEG) is an independent agency created in 1995 to regulate both the electricity and gas sectors. AEEG has substantial regulatory powers and is entrusted with many functions, including the regulation of the network (through third party access tariffs), consumer protection, end-use tariffs, implementing unbundling obligations and some consultative and support activities.

ENERGY SUPPLY AND DEMAND

In 1999, total primary energy supply was 169 Mtoe, 11.5% over the 1990 level. The shares of coal and oil in TPES have been decreasing, while the shares of natural gas and renewables have been increasing. Electricity imports were stable in the last decade. Final energy consumption increased by 12.1% between 1990 to 1999. Growth was strongest in the transport sector (20.2%), followed by households and services (15.1%) and industry (3%).

New electricity and gas legislation aims to enhance energy efficiency by obliging electricity and gas distributors to promote end-use energy savings and by stipulating that quantitative national targets for those savings must be set. Decree 79/1999, "Implementing the European Directive 96/92/CE with common rules for the single market of electricity", is a framework law that introduces regulations governing different activities, including energy efficiency, in the electricity sector. The gas sector is covered by Decree 164/2000, which was issued in March 1999 to implement the EU Natural Gas Directive. The decrees give AEEG enforcement powers. In addition to those powers and the functions mentioned above, AEEG publishes guidelines for the preparation, implementation and assessment of demand-side management projects. The types of projects that are likely to be considered are those aimed at reducing energy consumption and increasing energy efficiency in appliances, better energy and load management techniques and fuel substitution.

ENERGY AND ENVIRONMENT

Energy-related CO_2 emissions have been growing gradually and were 6% above the 1990 level in 1999. In keeping with the Kyoto Protocol of December 1997 and the Burden-Sharing Agreement of the EU of June 1998, Italy is committed to reducing its total GHG emissions by 6.5% between 1990 and 2008-2012.

During the last few years, Italy has introduced a wide range of measures to reduce CO_2 emissions. A carbon tax, applicable to all energy products, was established in December 1998 (Law 448/1998). According to the law, tax increases are to be decided each year by the government between 1999 and 2004. However, in September 2000, the CO_2 tax increases for oil products were suspended by Decree 268/2000. The government is considering a revision to the method of calculating excise tax increases but has not yet taken a final decision. A green certificate system will start in 2002 (see Renewables). The public sector has been mandated to increase its purchases of electric, hybrid and natural gas vehicles to 50% of total new vehicle procurement over the next five years. The government estimates that this measure will put some 60,000 vehicles with low CO_2 emissions on Italy's roads by 2003. ENEL has signed an agreement with the Ministry of Environment to reduce CO_2 emissions by 20% from the 1990 level by 2006. This will require investment of US$ 3.6-4.8 billion in renewables and production efficiency. In November 1998, the industry entered into a framework agreement with the government, "Patto per l'energia ed ambiente", which will later lead to voluntary agreements to reduce CO_2 emissions through increased energy efficiency and use of renewables.

ELECTRICITY

In 1999, electricity consumption was 289.1 TWh, compared to 235.2 TWh in 1990. This corresponds to a growth rate of 2.3% per year. In addition to meeting growing demand for electricity, more natural gas was used to replace oil and coal in power generation in the 1990s. As a result, the share of oil in power generation decreased from 48.2% to 35.2% between 1990 and 1999. The share of coal dropped from 16.8% to 10.9%, whereas the share of natural gas increased from 18.6% to 33.6%. Imports play an important role in electricity supply. Net electricity imports were steady at 14%-15% in the 1990s. In 1999, the sources of electricity imports were Switzerland (51%), France (37%), Slovenia (8%) and Austria (4%).

The major player in the electricity sector is ENEL, a vertically-integrated company covering generation, import, transmission and distribution. In 2000, Compart SpA purchased Falck Spa, forming the second-largest electricity generation company in Italy. In 1999, ENEL generated 71% of Italy's electricity; the rest was covered by autoproducers (24%), municipal companies (4%), and other generators (1%).

ENEL is undergoing a restructuring and partial privatisation. In November 1999, 34.5% of ENEL stock was sold. Another public offering is likely to take place before the end of 2001. The government's privatisation plan specifies that ENEL should divest some generation facilities to reduce its share in power generation to less than 50% by 2003. Accordingly, some of the generation assets of ENEL were split into three companies, namely Eurogen SpA (7,000 MW, based in Rome and Milan), Elettrogen SpA (5,400 MW, based in Rome and Piacenza) and Interpower SpA (2,600 MW, based in Naples and Rome). As of June 2001, ENEL still held the three generation companies but had begun the sales process, which should be completed by the beginning of 2003. The rest of the activities of ENEL are to be unbundled into separate companies but remain under its ownership.

The schedule for electricity market liberalisation was accelerated in 2001 (Law 57/2001). At the beginning of 2000, 30% of the market was being opened. The original schedule required a 40% opening by 2002. Under the new schedule, those consuming at least 100 MWh per year (60% of the market) will be eligible 90 days after the sale of ENEL's generation companies. The consumers are allowed to form consortia to fulfil the eligibility criteria.

Three new institutions have been established in the electricity sector, namely Transmission System Operator (TSO), Single Buyer and Market Operator. The TSO, Gestore Rete Trasmissione Nazionale (GRTN), was established at the beginning of 2000 as a state-owned company with responsibility for all activities related to transmission. Ownership of the network remains with ENEL. Third party access tariffs were set by AEEG in February 1999. GRTN is currently establishing the Single Buyer as its subsidiary. The Single Buyer will be responsible for guaranteeing the supply of electricity to captive customers. The Market Operator was established as a subsidiary of GRTN in June 2001 to manage the electricity pool. The pool has not been established yet because some of the necessary regulation is in process. After the establishment of the pool, eligible customers can make purchases either from the pool or by bilateral contract with electricity producers.

To enhance competition, the authorisation procedure for installation of new facilities will be simplified and harmonised. Current procedure for ENEL is different from that for other generators.

In 1999, the government initiated a programme to reduce electricity retail prices in the regulated sector by as much as 17% and to eliminate cross-subsidies by 2001. Two price ceilings have been effective from the beginning of 2001, one limiting the amount of profit from a single consumer and the other limiting the amount of profit from each user group. If the supplier's profits exceed the ceiling, the supplier must refund the consumer. However, if the consumer is undercharged, there is no compensation mechanism for the supplier. The reform also seeks to establish convergence in the technical quality of supply across Italy as this now varies widely.

GAS

In 1999, natural gas supply was 55.6 Mtoe, up 42% from the 1990 level. Some 39% of gas was used in the service and household sectors, 31% in power generation and 30% in industry.

Italy used indigenous resources for 14.3 Mtoe of gas (26%) and depended on imports for the rest in 1999. Known domestic gas reserves were 206 billion cubic metres (bcm) in 2000. Import dependency has been growing, making the diversification of supply sources increasingly important. In 1999, the supply sources were Algeria (40%), Russia (29%), domestic sources (26%), the Netherlands (4%) and others (1%). Nigerian LNG is also imported to Italy, but under a swap agreement with France; it is received in France and swapped against Russian and Algerian gas. Libya and Norway are major potential suppliers. Supplies from Norway started in 2000 and will reach 6 bcm per year. A new pipeline project is under development to link Italy and Libya. The pipeline will be in operation in 2003/2004 to supply 8 bcm per year. ENI has a contract to import 8 bcm per year from Libya, which it has sold to other Italian and European companies (4 bcm per year to Edison Gas, 2 bcm per year to Gaz de France and 2 bcm per year to Energia Gas).

Italy has taken steps to liberalise the gas market. In 2000, Decree 164/2000 was introduced to implement the EU Natural Gas Directive. The decree set the liberalisation schedule, established regulated third party access to gas transmission networks, and introduced other measures aimed at increasing competition. From June 2000, those consuming 200,000 cubic metres or more per year became eligible, effectively liberalising 96% of the market. Full opening is scheduled for the beginning of 2003. Two cap mechanisms were set to enhance competition. From the beginning of 2002, no company will be allowed to supply more than 75% of annual national demand, with the ceiling dropping by two percentage points per year to reach 61% in 2010. No single supplier can supply more than 50% of gas sold to final users beginning in 2002.

The dominant player in the Italian gas market is ENI with its subsidiaries SNAM and AGIP. AGIP has an 88% market share in indigenous gas production. SNAM has 100% market share in transmission and is also dominant in gas distribution through direct sales to large industrial companies, power stations and distribution companies (in which it has significant shares). Decree 164/2000 requires legal separation of transmission and dispatching activities from all other activities, except storage activities. Although storage activities must not be legally separated from other activities, they must be unbundled from them in terms of accounting and management. In November 2000, ENI's Board approved a plan to spin off SNAM’s gas transportation activity and AGIP’s storage assets and service. Two new companies were created, Rete Gas Italia (transportation and dispatching) and Stoccaggi Gas Italia (gas storage). The remaining gas operations of SNAM became a gas division of ENI. ENI has retained ownership of Rete Italia and is preparing to float part of the company on the stock market.

Imports of gas from non-EU countries require the approval of the Ministry of Industry, Trade and Handicrafts (MICA). In addition to technical and financial minimum requirements, the importer needs to demonstrate:

- Availability of strategic storage located in Italy equivalent to 10% of the volume annually imported and to 50% of the average planned daily peak requirement outside the peak season.

- The capacity, via appropriate investment plans, to contribute to the development and security of the gas system or supply diversification.

MICA is responsible for emergency and safety conditions of the Italian system. It supervises long-term planning, may give specific instructions to safeguard the continuity and security of supply and oversees the functioning of the storage system.

OIL

Total oil consumption was stable during the 1990s. In 1999, total primary energy supply was 89.5 Mtoe. The share of oil in TPES decreased from 58.9% in 1990 to 52.9% in 1999 and is expected to decline further. Italy depends on imports for almost all of its oil supply. Oil imports accounted for 95% of total oil supply in 1999. Italy is trying to increase domestic oil production. New projects have been developed at Val d'Agri (600 million barrels of oil equivalent of oil and gas) and at Tempa Rossa (400 million barrels of oil equivalent of oil and gas) in the southern Alpine region. The new resources more than double the 622 million barrels of proven oil reserves in Italy.

Liberalisation in the oil sector started at the beginning of 2000, with the introduction of Decree 32/1998. The decree liberalised the opening procedure for new filling stations. The former concession process was replaced by an authorisation process in which anyone meeting the requirements set by the decree would be allowed to open a filling station. The decree also introduced a sinking fund for managers (*gestori*) of filling stations that are likely to be closed because of the restructuring process. The fund is fed by contributions from operators of the retail sector; the claims process for damages was established by a provision of the Minister of Industry of February 1999. The number of filling stations declined from 27,100 in 1997 to 24,600 by the end of 1999. About 3,500 more are expected to close during the next few years.

EU Directive 98/70/CE on the quality of gasoline and diesel has been adopted into Italian legislation by Decree 434/2000. Decree 22/2001 was introduced to comply with EU Directive 98/93/CE regarding the obligation to maintain petroleum product reserves. The decree also aims to help meet the 90-day stock obligation of the IEA.

RENEWABLES

In 1999, hydropower amounted to 3.9 Mtoe (2.3%) of TPES, geothermal energy 2.7 Mtoe (1.6%), biomass and waste 1.9 Mtoe (1.1%) and solar and wind energy 0.1 Mtoe (0.1%). According to the recent estimate by the government, the share of biomass and waste will increase to 3.8% of TPES and the share of solar and wind energy to 0.8% of TPES by 2010. Wind power capacity grew from 231 MW in 1999 to 394 MW in 2000. Erga, the renewable energy division of ENEL, plans to increase its wind power capacity from 25 MW to 210 MW during the next four years.

The Inter-Ministerial Committee for Economic Programming (CIPE) approved on 6 August 1999 the "Italian White Paper for the Valorisation of Renewable Energy Sources". It defines the government's main policies concerning the progressive integration of renewables into the energy markets. The White Paper identifies, for each renewable, the targets that should be attained to obtain the greenhouse gas reduction established by the CIPE resolution dated 19 November 1998 (Resolution 137/1998 approving the "Guidelines of the national policies and measures for reducing greenhouse gas emissions"). The White Paper also indicates the strategies and related instruments needed. It foresees an increase in electricity generation from renewables of 6.5 Mtoe in 2008-2012, resulting from augmenting installed capacity from 17,100 MW in 1997 to 24,700 MW in 2010 in hydropower, biomass and waste, geothermal and wind energy. This will save 24 million tonnes of CO_2 equivalent GHG emissions, compared to emissions from a similar increase in conventional power. Electricity production by conventional power plants is expected to increase 2 Mtoe over the same period.

A "green certificate system" will start in 2002 by Decree 79/1999. Major electricity importers and generators are obligated to supply a minimum amount of electricity to the national grid that is produced by renewables or waste incineration. This minimum amount has been set at 2%. The system will be implemented through the trading of green certificates between generators using renewable sources and importers or generators using conventional sources. The green certificates are issued by GRTN to generators that own renewables plants.

RESEARCH AND TECHNOLOGY

Public funding for energy R&D was ITL 430 billion[1] in 1998. About 44% of the budget was allocated for nuclear research, 21% for energy conservation and 14% for renewables.

CIPE approved the "National Research Programme 2001-2003" on 21 December 2000. The programme has four main target areas: Quality of Life, Competitive Sustainable Growth, Environment and Energy, and Mediterranean Civilisation in the Global

1. On average in 2000, ITL 100 = US$ 0.047 or € 0.0516.

System. Two strategic programmes, “Sustainable Development and Climate Change” (project on simulation, diagnosis and forecasts related to climate change) and “New Systems of Energy Production and Management” (two projects, one on hydrogen as an energy vector and the other on fuel cells), have been introduced under the Environment and Energy target area (See Table 1). Public funding covers 70% of the total cost of the projects; the remaining 30% is at the expense of the contractor.

Table 1
Funding of the National Research Programme in 2001
(billion liras)

Target area	*Cost*	*Public funding*
Quality of Life	590	413
Competitive Sustainable Growth	670	469
Environment and Energy	160	112
Sustainable development and climate change[a]	40	28
New systems of energy production and management[b]	120	84
Mediterranean Civilisation in the Global System	40	28
Total Cost	**1,460**	**1,022**

(a) Additional Funding has been credited to the Ministry of Environment by the Financial Law 2001.
(b) Additional Funding of ITL 200 billion for 2001-2003 has been adjudicated to the National Agency for New Technology, Energy and Environment (ENEA) by the Financial Law 2001.

Nuclear fusion R&D activities are carried out under the EURATOM-ENEA Association for Fusion. Funding provided by the EU Fifth Framework Programme amounted to ITL 23.56 billion in 2000.

JAPAN

MAJOR POLICY DEVELOPMENTS

In January 2001, the Ministry of International Trade and Industry became the Ministry of Economy,Trade and Industry (METI). The Agency for Natural Resources and Energy (ANRE) was reorganised into five units. The Nuclear and Industrial Safety Agency, with its seven sections related to nuclear energy, was added to ANRE as a special institution to take a central role in nuclear safety regulation. Responsibility for promoting and developing nuclear power remains in the Electricity and Gas Industry Division of ANRE.

The Long-Term Supply and Demand Outlook, which was originally presented in June 1994, was revised in 1998 to present Japan's supply and demand outlook to 2010. In March 2000, the Minister of International Trade and Industry announced an overall review of energy policy. The review, which focused on Asian energy security, was completed in July 2001. The review was conducted by the Advisory Committee on Energy in consultation with energy industries, consumer groups, environmental groups, and others. The objectives of the review were as follows:

- Evaluate the effectiveness of the current package of policies and measures.
- Review the current Long-term Supply and Demand Outlook to 2010.
- Develop new policies and measures if the current package was deemed insufficient to achieve the Kyoto target under the revised outlook.

In the 1998 Outlook, Japan sought to stabilise carbon dioxide emissions from energy by expanding nuclear power generation to 480 TWh in 2010 by building 20 or more new plants, promoting new and renewable energy, and reducing energy consumption by 51.5 Mtoe. Several changes have occurred since 1998:

- Deregulation of the energy sector has resulted in increasing cost sensitivity and conflicts between the objectives of economic efficiency, environmental protection and energy security.
- Lifestyle changes have caused a rapid increase in energy consumption in passenger transport and the residential sector. As a result, carbon dioxide emissions from the energy sector increased by about 8.9% in 1999 over 1990.
- Construction of some nuclear power generation plants has been postponed.
- The share of coal in energy supply has increased rapidly, while the share of nuclear and renewable energy has shown only a slow increase.

The review of the 1998 Outlook established the need for greater promotion of energy conservation and of new and renewable energy, and for fuel switching, to achieve a reduction of 20 Mt of carbon in addition to the reduction of 40 Mt achieved by policy measures introduced after the third Conference of the Parties (COP-3). These measures include the following:

- In the industry sector, the Keidanren Voluntary Action Plan.
- In the residential and commercial sector, the “front runner” energy efficiency standards for household electrical appliances, and the energy efficiency standard for private houses and buildings.
- In the transportation sector, the “top runner” standards for cars and trucks, enhancement of freight transport efficiency and modal changes from trucks to rail and shipping, and deployment of computer-based technologies.

The reduction of 20 Mt of carbon to be achieved by each group of policies is now expected to be as follows:

- Further promotion of energy conservation measures, 6 Mt.
- Further promotion of new and renewable energy, 9 Mt.
- Fuel switching (principally coal to gas), 5 Mt.

ENERGY DEMAND AND END-USE EFFICIENCY

Total energy consumption in 1998 fell for the first time since the second oil crisis in 1979. The fall was entirely the result of the economic recession and weak energy demand in the industrial sector. While energy demand in the industrial sector was almost stable between 1973 and 1998, it almost doubled in the residential/commercial and transport sectors in the same period.

Japan has set a target to reduce energy demand to 400 million kilolitres of crude oil equivalent by 2010, or 9 million kilolitres of crude oil equivalent lower than in the projected business-as-usual case for that year. This target would require virtually no growth in energy consumption from 1996 to 2010. Two major policies to realise this target are the Voluntary Action Plan of Keidanren (the Japan Federation of Economic Organisations) in the industrial sector and the Top Runner programme in the residential/commercial and transport sectors.

Keidanren’s Voluntary Action Plan covers 32 industry associations, which are responsible for 75% of total carbon dioxide emissions from the industrial sector. A joint sub-committee of the relevant advisory bodies of METI annually reviews the plan’s progress. The Top Runner programme is a legally binding energy efficiency standard based on the Law Concerning Rational Use of Energy. It covers 11 products such as passenger vehicles, motor trucks, air-conditioners, etc. The targets are based on a product that has the highest energy efficiency performance of all the products in the same group in the market. This is a substantial change from previous standards, which were based on the average performance of product groups.

Energy conservation measures introduced after COP-3 are expected to achieve reductions in energy use of 46 Mtoe. The review of the 1998 Outlook concluded that a further reduction of 6.5 Mtoe by 2010 is possible by stronger energy conservation measures. Table 1 compares savings expected from measures introduced after COP-3 (the base case) and additional measures recommended in the review of the 1998 Outlook.

Table 1
Major Energy Conservation Policy Measures and Effects
(Mtoe)

Sector/Policy measure	*Base case*	*Policy case*
Industry Sector	18.59	18.96
Keidanren Voluntary Action Plan	18.59	18.59
Promotion of efficient industrial furnace	0	0.37
Residential/Commercial Sector	12.96	17.21
Efficiency standard for appliances	5	6.11
Efficiency standard for houses and buildings	7.96	7.96
Promotion of efficient appliances	0	0.83
Promotion of Home Energy Management System	0	0.83
Promotion of business energy management	0	1.48
Transport Sector	14.71	15.63
Efficiency standard for cars	5	5.46
Promotion of natural gas vehicles, hybrid vehicles, fuel-cell vehicles	0.74	1.20
Promotion of computer-based technology applications	8.97	8.97
Cross-sector Measures	0	0.92
Promotion of efficient boilers, laser and light technology	0	0.92
Total Energy Consumption Reduction	46.26	52.72

ENVIRONMENT

Approximately 90% of carbon dioxide produced in Japan is energy-related. Under the Kyoto Protocol (December 1997) Japan agreed to reduce greenhouse gas emissions by 6% compared with 1990 during the first commitment period between 2008 and 2012. Following the Kyoto conference, the Long-Term Supply and Demand Outlook was revised in June 1998 on the basis of the contribution of all six greenhouse gases, giving rise to the aim of stabilising carbon dioxide emissions by the energy sector at the 1990 level by 2010.

For the energy sector, policy is focused on strong energy conservation measures in the industry, residential/commercial, and transport sectors, and on the supply side, the promotion of nuclear power and renewable energy supplies.

OIL

Oil accounts for over 50% of Japan's primary energy supply. It is supplied largely from the Middle East. Security of oil supply continues to be the overriding consideration in the design of oil policies. The Japan National Oil Corporation (JNOC) is a government organisation established to secure international oil supplies from fields involving Japanese companies. Its functions include supporting overseas and domestic oil exploration and development by providing equity and loans to Japanese oil companies, and by undertaking research and development of oil exploration and production technology. Other than JNOC activities, exploration, development and refining are managed by private companies.

JNOC has been criticised because of debts incurred in its operations. JNOC has reviewed the performance of its operations and withdrawn from many projects. Privatisation or abolition of JNOC have been suggested by some critics.

In March 1999, a government advisory committee was established to recommend policies to promote petroleum and natural gas development by Japanese companies. The interim report, compiled in August 2000, pointed out the importance of forming core groups of Japanese companies to promote development. It also indicated the need to provide government support for buying assets such as productive oil fields, and to expand the use of natural gas. The government plans to implement elements of the committee's findings during 2001.

ELECTRICITY

There are nine general electric utilities supplying the four principal islands of Japan. A tenth company supplies Okinawa. All of the utilities are privately-owned and vertically-integrated, from generation to retail supply. Until 1995, the utilities enjoyed mutually exclusive supply areas, and interconnections remain limited.

As a result of amending the Electric Utility Industry Law in 1995[1], the electricity industry underwent a number of changes:

- Regulations on entry into the wholesale power market were abolished to promote new participants in the power generation sector, a bidding system was introduced for independent power producers, and regulations on access to the electricity transmission system were established.

1. Amendments to the Electric Utility Industry Law in 1995, and to the Gas Utility Industry Law in 1994, are discussed in greater detail in *Energy Policies of IEA Countries, Japan 1999 Review* (OECD/IEA, 1999).

- A wheeling service for the distribution of wholesale electricity was established.

- The rate system was reformed through the promotion of load levelling and the introduction of yardstick assessment.

With the amendment of the Electric Utility Industry Law in 1999 (effective from March 2000), a number of reforms were implemented to further introduce the principle of competition, and to minimise administrative interventions:

- Partial liberalisation of retail supply to extra high-voltage customers.

- Introduction of a notification system when reducing electricity rates, to avoid unfair competition.

Eligible consumers use 2,000 kW or more of electricity at 20 kV or more. Consumption by this sector accounts for about 30% of Japan's total electricity supply, comparable to the level of market liberalisation required in the European Union. Within the liberalised sector, any entity can in principle enter the market, and any electricity producer can supply electricity to eligible customers. No rate regulations or supply obligations are imposed on new electric power companies, but the existing regional electricity companies have an obligation to supply in the event of a failure to supply by the new companies. Table 2 lists new entrants into the market.

Table 2
Electricity Generation - New Entrants

Generator	*Capacity (MW)*	*Customer*
Diamond Power (Mitsubishi)	207	METI, NKK headquarters, Nissan headquarters, and others
Asahi Glass	41	Nippon Steel Corporation (for wholesale)
eREX (Nittan Capital Group, Ueda Yagi Tanshi, Mitsui, and others)	33	Kagoshima Prefecture office
Nippon Steel Corporation headquarters, Kyushu University	31	Fukuoka municipal office, Toyota T
Ennet (NTT, Tokyo Gas, Osaka Gas)	93	Osaka Prefecture office, NTT group office, Osaka Gas headquarters, and others
Summit Energy (Sumitomo)	54	Sumitomo Trading Corporation headquarters
Daio Paper	506	Taisei Paper
Marubeni	32	To be decided
Sanix	74	To be decided

In March 2000, a bill was submitted to the Diet to eliminate the antimonopoly exemption for electricity and some other sectors. This law will increase the involvement of the Japan Fair Trade Commission in the electricity supply industry that, until now, was limited.

GAS

Japan imports natural gas in the form of liquefied natural gas (LNG), and produces liquefied petroleum gas (LPG) and small quantities of natural gas. Most natural gas is used in power plants and by consumers in other sectors close to the major LNG terminals in Tokyo, Nagoya and Osaka, which have only limited pipeline networks. Japan has the smallest gas transmission network of any major gas-using country. There are many vertically-integrated regional companies, most of which produce or import their own gas. Three companies, Tokyo Gas, Osaka Gas and Toho Gas, account for over 75% of the market of the gas utilities. Natural gas accounts for over 85% of all gas sold in Japan, and LPG for the remaining 15%.

The Gas Utility Industry Law was amended in 1994 to allow the following:

- Gas prices for larger consumers to be negotiated freely between the parties involved.

- Entities other than general gas suppliers to supply gas in areas outside their supply areas and in areas supplied by other companies.

Further amendments effective from November 1999 implemented the following reforms aimed at further stepping up competition in this sector:

- The definition of large consumers was lowered from two million cubic metres and over to one million cubic metres and over.

- Rules on gas transmission by pipeline were established, the Regional Gas Industry Co-ordination Council was abolished, and the criteria for entering the household gas market were clarified.

Reforms in the electricity and gas sectors will be reviewed every three years to determine if further measures are necessary.

NUCLEAR

Nuclear power is highly regarded in Japan on the grounds of the stability of fuel supply and fuel price, economical performance and the environment. On the supply side, nuclear power is seen as the best option for meeting both energy security and climate policy objectives. Standardised advanced boiling water reactors are being developed as the mainstay of Japanese nuclear power generation in the future. At present, there are 23 pressurised water reactors, 26 boiling water reactors, and two advanced boiling water reactors. Total installed nuclear capacity is 45 GW, producing over one-third of Japan's power requirements. The review of the 1998 Outlook considered the impact of nuclear power on energy supply. In 1998, the government planned to increase the proportion of electricity generated by nuclear to 42% by 2010. This would have required the construction of 16-20 reactors. The review of the 1998 Outlook assumed an additional 10-13 nuclear power plants. A case was also studied under the assumption that there would be no additional nuclear power plants. This case forecast a doubling in carbon emissions relative to 1990, and a very significant negative impact on the economy.

Accidents at the Tokaimura reprocessing plant in 1997 and the nuclear fuel conversion plant in 1999 have adversely affected public attitudes to nuclear power in Japan. Quality problems with mixed oxide fuel rods prepared by British Nuclear Fuels Limited have also affected public confidence in the government's policy to use mixed oxide fuels in Japanese reactors.

In November 2000, the Atomic Energy Commission prepared a new long-term programme for the systematic implementation of research, development and utilisation of nuclear energy in Japan. The programme has two parts.

- Part I includes commitments to the Japanese people and the international community on nuclear energy.

- Part II includes specific proposals for promoting nuclear research, development and utilisation, including research and development on innovative nuclear reactors with high economic efficiency and safety, suitable for diversified energy supply applications such as heat utilisation.

The programme was released to the Japanese people, the international community, and all those employed in the nuclear power industry in Japan to raise understanding of these issues.

The government has taken steps to improve public confidence in nuclear power, including promulgation of the Special Law for Nuclear Disaster Measures, and major reinforcement of nuclear safety regulation. In addition, the Specified Radioactive Waste Final Disposal Act was announced in June 2000, which creates the legislative framework for the final disposal system of high-level radioactive waste in Japan. Based on the legislation, the Nuclear Waste Management Organization of Japan (NUMO) was established in October 2000.

COAL

Japan is by far the world's largest importer of steam coal for power generation, paper pulp and cement production. Japan also maintains heavily subsidised coal production, in part on security grounds and to support the development of coal technology. Production has declined under competitive pressure from imported coal from about 55 Mt in the early 1960s to 3.1 Mt in 2000. Support for the coal industry is analysed in Table 3.

Table 3

IEA Secretariat Estimates of Assistance to Japanese Coal Producers

	Fiscal Years (1 April - 31 March)									
Assistance Category [a]	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000p*
I. ASSISTANCE INCLUDED IN PRODUCER SUBSIDY EQUIVALENT										
1. Direct aid to current production										
a) Grants for modernising coal pits	4.2	4.2	4.0	3.3	3.2	1.9	1.9	1.4	0.9	0.9
b) Grants for stabilising the coal industry	6.7	5.8	3.6	4.3	3.5	2.4	2.4	1.2	0.6	0.6
c) Grants to improve safety conditions	3.5	3.2	3.1	2.9	2.1	2.1	3.0	2.4	2.2	1.6
d) Grants for paying off interest on loans	2.6	2.0	1.1	0.7	0.5	0.3	0.2	0.1	0.0	0.0
Subtotal	**17.0**	**15.2**	**11.8**	**11.2**	**9.3**	**6.7**	**7.5**	**5.1**	**3.7**	**3.1**
2. Price support [b]										
e) On coal consumed by electricity producers and non-ferrous industries	105.6	94.4	81.8	86.5	84.5	76.5	71.9	51.6	36.2	39.2
f) On coal consumed by iron and steel and gas coke producers	7.6	0	0	0	0	0	0	0	0	0
Sub-total	**113.2**	**94.4**	**81.8**	**86.5**	**84.5**	**76.5**	**71.9**	**51.6**	**36.2**	**39.2**
Total PSE (billion Yen)	**130.2**	**109.6**	**93.6**	**97.7**	**93.8**	**83.2**	**79.4**	**56.7**	**39.9**	**42.3**
Total PSE (million US$)	**899**	**815**	**739**	**879**	**918**	**884**	**729**	**469**	**306**	**376**
Yen per tonne produced	**16 316**	**13 819**	**12 313**	**13 558**	**13 709**	**13 171**	**12 869**	**14 270**	**10 790**	**11 463**
US$ per tonne produced	**113**	**103**	**97**	**122**	**134**	**140**	**118**	**118**	**83**	**102**
Yen per tonne sold	17 190	17 140	16 370	16 410	16 650	16 760	16 820	15 740	14 810	14 350
Production (million tonnes)	7.980	7.931	7.602	7.206	6.842	6.317	6.166	3.970	3.698	3 690
US$/Yen exchange rate (OECD figures)	144.8	134.5	126.7	111.2	102.2	94.1	108.8	121.0	130.4	112.4

Table 3 (continued)

IEA Secretariat Estimates of Assistance to Japanese Coal Producers

	Fiscal Years (1 April - 31 March)									
Assistance Category [a]	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000p*
II. ASSISTANCE NOT BENEFITING CURRENT PRODUCTION										
1. Regional economic development and aid for work training										
g) Regional economic development aid to coal mining districts	8.0	8.0	10.3	11.5	11.4	11.3	11.7	8.5	8.9	7.1
h) Worker retraining	17.4	15.6	14.3	13.4	13.4	13.8	13.2	12.0	11.1	10.1
2. i) Grants to offset the costs of closing collieries	2.8	0.0	3.7	0.0	2.5	4.3	0.0	0.0	0.3	0.0
3. j) Grants to help pay for past subsidence damage	39.1	31.4	33.0	35.5	45.1	49.0	45.6	44.2	48.3	40.7
4. k) Coal-related R&D	20.1	19.5	25.2	25.1	26.2	27.1	21.0	18.1	14.8	12.5
Total aid not benefiting current production (billion Yen)	87.4	74.5	86.5	85.5	98.6	105.5	91.5	82.8	83.4	70.4

p Preliminary data, subject to revision.

[a] Definitions of categories are in Appendix D of *Coal Prospects and Policies in IEA Countries: 1987 Review* (Paris: OECD, 1988)

[b] Includes benefits to coal producers arising from differences between prices in external markets and those established under domestic agreements.

Source: MITI.

RENEWABLES

Development of renewable and non-conventional energy sources (know in Japan as "new energies") is considered necessary to reduce oil dependence and to assist in environmental protection. The target for the share of new energies in total primary energy supply is about 3% in financial year 2010. Table 4 compares the shares achieved in 1999, the targets set on the basis of measures introduced after COP-3 (the base case), and targets recommended in the review of the 1998 Outlook (the policy case).

Table 4
New and Renewable Energy Targets for 2010
(Mtoe)

Technology	*1999*	*Base case*	*Policy case*
Solar Energy	**0.96**	**1.24**	**5.15**
Photovoltaic cells	0.05	0.57	1.09
Solar heat use	0.91	0.67	4.06
Wind Power	**0.03**	**0.30**	**1.24**
Biomass	**4.28**	**4.55**	**5.50**
Biomass-fired power	0.05	0.12	0.31
Biomass fuel use	0	0	0.62
Black liquor, pulp and paper waste	4.23	4.43	4.57
Wastes	**1.10**	**1.96**	**5.24**
Waste-fired power	1.06	1.92	5.11
Waste and residue derived fuel use	0.04	0.04	0.13
Waste Energy Recovery	**0.04**	**0.09**	**0.54**
Total	**6.41**	**8.14**	**17.67**

SWITZERLAND

GENERAL ENERGY POLICY

The current energy policy of Switzerland is defined in the Swiss Energy Action Plan ("SwissEnergy"), which was launched by the federal government in 2001 and replaced the Energy 2000 Action Plan. SwissEnergy summarises both energy policy objectives and the measures to be taken in co-operation with the cantons and the private sector. The key areas of the plan are energy efficiency in buildings, transport and industry, and the promotion of renewables.

In the plan, the government sets a target to reduce consumption of fossil fuels by 10% and to limit the increase of electricity consumption at 5% between 2000 and 2010. The share of non-hydro renewables in electricity generation is planned to increase from 2.2% in 1999 to 3.2% in 2010, i.e. by 0.5 TWh. Heat production is planned to increase by 10,800 TJ over the same period.

To meet the government targets and the objectives and measures introduced in SwissEnergy, many activities initiated under the Energy 2000 Action Plan will be continued. Important new measures are the voluntary agreements signed between the Federal Office of Energy and private energy agencies and organisations, mandatory labelling of motor vehicles and electric appliances, and energy efficiency standards for buildings. Other measures are financial contributions to cantonal programmes to support energy efficiency and renewables; funding for research and development, especially for renewables; and intensified dissemination of information on energy efficiency to the general public and those working in the energy sector.

ENERGY TAXES

The long-term objective of the federal government is to implement an energy tax reform based on ecological considerations. It is planning to work out a report (indicative strategic plan) on an ecological tax reform by the end of 2003. At the beginning of 1999, six tax proposals were pending. According to the CO_2 law which entered into force in 2000, the government could implement a CO_2 tax in 2004 at the earliest (see Energy and Environment) if Switzerland's national targets for reducing greenhouse gases cannot be reached with measures already in place. Proposals aiming at introducing energy levies for non-renewables were rejected in a public referendum in September 2001[1]. One

1. Two of the proposals were the popular "Solar Initiative" and a counter-proposal of the federal parliament that envisaged a tax whose revenue would be used for energy programmes. Another two proposals were the popular "Energy and Environment Initiative" and a counter-proposal of the federal parliament that envisaged incentive taxes.

popular tax initiative, "Tax on Energy, not Labour", is still pending. The initiative aims at improving energy efficiency in industry and households by introducing a tax on non-renewable energies and hydropower whose revenue would be used for reducing the costs of social insurance.

ENERGY SUPPLY AND DEMAND

Total energy supply was 26.7 Mtoe in 1999, representing moderate growth of 6.5% since 1990. Between 1990 and 1999, natural gas showed the sharpest growth (50%), followed by hydro and other renewables (40%) and nuclear (9.3%). Coal supply decreased by 74% and oil by 1.8%.

Final energy consumption increased by 9.0% between 1990 to 1999. Growth was strongest in the industrial sector (18%), followed by transport (9.9%) and residential and other sectors (4.4%). Final consumption of all fossil fuels increased by 7% and by 11% for electricity. The use of oil and gas increased while the use of coal decreased. As a result of policies to promote the use of renewables, the end use of geothermal, wind and solar energy increased by 85% and that of combustible renewables and waste by 22%. Despite the significant increases, their total contribution to final energy consumption was still only 3.9% in 1999. The increase in the use of district heating was 36%.

A recent study by the Federal Office of Energy estimates that total energy supply, final consumption and energy-related CO_2 emissions might, depending on the nuclear policy, remain approximately at the 1999 level until 2020. The study took into account the impact of emissions reduction measures already in place and those introduced by SwissEnergy.

ENERGY AND ENVIRONMENT

In 1999, energy-related CO_2 emissions remained at about the 1990 level. The Kyoto target for Switzerland is an 8% reduction in greenhouse gas emissions from 1990 levels in the first commitment period (2008-2012). The federal law on the reduction of CO_2 emissions took force on 1 May 2000. According to the law, total CO_2 emissions must be reduced by 10% by 2010 compared to 1990. CO_2 emissions from petrol and diesel must be cut by 8% and from other combustible fuels by 15%.

The CO_2 law is planned to be implemented in two stages. The first phase (2000-2004) emphasises voluntary measures by industries and households. If the reduction target is not likely to be met, a CO_2 tax on fossil fuels will be levied in the second phase, i.e. after 2004. In such a case, the CO_2 tax would not exceed CHF[2] 210 per tonne of CO_2. The tax rates will be set by the parliament in 2004

2. On average in 2000, the Swiss franc (CHF) equalled US$ 0.59 or €0.64.

based on the emission forecast at that stage. If a CO_2 tax is introduced, exemptions will be made for industries entering into legally-binding CO_2 reduction commitments with the government. The law also stipulates that the CO_2 tax must be revenue-neutral, i.e. that revenues must be returned to households on a per-capita basis and to the economy on a per-wage basis, to be used for social insurance.

ELECTRICITY

In 1999, electricity consumption grew by 2.1% to 58.1 TWh, reflecting economic growth. Electricity generation increased to 68.4 TWh in 1999, of which 10 TWh were net exports due to good weather conditions for hydropower. In 2000, weather was less favourable for hydro generation. Domestic generation fell by 2.0% and net exports were 7.1 TWh.

In December 2000, the Swiss federal parliament passed a law to liberalise the electricity sector. But it will only come into force if the public accepts it in a referendum in 2002. The law stipulates:

- Free and non-discriminatory access to the grid and cost-reflective pricing for grid access.
- Gradual opening of the Swiss electricity market.
- Creation of an independent transmission system operator.
- Continuation of the public service obligation.
- Financial measures to modernise and improve the performance of hydropower plants.

According to law, consumers of at least 20 GWh a year, and distributors for 20% of their sales volume, initially will become eligible for free market access. This corresponds to a 30% market opening. Three years after the initial market opening, consumers of at least 10 GWh a year and distributors, for 40% of their sales volume, will become eligible. This corresponds to a 50% market opening. Full market liberalisation for all consumers is planned six years after the initial opening.

Following consultations with the cantons, political parties and interested associations, the government forwarded the draft Nuclear Energy Law to parliament in February 2001. The government decided to use the draft law to counter two new “public initiatives”. The first initiative aims at banning the construction of new nuclear power plants until 2010. The other one demands the closure of all nuclear power plants after 30 years of operation. The main elements of the proposed law are:

- Possibility to build new nuclear power plants.
- No legal time limit on the operating licences of existing nuclear power plants.
- Possibility of a referendum in case of licences for the construction of new plants,
- Interdiction on the reprocessing nuclear fuel (existing contracts can be fulfilled).
- Provisions on the decommissioning of nuclear installations.
- Concept of monitored long-term geological disposal (combines elements of final disposal and reversibility).
- Funding system for decommissioning and waste management costs.
- Simplified licensing procedures.
- General possibility to appeal.

GAS

Gas demand increased by 50% between 1990 and 1999. The high-pressure pipeline system is being extended to respond to the increase in demand for domestic use and for transit to Italy. By 2002, transit capacity will have been doubled from 1998 levels. After capacity is increased, the federal government estimates that transit volume will reach 6 billion cubic metres (bcm) per year from Norway and 4 bcm per year from the Netherlands to Italy starting in mid-2001. Transmission capacity from France also has increased.

Switzerland is not an EU member country but since 1996 has studied possibilities to liberalise its gas market in line with developments in the EU. A draft law is being prepared and will be discussed after the electricity market referendum is held.

About 100 companies are currently active in the transmission and distribution of gas. Most of them belong to the public sector (communes and cantons). The seven largest distribute 50% of all gas consumed while about 50 of the smallest distribute altogether only 10%. Some communes are already paving the way towards a liberalised market, especially by removing their gas services from the general administrative authority ("depoliticisation") and making them independent, like private entities. This way, gas companies may act and react without having to refer to local governments or parliaments, which is essential in a fast-moving business environment.

OIL

Total oil supply decreased slightly from 13.46 Mtoe to 13.22 Mtoe between 1990 and 1999. As a result of price increases on the world market in 2000, oil prices in Switzerland reached their highest level since 1990. The average annual price of light fuel oil increased by two-thirds and natural gas prices rose by 12%, compared with 1999. This led to some substitution of fuel oil by gas.

In 1997, oil and gas exploration was resumed under the lead of SEAG (Schweizerische Erdöl AG) in co-operation with the American Forest Oil Corporation. Test drilling took place in Weiach, north-west of Zurich, in summer 2000. Because neither gas nor oil was found, it is uncertain whether drillings will continue in this area. Nevertheless, a 40-metre-thick layer of coal was discovered at a depth of 1,200 metres.

The largest (3.3 million tonnes per year) Swiss refinery, Raffinerie de Cressier, was sold by Shell to Dutch Petroplus in May 2000. However, Shell remains the largest client of the refinery. The second-largest refinery in Switzerland in Collombey belongs to Tamoil (Suisse) SA and has a capacity of 2.3 million tonnes per year. These two refineries account for nearly 40% of domestic oil sales.

The number of filling stations continues to decline. In 2000, 42 units were closed and the number of stations totalled at 3,610. However, the number of stations with convenience shops is increasing while the total of unattended ones is diminishing.

RENEWABLES

In 1999, the contribution of all renewables, including hydropower, to primary energy supply was 18.9%. During the last two years, electricity generation from non-hydro renewables has been increasing by 0.1 TWh per year and heat production by 1,400 TJ per year. Heat is mainly produced from wood-based biomass, solar energy and co-generation from waste. The use of heat pump applications is also increasing.

SwissEnergy is continuing to implement the measures to promote renewables of the Energy 2000 Action Plan. These include close co-operation between the federal government and private associations, information campaigns and support for RD&D programmes. The federal budget for RD&D programmes for renewables has been on average CHF 37 million per year. Private companies and the cantons have been investing an additional CHF 10 million per year on a voluntary basis in the promotion of renewables. The same level of investments is planned to continue for the next few years.

The proposed federal law on electricity markets (see Electricity above) contains regulations to promote renewable energy. The law introduces the possibility of exceptionally granting federal loans to hydropower plants for necessary modernisation and for bridging financial bottlenecks in case of stranded investments. It introduces exemptions from network access fees for electricity generated in small-scale renewable plants for ten years, immediate access to the market for consumers purchasing power from small plants using renewables, and a new mechanism for financing preferential pricing for electricity supplied by qualified independent power producers using renewables. The law also envisages improved information for consumers on the origin and use of energy for power generation.

RESEARCH AND TECHNOLOGY

In November 1999, the federal government adopted the fifth Swiss Federal Energy Research Concept for 2000-2003. The purpose of the concept is to focus research activities on ways to most effectively meet the federal government's energy policy objectives. It sets a framework for collaboration between the federal administration, the cantons and the local authorities. The concept also includes plans for RD&D for the four-year period and estimates of required public funding. One of the main objectives of the Swiss energy research is to achieve sustainable development through significant reductions of CO_2 emissions. The Swiss Federal Office of Energy, counselled by the Federal Energy Research Commission, is responsible for implementing the concept and ensuring that results find practical applications.

The publicly-funded programmes concentrate on applied research and pilot and demonstration projects. The four priority research areas are:

- Energy efficiency: rational and more efficient energy use in all sectors but particularly in buildings; development of combustion engine processes; development of co-generation (including electricity, heating and cooling); heat pump technologies.

- Renewables: increasing the use of hydropower and wood-based biomass; reducing the cost and improving the efficiency of various technologies; studies in geothermal, wind and small-scale hydropower; solar chemistry including the use of hydrogen (fuel cells).

- Nuclear energy: reactor security; radioactive wastes disposal; transmutation of wastes associated with nuclear fission technologies; and participation in international fusion research through demonstration projects (e.g. Tokamak TCV).

- Economic, ecological and social impacts (including general acceptability) of energy policies and technologies; technology transfer.

Annual public funding for energy RD&D was about CHF 180 million for the past three years (1998-2000). In 1999, 34% of the budget was dedicated to international co-operation, such as the IEA Implementing Agreements and the EU Framework Programmes. About 37% of the budget was allocated for research on renewables, 31% for rational use of energy, 26% for nuclear energy and 7% for research on measures related to energy policy.

Energy balances and key statistical data of IEA countries

AUSTRALIA

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit: Mtoe

SUPPLY		1973	1990	1998	1999	2005	2010	2020
TOTAL PRODUCTION		**68.0**	**157.7**	**213.8**	**212.2**	**248.6**	**280.4**	**..**
Coal[1]		40.3	106.3	149.3	153.3	169.6	185.4	..
Oil		19.8	29.0	31.1	25.1	30.4	29.4	..
Gas		3.4	17.1	26.6	27.1	41.4	58.0	..
Comb. Renewables & Wastes[2]		3.5	4.0	5.3	5.3	5.5	5.8	..
Nuclear		–	–	–	–	–	–	..
Hydro		1.0	1.2	1.4	1.4	1.5	1.5	..
Geothermal		–	..	..	..	–	–	..
Solar / Wind / Other[3]		–	0.1	0.1	0.1	0.1	0.2	..
TOTAL NET IMPORTS[4]		**–10.3**	**–65.7**	**–108.9**	**–108.3**	**–129.0**	**–152.6**	**..**
Coal[1]	Exports	17.6	67.7	104.7	109.5	125.4	141.1	..
	Imports	–	–	–	–	–	–	..
	Net Imports	–17.6	–67.7	–104.7	–109.5	–125.4	–141.1	..
Oil	Exports	3.4	9.3	18.4	17.2	22.2	24.4	..
	Imports	12.5	14.2	23.7	28.0	32.9	38.9	..
	Bunkers	1.8	0.6	0.7	0.8	0.9	0.9	..
	Net Imports	7.4	4.3	4.6	10.1	9.8	13.6	..
Gas	Exports	–	2.3	8.9	8.9	13.4	25.1	..
	Imports	–	–	–	–	–	–	..
	Net Imports	–	–2.3	–8.9	–8.9	–13.4	–25.1	..
Electricity	Exports	–	–	–	–	–	–	..
	Imports	–	–	–	–	–	–	..
	Net Imports	–	–	–	–	–	–	..
TOTAL STOCK CHANGES		**–0.1**	**–4.5**	**–0.5**	**4.0**	**–**	**–**	**..**
TOTAL SUPPLY (TPES)		**57.6**	**87.5**	**104.4**	**107.9**	**119.6**	**127.7**	**..**
Coal[1]		22.6	35.0	44.8	47.4	44.3	44.3	..
Oil		27.1	32.5	35.1	35.6	40.2	43.0	..
Gas		3.4	14.8	17.7	18.2	27.9	32.9	..
Comb. Renewables & Wastes[2]		3.5	4.0	5.3	5.3	5.5	5.8	..
Nuclear		–	–	–	–	–	–	..
Hydro		1.0	1.2	1.4	1.4	1.5	1.5	..
Geothermal		–	..	..	..	–	–	..
Solar / Wind / Other[3]		–	0.1	0.1	0.1	0.1	0.2	..
Electricity Trade[5]		–	–	–	–	–	–	..
Shares (%)								
Coal		*39.2*	*39.9*	*42.9*	*43.9*	*37.0*	*34.7*	..
Oil		*47.1*	*37.2*	*33.6*	*33.0*	*33.6*	*33.7*	..
Gas		*5.9*	*16.9*	*17.0*	*16.9*	*23.4*	*25.8*	..
Comb. Renewables & Wastes		*6.1*	*4.5*	*5.1*	*4.9*	*4.6*	*4.6*	..
Nuclear		–	–	–	–	–	–	..
Hydro		*1.7*	*1.4*	*1.3*	*1.3*	*1.3*	*1.2*	..
Geothermal		–	..	..	..	–	–	..
Solar / Wind / Other		–	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	..
Electricity Trade		–	–	–	–	–	–	..

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

Please note: All data except GDP and population refer to the fiscal year July to June.

Unit: Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	1998	1999	2005	2010	2020
TFC	**40.0**	**58.1**	**69.0**	**69.9**	**78.4**	**84.5**	**..**
Coal[1]	4.9	4.3	4.3	4.2	3.7	3.7	..
Oil	24.7	30.5	35.6	36.0	37.2	40.0	..
Gas	2.4	8.8	10.7	10.8	16.1	18.1	..
Comb. Renewables & Wastes[2]	3.5	3.3	4.3	4.3	5.0	5.2	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	0.1	0.1	0.1	0.1	0.2	..
Electricity	4.5	11.1	14.0	14.5	16.3	17.4	..
Heat	–	–	–	–	–	–	..
Shares (%)							
Coal	*12.3*	*7.4*	*6.3*	*6.1*	*4.7*	*4.4*	..
Oil	*61.7*	*52.6*	*51.5*	*51.5*	*47.5*	*47.3*	..
Gas	*5.9*	*15.2*	*15.5*	*15.5*	*20.5*	*21.4*	..
Comb. Renewables & Wastes	*8.7*	*5.6*	*6.2*	*6.1*	*6.4*	*6.1*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	*0.1*	*0.1*	*0.1*	*0.2*	*0.2*	..
Electricity	*11.3*	*19.1*	*20.3*	*20.7*	*20.7*	*20.6*	..
Heat	–	–	–	–	–	–	..
TOTAL INDUSTRY[6]	**17.6**	**23.1**	**27.0**	**27.2**	**31.8**	**34.1**	**..**
Coal[1]	4.6	4.1	4.2	4.1	3.5	3.6	..
Oil	7.7	6.3	7.2	7.2	5.8	6.1	..
Gas	1.8	6.1	6.9	7.0	11.8	13.1	..
Comb. Renewables & Wastes[2]	1.5	1.5	2.4	2.4	3.3	3.5	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	2.0	5.1	6.3	6.5	7.4	7.8	..
Heat	–	–	–	–	–	–	..
Shares (%)							
Coal	*26.4*	*17.6*	*15.5*	*15.1*	*11.0*	*10.4*	..
Oil	*43.8*	*27.4*	*26.6*	*26.4*	*18.3*	*18.0*	..
Gas	*10.0*	*26.5*	*25.7*	*25.8*	*37.2*	*38.4*	..
Comb. Renewables & Wastes	*8.5*	*6.4*	*8.9*	*8.8*	*10.3*	*10.3*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	*11.3*	*22.0*	*23.3*	*23.9*	*23.3*	*22.9*	..
Heat	–	–	–	–	–	–	..
TRANSPORT[7]	**13.5**	**22.7**	**27.0**	**27.4**	**29.8**	**32.3**	**..**
TOTAL OTHER SECTORS[8]	**8.9**	**12.3**	**15.1**	**15.3**	**16.9**	**18.1**	**..**
Coal[1]	0.3	0.1	0.1	0.0	0.1	0.1	..
Oil	3.5	1.8	2.0	2.0	2.2	2.3	..
Gas	0.6	2.7	3.6	3.6	4.1	4.6	..
Comb. Renewables & Wastes[2]	2.0	1.8	1.9	1.9	1.7	1.7	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	0.1	0.1	0.1	0.1	0.2	..
Electricity	2.5	5.9	7.6	7.8	8.6	9.3	..
Heat	–	–	–	–	–	–	..
Shares (%)							
Coal	*3.2*	*1.1*	*0.4*	*0.3*	*0.4*	*0.4*	..
Oil	*39.7*	*14.2*	*13.1*	*13.0*	*13.0*	*12.9*	..
Gas	*7.0*	*21.8*	*23.6*	*23.2*	*24.4*	*25.2*	..
Comb. Renewables & Wastes	*22.5*	*14.4*	*12.4*	*12.1*	*10.3*	*9.1*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	*0.7*	*0.6*	*0.6*	*0.8*	*1.0*	..
Electricity	*27.7*	*47.7*	*50.0*	*50.8*	*51.0*	*51.3*	..
Heat	–	–	–	–	–	–	..

Unit: Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	1998	1999	2005	2010	2020
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**16.0**	**35.1**	**45.1**	**47.3**	**48.1**	**49.9**	**..**
OUTPUT (Mtoe)	**5.5**	**13.3**	**16.8**	**17.5**	**19.1**	**20.3**	**..**
(TWh gross)	64.4	154.3	195.6	203.0	221.6	236.1	..
Output Shares (%)							
Coal	*74.9*	*77.1*	*79.5*	*78.1*	*73.1*	*70.5*	..
Oil	*2.6*	*2.7*	*1.4*	*1.3*	*0.8*	*0.7*	..
Gas	*4.3*	*10.6*	*8.9*	*10.6*	*17.1*	*20.0*	..
Comb. Renewables & Wastes	*0.5*	*0.4*	*2.1*	*1.8*	*1.0*	*1.3*	..
Nuclear	–	–	–	–	–	–	..
Hydro	*17.7*	*9.2*	*8.1*	*8.2*	*7.9*	*7.5*	..
Geothermal	–	–	–	–	–	–	..
Solar/Wind/Other	–	–	*0.0*	*0.0*	..	..	..
TOTAL LOSSES	**17.8**	**29.3**	**38.8**	**40.2**	**41.1**	**43.3**	**..**
of which:							
Electricity and Heat Generation[10]	10.5	21.7	28.2	29.8	29.5	29.6	..
Other Transformation	5.5	0.6	1.8	1.5	2.7	2.7	..
Own Use and Losses[11]	1.7	7.0	8.8	8.9	9.0	11.0	..
Statistical Differences	**–0.1**	**0.2**	**–3.5**	**–2.2**	**–**	**–**	**..**

INDICATORS

	1973	1990	1998	1999	2005	2010	2020
GDP (billion 1995 US$)	193.56	318.14	427.92	446.61	549.00	642.64	..
Population (millions)	13.51	17.09	18.73	18.97	20.36	21.49	..
TPES/GDP[12]	0.30	0.28	0.24	0.24	0.22	0.20	..
Energy Production/TPES	1.18	1.80	2.05	1.97	2.08	2.20	..
Per Capita TPES[13]	4.27	5.12	5.57	5.69	5.87	5.94	..
Oil Supply/GDP[12]	0.14	0.10	0.08	0.08	0.07	0.07	..
TFC/GDP[12]	0.21	0.18	0.16	0.16	0.14	0.13	..
Per Capita TFC[13]	2.96	3.40	3.69	3.68	3.85	3.93	..
Energy-related CO_2 Emissions (Mt CO2)[14]	173.9	259.8	308.6	321.6	344.6	364.1	..
CO_2 Emissions from Bunkers (Mt CO_2)	7.3	6.3	9.3	9.7	9.9	10.1	..

GROWTH RATES (% per year)

	73–79	79–90	90–98	98–99	99–05	05–10	10–20
TPES	3.0	2.2	2.2	3.4	1.7	1.3	..
Coal	1.5	3.2	3.1	5.8	–1.1	0.0	..
Oil	2.9	0.1	1.0	1.3	2.1	1.4	..
Gas	12.7	7.1	2.3	2.8	7.4	3.3	..
Comb. Renewables & Wastes	0.1	1.0	3.8	–1.1	0.8	1.0	..
Nuclear	–	–	–	–	–	–	..
Hydro	5.1	–0.7	1.4	5.6	0.8	0.2	..
Geothermal	–	–	–	–	–	–	..
Solar/Wind/Other	–	17.3	1.5	5.5	6.1	5.5	..
TFC	2.5	2.1	2.2	1.2	1.9	1.5	..
Electricity Consumption	6.3	5.0	3.0	3.3	1.9	1.3	..
Energy Production	3.9	5.7	3.9	–0.7	2.7	2.4	..
Net Oil Imports	4.2	–6.9	0.8	120.4	–0.5	6.8	..
GDP	2.7	3.1	3.8	4.4	3.5	3.2	..
Growth in the TPES/GDP Ratio	0.3	–0.8	–1.5	–0.9	–1.7	–1.8	..
Growth in the TFC/GDP Ratio	–0.2	–1.0	–1.5	–3.0	–1.5	–1.7	..

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

AUSTRIA

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit: Mtoe

SUPPLY		1973	1990	1998	1999	2005	2010	2020
TOTAL PRODUCTION		**7.9**	**8.3**	**9.0**	**9.5**	**9.7**	**9.9**	**..**
Coal[1]		1.0	0.6	0.3	0.3	0.1	0.1	..
Oil		2.7	1.2	1.0	1.0	0.7	0.6	..
Gas		2.0	1.1	1.3	1.5	1.3	1.0	..
Comb. Renewables & Wastes[2]		0.7	2.7	3.2	3.2	3.9	4.4	..
Nuclear		–	–	–	–	–	–	..
Hydro		1.6	2.7	3.2	3.5	3.5	3.6	..
Geothermal		–	–	–	0.0	–	–	..
Solar/Wind/Other[3]		–	–	–	0.1	0.2	0.3	..
TOTAL NET IMPORTS[4]		**14.0**	**17.2**	**19.6**	**18.8**	**21.1**	**22.9**	**..**
Coal[1]	Exports	0.1	0.0	–	0.0	–	–	..
	Imports	3.1	3.1	3.0	2.7	2.0	1.8	..
	Net Imports	3.0	3.1	3.0	2.7	2.0	1.8	..
Oil	Exports	0.1	0.4	1.6	1.6	0.9	0.9	..
	Imports	9.9	10.0	12.9	12.6	11.4	11.6	..
	Bunkers	–	–	–	–	–	–	..
	Net Imports	9.7	9.6	11.3	11.0	10.5	10.7	..
Gas	Exports	–	–	–	–	0.0	0.0	..
	Imports	1.3	4.5	5.3	5.2	8.7	10.5	..
	Net Imports	1.3	4.5	5.3	5.2	8.7	10.4	..
Electricity	Exports	0.4	0.6	0.9	1.2	0.8	0.8	..
	Imports	0.3	0.6	0.9	1.0	0.7	0.8	..
	Net Imports	–0.1	–0.0	–0.0	–0.2	–0.1	–0.0	..
TOTAL STOCK CHANGES		**–0.3**	**–0.3**	**–0.2**	**0.1**	**–**	**–**	**..**
TOTAL SUPPLY (TPES)		**21.7**	**25.2**	**28.3**	**28.4**	**30.8**	**32.8**	**..**
Coal[1]		3.9	4.1	3.2	3.1	2.1	1.9	..
Oil		12.3	10.4	12.0	11.9	11.1	11.2	..
Gas		3.3	5.2	6.7	6.8	10.0	11.5	..
Comb. Renewables & Wastes[2]		0.7	2.8	3.2	3.2	4.0	4.5	..
Nuclear		–	–	–	–	–	–	..
Hydro		1.6	2.7	3.2	3.5	3.5	3.6	..
Geothermal		–	–	–	0.0	–	–	..
Solar/Wind/Other[3]		–	–	–	0.1	0.2	0.3	..
Electricity Trade[5]		–0.1	–0.0	–0.0	–0.2	–0.1	–0.0	..
Shares (%)								
Coal		*17.9*	*16.4*	*11.4*	*10.7*	*6.8*	*5.6*	..
Oil		*56.7*	*41.3*	*42.3*	*41.9*	*36.2*	*34.2*	..
Gas		*15.3*	*20.8*	*23.7*	*24.0*	*32.3*	*34.9*	..
Comb. Renewables & Wastes		*3.3*	*10.9*	*11.3*	*11.4*	*12.9*	*13.7*	..
Nuclear		–	–	–	–	–	–	..
Hydro		*7.4*	*10.7*	*11.3*	*12.2*	*11.3*	*11.0*	..
Geothermal		–	–	–	–	–	–	..
Solar/Wind/Other		–	–	–	*0.2*	*0.7*	*0.8*	..
Electricity Trade		*–0.6*	*–0.2*	–	*–0.6*	*–0.3*	*–0.1*	..

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

Please note: Forecasts are based on the 1996 submission. Forecasts for final consumption by sector are IEA Secretariat estimates.

Unit: Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	1998	1999	2005	2010	2020
TFC	**16.8**	**20.9**	**24.0**	**24.2**	**26.6**	**28.4**	**..**
Coal[1]	2.0	1.6	1.3	1.1	1.5	1.4	..
Oil	10.2	9.3	10.9	10.9	10.3	10.4	..
Gas	1.8	3.1	4.1	4.3	6.1	6.9	..
Comb. Renewables & Wastes[2]	0.7	2.5	2.5	2.5	2.7	2.9	..
Geothermal	–	–	–	0.0	–	–	..
Solar / Wind / Other	–	–	–	0.1	0.1	0.1	..
Electricity	2.2	3.7	4.3	4.3	4.7	5.3	..
Heat	–	0.6	1.0	1.0	1.3	1.4	..
Shares (%)							
Coal	*11.8*	*7.5*	*5.3*	*4.7*	*5.6*	*5.0*	..
Oil	*60.4*	*44.8*	*45.3*	*44.9*	*38.8*	*36.7*	..
Gas	*10.8*	*14.8*	*16.9*	*17.7*	*22.8*	*24.4*	..
Comb. Renewables & Wastes	*4.1*	*12.2*	*10.6*	*10.5*	*10.1*	*10.0*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	*0.3*	*0.2*	*0.2*	..
Electricity	*12.9*	*17.8*	*17.9*	*17.8*	*17.8*	*18.7*	..
Heat	–	*2.9*	*4.0*	*4.2*	*4.7*	*4.9*	..
TOTAL INDUSTRY[6]	**6.4**	**7.1**	**7.8**	**7.3**	**8.8**	**9.4**	**..**
Coal[1]	0.7	0.9	0.9	0.8	1.1	1.0	..
Oil	3.3	2.3	2.2	2.1	2.5	2.5	..
Gas	1.2	1.8	2.4	2.3	2.8	3.2	..
Comb. Renewables & Wastes[2]	0.0	0.4	0.6	0.6	0.5	0.6	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	1.0	1.6	1.7	1.4	1.8	2.1	..
Heat	–	0.1	0.1	0.1	0.1	0.1	..
Shares (%)							
Coal	*11.6*	*12.5*	*11.5*	*11.0*	*11.9*	*10.6*	..
Oil	*52.3*	*32.9*	*28.1*	*28.3*	*28.0*	*26.2*	..
Gas	*19.2*	*26.2*	*30.4*	*31.2*	*31.9*	*33.9*	..
Comb. Renewables & Wastes	*0.5*	*5.3*	*7.1*	*8.1*	*5.9*	*5.8*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	*16.3*	*22.1*	*21.4*	*19.8*	*20.9*	*22.0*	..
Heat	–	*1.0*	*1.5*	*1.6*	*1.4*	*1.5*	..
TRANSPORT[7]	**4.0**	**5.5**	**6.4**	**6.5**	**6.2**	**6.3**	**..**
TOTAL OTHER SECTORS[8]	**6.4**	**8.3**	**9.8**	**10.4**	**11.6**	**12.7**	**..**
Coal[1]	1.1	0.7	0.4	0.3	0.4	0.4	..
Oil	3.1	1.8	2.7	2.7	2.1	2.1	..
Gas	0.6	1.2	1.5	1.8	3.2	3.7	..
Comb. Renewables & Wastes[2]	0.7	2.2	2.0	2.0	2.2	2.3	..
Geothermal	–	–	–	0.0	–	–	..
Solar / Wind / Other	–	–	–	0.1	0.1	0.1	..
Electricity	1.0	1.9	2.3	2.7	2.6	2.9	..
Heat	–	0.5	0.8	0.9	1.1	1.3	..
Shares (%)							
Coal	*17.6*	*8.1*	*3.7*	*3.2*	*3.6*	*3.2*	..
Oil	*47.8*	*21.4*	*27.6*	*25.6*	*17.6*	*16.4*	..
Gas	*9.2*	*14.7*	*15.8*	*17.5*	*27.7*	*29.2*	..
Comb. Renewables & Wastes	*10.2*	*26.1*	*20.4*	*18.8*	*18.6*	*18.1*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	*0.6*	*0.5*	*0.6*	..
Electricity	*15.3*	*23.2*	*23.9*	*25.6*	*22.1*	*22.8*	..
Heat	–	*6.5*	*8.7*	*8.7*	*9.8*	*9.9*	..

Unit: Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	1998	1999	2005	2010	2020
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**4.9**	**7.3**	**8.1**	**8.4**	**9.2**	**10.1**	**..**
OUTPUT (Mtoe)	**2.7**	**4.2**	**4.8**	**5.1**	**5.1**	**5.6**	**..**
(TWh gross)	30.9	49.4	56.1	59.2	59.8	64.9	..
Output Shares (%)							
Coal	*10.3*	*14.8*	*9.0*	*9.1*	*2.3*	*1.4*	..
Oil	*14.1*	*4.4*	*5.5*	*4.7*	*1.5*	*1.2*	..
Gas	*14.3*	*14.8*	*15.8*	*14.7*	*20.9*	*23.3*	..
Comb. Renewables & Wastes	*0.7*	*2.3*	*3.0*	*3.0*	*7.0*	*8.3*	..
Nuclear	–	–	–	–	–	–	..
Hydro	*60.6*	*63.7*	*66.6*	*68.4*	*68.2*	*65.8*	..
Geothermal	–	–	–	–	–	–	..
Solar/Wind/Other	–	–	–	*0.1*	–	–	..
TOTAL LOSSES	**4.7**	**4.2**	**4.3**	**4.3**	**4.1**	**4.5**	**..**
of which:							
Electricity and Heat Generation[10]	2.2	2.4	2.2	2.2	2.6	2.9	..
Other Transformation	1.3	0.3	0.4	0.2	0.3	0.3	..
Own Use and Losses[11]	1.2	1.5	1.7	1.9	1.2	1.2	..
Statistical Differences	**0.1**	**0.1**	**–0.0**	**–0.1**	**–**	**–**	**..**

INDICATORS

	1973	1990	1998	1999	2005	2010	2020
GDP (billion 1995 US$)	138.55	212.47	250.97	258.05	290.61	320.86	..
Population (millions)	7.57	7.72	8.08	8.09	8.15	8.20	..
TPES/GDP[12]	0.16	0.12	0.11	0.11	0.11	0.10	..
Energy Production/TPES	0.37	0.33	0.32	0.33	0.31	0.30	..
Per Capita TPES[13]	2.86	3.27	3.51	3.51	3.77	4.00	..
Oil Supply/GDP[12]	0.09	0.05	0.05	0.05	0.04	0.03	..
TFC/GDP[12]	0.12	0.10	0.10	0.09	0.09	0.09	..
Per Capita TFC[13]	2.22	2.70	2.97	2.99	3.27	3.46	..
Energy-related CO_2 Emissions (Mt CO_2)[14]	57.6	57.0	61.0	60.5	61.6	64.3	..
CO_2 Emissions from Bunkers (Mt CO_2)	0.3	0.9	1.6	1.5	1.5	1.5	..

GROWTH RATES (% per year)

	73–79	79–90	90–98	98–99	99–05	05–10	10–20
TPES	1.6	0.5	1.5	0.3	1.3	1.3	..
Coal	–1.1	1.2	–3.1	–5.2	–6.1	–2.4	..
Oil	0.7	–1.9	1.8	–0.5	–1.1	0.1	..
Gas	4.6	1.7	3.2	1.5	6.5	2.8	..
Comb. Renewables & Wastes	6.3	9.3	1.9	0.9	3.5	2.4	..
Nuclear	–	–	–	–	–	–	..
Hydro	6.7	1.2	2.2	8.3	–0.1	0.7	..
Geothermal	–	–	–	–	–	–	..
Solar/Wind/Other	–	–	–	–	–1.6	3.1	..
TFC	2.2	0.8	1.8	0.8	1.6	1.3	..
Electricity Consumption	3.9	2.8	1.8	0.2	1.6	2.3	..
Energy Production	0.2	0.3	0.9	6.2	0.3	0.5	..
Net Oil Imports	2.7	–1.6	2.0	–2.4	–0.8	0.4	..
GDP	3.0	2.3	2.1	2.8	2.0	2.0	..
Growth in the TPES/GDP Ratio	–1.3	–1.8	–0.6	–2.4	–0.7	–0.7	..
Growth in the TFC/GDP Ratio	–0.8	–1.5	–0.3	–1.9	–0.4	–0.7	..

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

BELGIUM

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit: Mtoe

SUPPLY		1973	1990	1998	1999	2005	2010	2020
TOTAL PRODUCTION		**6,5**	**12.8**	**12.8**	**13.8**	**12.5**	**12.9**	**..**
Coal[1]		6.4	1.2	0.2	0.2	–	–	..
Oil		–	–	–	–	–	–	..
Gas		0.0	0.0	–	–	–	–	..
Comb. Renewables & Wastes[2]		0.0	0.4	0.6	0.8	0.2	0.6	..
Nuclear		0.0	11.1	12.0	12.8	12.3	12.3	..
Hydro		0.0	0.0	0.0	0.0	0.0	0.0	..
Geothermal		–	0.0	0.0	0.0	..	..	..
Solar/Wind/Other[3]		–	0.0	0.0	0.0	0.0	0.0	..
TOTAL NET IMPORTS[4]		**39.8**	**35.5**	**46.3**	**44.1**	**41.9**	**44.4**	**..**
Coal[1]	Exports	0.8	1.1	1.0	1.0	0.9	0.9	..
	Imports	5.3	10.3	9.7	8.3	8.6	8.6	..
	Net Imports	4.6	9.2	8.6	7.4	7.7	7.7	..
Oil	Exports	15.1	19.2	21.4	22.5	16.0	16.4	..
	Imports	46.4	41.7	51.9	50.1	41.8	42.9	..
	Bunkers	3.1	4.1	5.4	4.4	4.0	4.0	..
	Net Imports	28.2	18.4	25.1	23.2	21.8	22.5	..
Gas	Exports	–	–	–	–	–	–	..
	Imports	7.1	8.2	12.4	13.5	12.4	14.2	..
	Net Imports	7.1	8.2	12.4	13.5	12.4	14.2	..
Electricity	Exports	0.2	0.7	0.6	0.7	..	..	..
	Imports	0.1	0.4	0.7	0.8	..	..	..
	Net Imports	–0.1	–0.3	0.1	0.1	..	..	..
TOTAL STOCK CHANGES		**–0.0**	**0.1**	**–0.8**	**0.8**	**–**	**–**	**..**
TOTAL SUPPLY (TPES)		**46.3**	**48.4**	**58.3**	**58.6**	**54.4**	**57.3**	**..**
Coal[1]		11.2	10.2	8.6	7.5	7.7	7.7	..
Oil		28.0	18.7	24.6	24.2	21.8	22.5	..
Gas		7.1	8.2	12.5	13.3	12.4	14.2	..
Comb. Renewables & Wastes[2]		0.0	0.4	0.6	0.8	0.2	0.6	..
Nuclear		0.0	11.1	12.0	12.8	12.3	12.3	..
Hydro		0.0	0.0	0.0	0.0	0.0	0.0	..
Geothermal		–	0.0	0.0	0.0	..	..	..
Solar/Wind/Other[3]		–	0.0	0.0	0.0	0.0	0.0	..
Electricity Trade[5]		–0.1	–0.3	0.1	0.1	–	–	..
Shares (%)								
Coal		*24.1*	*21.1*	*14.7*	*12.8*	*14.2*	*13.4*	..
Oil		*60.5*	*38.7*	*42.1*	*41.2*	*40.1*	*39.3*	..
Gas		*15.4*	*16.9*	*21.4*	*22.7*	*22.8*	*24.7*	..
Comb. Renewables & Wastes		–	*0.9*	*1.0*	*1.3*	*0.3*	*1.0*	..
Nuclear		–	*23.0*	*20.6*	*21.8*	*22.6*	*21.4*	..
Hydro		–	–	*0.1*	–	*0.1*	*0.1*	..
Geothermal		–	–	–	–	..	..	..
Solar/Wind/Other		–	–	–	–	–	–	..
Electricity Trade		*–0.1*	*–0.7*	*0.2*	*0.1*	–	–	..

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

Please note: All forecast data are based on the 1996 submission.

Unit:Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	1998	1999	2005	2010	2020
TFC	**34.6**	**32.9**	**41.2**	**41.3**	**39.5**	**41.0**	**..**
Coal[1]	5.7	3.4	2.6	2.5	3.7	3.7	..
Oil	21.0	17.3	22.4	22.0	20.1	20.8	..
Gas	4.6	6.8	9.3	9.7	8.8	9.0	..
Comb. Renewables & Wastes[2]	–	0.2	0.2	0.3	..	..	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	2.9	5.0	6.4	6.4	6.0	6.4	..
Heat	*0.3*	*0.2*	*0.3*	*0.4*	*0.9*	*1.1*	..
Shares (%)							
Coal	*16.5*	*10.2*	*6.2*	*6.1*	*9.4*	*9.0*	..
Oil	*60.7*	*52.6*	*54.4*	*53.2*	*50.8*	*50.7*	..
Gas	*13.3*	*20.7*	*22.7*	*23.5*	*22.3*	*22.0*	..
Comb. Renewables & Wastes	–	*0.6*	*0.4*	*0.7*	..	..	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	*8.5*	*15.1*	*15.4*	*15.5*	*15.1*	*15.7*	..
Heat	*0.9*	*0.7*	*0.8*	*0.9*	*2.3*	*2.6*	..
TOTAL INDUSTRY[6]	**16.8**	**13.4**	**16.6**	**17.2**	**15.7**	**16.1**	**..**
Coal[1]	3.5	2.9	2.3	2.3	3.4	3.4	..
Oil	7.9	4.3	6.3	6.3	4.1	4.1	..
Gas	3.2	3.3	4.4	4.9	3.9	3.9	..
Comb. Renewables & Wastes[2]	–	0.0	0.0	0.1	..	..	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	1.9	2.6	3.2	3.2	3.4	3.7	..
Heat	0.3	0.2	0.3	0.3	0.8	0.9	..
Shares (%)							
Coal	*21.1*	*21.7*	*14.1*	*13.6*	*21.8*	*21.3*	..
Oil	*46.8*	*32.4*	*37.9*	*36.4*	*26.4*	*25.6*	..
Gas	*18.7*	*24.7*	*26.8*	*28.8*	*25.1*	*24.5*	..
Comb. Renewables & Wastes	–	*0.1*	*0.1*	*0.4*	..	..	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	*11.5*	*19.7*	*19.4*	*18.8*	*21.8*	*23.0*	..
Heat	*1.9*	*1.4*	*1.7*	*2.0*	*4.8*	*5.5*	..
TRANSPORT[7]	**5.0**	**7.9**	**9.8**	**9.8**	**9.4**	**9.7**	**..**
TOTAL OTHER SECTORS[8]	**12.7**	**11.7**	**14.8**	**14.3**	**14.4**	**15.2**	**..**
Coal[1]	2.2	0.5	0.2	0.2	0.3	0.3	..
Oil	8.1	5.2	6.4	6.0	6.6	7.2	..
Gas	1.5	3.5	4.9	4.8	4.9	5.1	..
Comb. Renewables & Wastes[2]	–	0.2	0.2	0.2	..	..	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	0.9	2.3	3.0	3.1	2.4	2.6	..
Heat	–	0.0	0.0	0.1	0.2	0.2	..
Shares (%)							
Coal	*17.0*	*4.1*	*1.5*	*1.3*	*2.1*	*1.6*	..
Oil	*64.2*	*44.6*	*43.5*	*42.0*	*46.1*	*47.0*	..
Gas	*11.4*	*30.1*	*33.1*	*33.4*	*34.0*	*33.2*	..
Comb. Renewables & Wastes	–	*1.6*	*1.2*	*1.4*	..	..	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	*7.4*	*19.3*	*20.5*	*21.4*	*16.7*	*16.9*	..
Heat	–	*0.3*	*0.3*	*0.4*	*1.2*	*1.2*	..

Unit:Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	1998	1999	2005	2010	2020
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**10.0**	**17.5**	**19.6**	**20.1**	**20.0**	**22.0**	**..**
OUTPUT (Mtoe)	**3.5**	**6.0**	**7.1**	**7.2**	**6.7**	**7.3**	**..**
(TWh gross)	40.6	70.2	82.1	83.4	78.3	84.9	..
Output Shares (%)							
Coal	*21.7*	*28.3*	*20.6*	*15.0*	*11.5*	*8.7*	..
Oil	*53.7*	*1.9*	*3.1*	*1.2*	*2.3*	*2.3*	..
Gas	*23.7*	*7.7*	*18.3*	*23.1*	*24.7*	*29.6*	..
Comb. Renewables & Wastes	*0.3*	*0.9*	*1.3*	*1.4*	*1.0*	*3.5*	..
Nuclear	*0.2*	*60.8*	*56.2*	*58.8*	*60.1*	*55.5*	..
Hydro	*0.4*	*0.4*	*0.5*	*0.4*	*0.4*	*0.4*	..
Geothermal	–	–	–	–	–	–	..
Solar/Wind/Other	–	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	..
TOTAL LOSSES	**11.8**	**16.0**	**16.6**	**16.8**	**14.9**	**16.3**	**..**
of which:							
Electricity and Heat Generation[10]	6.2	11.3	12.2	12.5	12.3	13.6	..
Other Transformation	4.2	2.1	1.7	1.5	1.3	1.3	..
Own Use and Losses[11]	1.4	2.7	2.7	2.7	1.3	1.5	..
Statistical Differences	**–0.1**	**–0.5**	**0.6**	**0.6**	**–**	**–**	**..**

INDICATORS

	1973	1990	1998	1999	2005	2010	2020
GDP (billion 1995 US$)	174.25	256.19	295.71	303.80	348.21	390.13	..
Population (millions)	9.73	9.97	10.20	10.22	10.00	10.00	..
TPES/GDP[12]	0.27	0.19	0.20	0.19	0.16	0.15	..
Energy Production/TPES	0.14	0.26	0.22	0.23	0.23	0.23	..
Per Capita TPES[13]	4.76	4.86	5.72	5.74	5.44	5.73	..
Oil Supply/GDP[12]	0.16	0.07	0.08	0.08	0.06	0.06	..
TFC/GDP[12]	0.20	0.13	0.14	0.14	0.11	0.10	..
Per Capita TFC[13]	3.55	3.30	4.04	4.04	3.95	4.10	..
Energy-related CO_2 Emissions (Mt CO_2)[14]	136.9	106.2	122.5	118.7	108.8	114.8	..
CO_2 Emissions from Bunkers (Mt CO_2)	11.3	16.0	22.0	18.5	17.1	17.1	..

GROWTH RATES (% per year)

	73–79	79–90	90–98	98–99	99–05	05–10	10–20
TPES	0.7	0.0	2.4	0.5	–1.3	1.0	..
Coal	–1.0	–0.3	–2.2	–12.7	0.5	–	..
Oil	–1.5	–2.8	3.4	–1.6	–1.7	0.6	..
Gas	4.5	–1.2	5.4	6.9	–1.2	2.7	..
Comb. Renewables & Wastes	41.7	17.8	2.9	37.5	–23.8	31.5	..
Nuclear	130.2	12.8	1.0	6.2	–0.7	–	..
Hydro	4.9	1.3	4.6	–12.1	0.6	–	..
Geothermal	–	–	–	–	–	–	..
Solar/Wind/Other	–	–	–	–	–10.9	–	..
TFC	0.3	–0.6	2.8	0.2	–0.7	0.7	..
Electricity Consumption	4.2	2.6	3.1	0.7	–1.2	1.5	..
Energy Production	2.4	5.0	0.0	7.5	–1.7	0.7	..
Net Oil Imports	–0.8	–3.4	4.0	–7.7	–1.0	0.6	..
GDP	2.4	2.3	1.8	2.7	2.3	2.3	..
Growth in the TPES/GDP Ratio	–1.6	–2.2	0.5	–2.2	–3.5	–1.2	..
Growth in the TFC/GDP Ratio	–2.0	–2.8	1.0	–2.5	–3.0	–1.5	..

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

CANADA

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit: Mtoe

SUPPLY		1973	1990	1998	1999	2005	2010	2020
TOTAL PRODUCTION		**198.0**	**273.7**	**368.5**	**366.6**	**439.1**	**462.3**	**506.6**
Coal[1]		11.7	37.9	40.7	39.2	38.7	39.9	38.7
Oil		96.3	94.1	128.3	123.0	163.1	170.9	193.5
Gas		61.4	88.6	142.1	144.7	165.2	179.5	199.9
Comb. Renewables & Wastes[2]		7.8	8.1	10.2	10.9	17.0	18.0	20.4
Nuclear		4.1	19.4	18.6	19.2	23.4	20.3	19.0
Hydro		16.7	25.5	28.5	29.7	31.4	33.2	34.6
Geothermal		–	–	–	–	0.4	0.4	0.4
Solar / Wind / Other[3]		–	0.0	0.0	0.0	0.0	0.1	0.1
TOTAL NET IMPORTS[4]		**–35.4**	**–60.6**	**–130.0**	**–128.0**	**–166.9**	**–177.9**	**–194.0**
Coal[1]	Exports	7.6	21.4	23.7	23.3	21.2	23.1	23.1
	Imports	10.5	9.5	12.1	12.2	10.0	8.7	2.1
	Net Imports	2.8	–11.9	–11.6	–11.1	–11.2	–14.4	–21.0
Oil	Exports	63.1	49.7	90.8	86.4	123.6	128.2	143.9
	Imports	48.8	34.5	48.4	50.2	51.7	54.3	60.0
	Bunkers	–	0.9	1.2	1.1	0.7	0.7	0.8
	Net Imports	–14.3	–16.1	–43.6	–37.3	–72.6	–74.6	–84.7
Gas	Exports	23.1	33.0	73.1	77.8	81.0	88.0	88.0
	Imports	0.3	0.5	0.7	0.7	1.0	1.0	1.0
	Net Imports	–22.8	–32.5	–72.5	–77.2	–80.0	–86.9	–86.9
Electricity	Exports	1.4	1.6	3.8	3.9	6.8	5.4	4.7
	Imports	0.2	1.5	1.5	1.4	3.6	3.4	3.3
	Net Imports	–1.2	–0.0	–2.4	–2.5	–3.2	–2.0	–1.4
TOTAL STOCK CHANGES		**–1.6**	**–4.0**	**–1.1**	**3.3**	**–**	**–**	**–**
TOTAL SUPPLY (TPES)		**161.0**	**209.1**	**237.4**	**241.8**	**272.1**	**284.4**	**312.7**
Coal[1]		15.3	24.3	28.8	27.8	27.4	25.5	17.7
Oil		81.0	77.1	85.2	86.4	90.6	96.3	108.9
Gas		37.3	54.7	68.3	70.3	85.2	92.6	113.0
Comb. Renewables & Wastes[2]		7.8	8.1	10.2	10.9	17.0	18.0	20.4
Nuclear		4.1	19.4	18.6	19.2	23.4	20.3	19.0
Hydro		16.7	25.5	28.5	29.7	31.4	33.2	34.6
Geothermal		–	–	–	–	0.4	0.4	0.4
Solar / Wind / Other[3]		–	0.0	0.0	0.0	0.0	0.1	0.1
Electricity Trade[5]		–1.2	–0.0	–2.4	–2.5	–3.2	–2.0	–1.4
Shares (%)								
Coal		*9.5*	*11.6*	*12.1*	*11.5*	*10.1*	*9.0*	*5.7*
Oil		*50.3*	*36.9*	*35.9*	*35.7*	*33.3*	*33.9*	*34.8*
Gas		*23.2*	*26.2*	*28.8*	*29.1*	*31.3*	*32.5*	*36.1*
Comb. Renewables & Wastes		*4.9*	*3.9*	*4.3*	*4.5*	*6.2*	*6.3*	*6.5*
Nuclear		*2.5*	*9.3*	*7.9*	*7.9*	*8.6*	*7.1*	*6.1*
Hydro		*10.4*	*12.2*	*12.0*	*12.3*	*11.5*	*11.7*	*11.1*
Geothermal		–	–	–	–	*0.2*	*0.2*	*0.1*
Solar / Wind / Other		–	–	–	–	–	–	–
Electricity Trade		*–0.7*	–	*–1.0*	*–1.0*	*–1.2*	*–0.7*	*–0.4*

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

Unit:Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	1998	1999	2005	2010	2020
TFC	133.2	161.3	180.7	186.1	210.0	221.3	250.2
Coal[1]	5.2	3.1	3.3	3.3	4.5	4.7	5.4
Oil	77.6	70.6	78.1	80.7	81.6	86.8	98.2
Gas	23.7	43.3	49.8	51.1	60.0	62.2	69.8
Comb. Renewables & Wastes[2]	7.6	7.8	9.6	10.2	15.7	16.7	18.9
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	18.9	36.0	39.2	40.0	47.4	50.2	57.0
Heat	0.1	0.6	0.7	0.8	0.7	0.7	0.9
Shares (%)							
Coal	*3.9*	*1.9*	*1.8*	*1.8*	*2.2*	*2.1*	*2.2*
Oil	*58.3*	*43.7*	*43.3*	*43.4*	*38.9*	*39.2*	*39.2*
Gas	*17.8*	*26.8*	*27.5*	*27.4*	*28.6*	*28.1*	*27.9*
Comb. Renewables & Wastes	*5.7*	*4.8*	*5.3*	*5.5*	*7.5*	*7.5*	*7.6*
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	*14.2*	*22.3*	*21.7*	*21.5*	*22.6*	*22.7*	*22.8*
Heat	*0.1*	*0.4*	*0.4*	*0.4*	*0.3*	*0.3*	*0.3*
TOTAL INDUSTRY[6]	**52.8**	**63.2**	**71.4**	**73.4**	**92.1**	**98.6**	**112.5**
Coal[1]	4.7	3.0	3.2	3.3	4.5	4.6	5.3
Oil	21.4	18.7	20.7	21.5	23.2	24.9	27.6
Gas	11.9	20.2	22.6	22.6	29.0	31.2	36.2
Comb. Renewables & Wastes[2]	5.7	6.2	7.8	8.4	13.8	14.7	16.8
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	9.1	14.4	16.5	16.9	20.8	22.4	25.8
Heat	0.1	0.6	0.7	0.8	0.7	0.7	0.9
Shares (%)							
Coal	*8.9*	*4.8*	*4.5*	*4.5*	*4.9*	*4.7*	*4.7*
Oil	*40.4*	*29.5*	*29.0*	*29.3*	*25.2*	*25.3*	*24.5*
Gas	*22.5*	*32.0*	*31.6*	*30.8*	*31.5*	*31.6*	*32.2*
Comb. Renewables & Wastes	*10.8*	*9.8*	*10.9*	*11.4*	*15.0*	*14.9*	*14.9*
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	*17.2*	*22.9*	*23.1*	*23.0*	*22.6*	*22.7*	*22.9*
Heat	*0.2*	*1.0*	*0.9*	*1.1*	*0.8*	*0.8*	*0.8*
TRANSPORT[7]	**35.3**	**44.2**	**52.7**	**54.1**	**59.2**	**63.1**	**72.8**
TOTAL OTHER SECTORS[8]	**45.1**	**54.0**	**56.5**	**58.7**	**58.7**	**59.7**	**64.8**
Coal[1]	0.4	0.1	0.0	0.0	0.1	0.1	0.1
Oil	21.3	10.9	10.5	10.9	6.2	6.5	6.9
Gas	11.9	20.2	21.9	23.2	25.0	24.5	25.7
Comb. Renewables & Wastes[2]	1.9	1.6	1.8	1.8	1.9	2.0	2.2
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	9.5	21.2	22.3	22.7	25.5	26.7	30.0
Heat	–	0.0	0.0	0.0	–	–	–
Shares (%)							
Coal	*0.9*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*
Oil	*47.4*	*20.2*	*18.6*	*18.5*	*10.6*	*10.8*	*10.7*
Gas	*26.3*	*37.4*	*38.8*	*39.5*	*42.6*	*41.0*	*39.6*
Comb. Renewables & Wastes	*4.2*	*3.0*	*3.2*	*3.1*	*3.2*	*3.3*	*3.3*
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	*21.2*	*39.3*	*39.4*	*38.7*	*43.5*	*44.7*	*46.2*
Heat	–	–	–	–	–	–	–

Unit:Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	1998	1999	2005	2010	2020
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**36.1**	**70.7**	**81.6**	**82.0**	**90.0**	**91.8**	**97.1**
OUTPUT (Mtoe)	**23.2**	**41.4**	**48.3**	**49.6**	**55.8**	**59.5**	**66.3**
(TWh gross)	270.1	481.9	561.5	577.0	649.2	691.3	771.5
Output Shares (%)							
Coal	*12.9*	*17.1*	*19.0*	*19.0*	*15.4*	*13.8*	*8.5*
Oil	*3.4*	*3.4*	*3.2*	*2.6*	*0.7*	*0.7*	*0.6*
Gas	*6.0*	*2.0*	*4.7*	*4.5*	*11.7*	*16.1*	*27.2*
Comb. Renewables & Wastes	–	*0.8*	*1.2*	*1.2*	*2.1*	*2.0*	*2.1*
Nuclear	*5.6*	*15.1*	*12.7*	*12.7*	*13.8*	*11.3*	*9.5*
Hydro	*72.1*	*61.6*	*59.1*	*59.9*	*56.2*	*55.9*	*52.1*
Geothermal	–	–	–	–	*0.1*	*0.1*	*0.1*
Solar/Wind/Other	–	*0.0*	*0.0*	*0.0*	*0.0*	*0.1*	*0.1*
TOTAL LOSSES	**31.2**	**48.7**	**55.3**	**55.6**	**62.1**	**63.1**	**62.5**
of which:							
Electricity and Heat Generation[10]	12.8	28.6	32.7	31.6	33.5	31.6	29.9
Other Transformation	1.9	–1.3	–3.1	–3.4	9.3	9.8	11.0
Own Use and Losses[11]	16.5	21.4	25.8	27.4	19.4	21.6	21.6
Statistical Differences	**–3.5**	**–0.9**	**1.4**	**0.1**	**–**	**–**	**–**

INDICATORS

	1973	1990	1998	1999	2005	2010	2020
GDP (billion 1995 US$)	316.45	531.62	634.17	663.30	783.75	868.29	1085.74
Population (millions)	22.49	27.70	30.25	30.49	32.60	34.00	35.60
TPES/GDP[12]	0.51	0.39	0.37	0.36	0.35	0.33	0.29
Energy Production/TPES	1.23	1.31	1.55	1.52	1.61	1.63	1.62
Per Capita TPES[13]	7.16	7.55	7.85	7.93	8.35	8.36	8.78
Oil Supply/GDP[12]	0.26	0.14	0.13	0.13	0.12	0.11	0.10
TFC/GDP[12]	0.42	0.30	0.28	0.28	0.27	0.25	0.23
Per Capita TFC[13]	5.92	5.82	5.97	6.10	6.44	6.51	7.03
Energy-related CO_2 Emissions (Mt CO_2)[14]	372.4	421.3	488.0	489.2	531.6	556.2	606.0
CO_2 Emissions from Bunkers (Mt CO_2)	1.5	5.6	6.6	6.5	5.4	5.5	5.6

GROWTH RATES (% per year)

	73–79	79–90	90–98	98–99	99–05	05–10	10–20
TPES	2.9	0.8	1.6	1.9	2.0	0.9	1.0
Coal	4.4	1.9	2.2	–3.4	–0.3	–1.4	–3.6
Oil	2.1	–1.6	1.3	1.4	0.8	1.2	1.2
Gas	2.7	2.1	2.8	2.9	3.3	1.7	2.0
Comb. Renewables & Wastes	–1.6	1.2	2.9	6.5	7.7	1.2	1.3
Nuclear	15.7	6.4	–0.5	2.8	3.4	–2.7	–0.7
Hydro	3.8	1.8	1.4	4.1	0.9	1.2	0.4
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	18.9	150.0	–	24.6	–
TFC	2.4	0.4	1.4	3.0	2.0	1.1	1.2
Electricity Consumption	4.7	3.4	1.1	2.1	2.9	1.2	1.3
Energy Production	1.0	2.4	3.8	–0.5	3.1	1.0	0.9
Net Oil Imports	–	–	13.2	–14.4	11.7	0.6	1.3
GDP	3.9	2.7	2.2	4.6	2.8	2.1	2.3
Growth in the TPES/GDP Ratio	–1.0	–1.8	–0.6	–2.6	–0.8	–1.2	–1.3
Growth in the TFC/GDP Ratio	–1.4	–2.2	–0.8	–1.5	–0.8	–1.0	–1.0

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

CZECH REPUBLIC

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[3]		–	–	–	–	–	–	0.10
TOTAL NET IMPORTS[4]		**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[3]		–	–	–	–	–	–	0.10
Electricity Trade[5]		–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[6]	**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[7]	**2.46**	**2.86**	**3.93**	**4.12**	**3.90**	**4.50**	**5.00**
TOTAL OTHER SECTORS[8]	**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[9]							
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[10]	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[11]	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[12]	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[13]	4.58	4.57	4.00	3.75	3.81	3.99	4.21
Oil Supply/GDP[12]	0.22	0.16	0.16	0.16	0.12	0.11	0.10
TFC/GDP[12]	0.82	0.65	0.48	0.47	0.40	0.38	0.32
Per Capita TFC[13]	3.33	3.41	2.46	2.41	2.34	2.48	2.68
Energy–related CO_2 Emissions (Mt CO_2)[14]	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.

DENMARK

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit:Mtoe

SUPPLY

		1973	1990	1998	1999	2005	2010	2020
TOTAL PRODUCTION		**0.40**	**9.68**	**20.19**	**23.64**	**22.93**	**12.22**	**..**
Coal[1]		–	–	–	–	–	–	..
Oil		0.07	5.81	11.66	14.86	11.70	5.49	..
Gas		–	2.74	6.76	6.94	8.58	3.80	..
Comb. Renewables & Wastes[2]		0.33	1.08	1.51	1.58	2.07	2.15	..
Nuclear		–	–	–	–	–	–	..
Hydro		0.00	0.00	0.00	0.00	–	–	..
Geothermal		–	0.00	0.00	0.00	–	0.00	..
Solar / Wind / Other[3]		–	0.06	0.25	0.27	0.59	0.77	..
TOTAL NET IMPORTS[4]		**19.85**	**8.01**	**0.18**	**–4.62**	**–1.99**	**9.54**	**..**
Coal[1]	Exports	0.04	0.03	0.10	0.12	..	..	..
	Imports	1.91	6.23	4.87	4.30	4.50	5.46	..
	Net Imports	1.87	6.20	4.77	4.18	4.50	5.46	..
Oil	Exports	2.89	5.37	11.69	15.32	0.96	5.52	..
	Imports	21.58	8.46	11.35	10.55	..	..	..
	Bunkers	0.69	0.96	1.40	1.31	1.51	1.51	..
	Net Imports	18.00	2.13	–1.74	–6.08	–2.47	4.00	..
Gas	Exports	–	0.93	2.51	2.55	3.14	1.55	..
	Imports	–	–	–	–	–	–	..
	Net Imports	–	–0.93	–2.51	–2.55	–3.14	1.55	..
Electricity	Exports	0.11	0.42	0.65	0.65	0.88	1.48	..
	Imports	0.09	1.03	0.28	0.45	..	..	..
	Net Imports	–0.02	0.61	–0.37	–0.20	–0.88	–1.48	..
TOTAL STOCK CHANGES		**–0.44**	**0.17**	**0.49**	**1.05**	**–**	**–**	**..**
TOTAL SUPPLY (TPES)		**19.81**	**17.85**	**20.86**	**20.07**	**20.95**	**21.76**	**..**
Coal[1]		1.93	6.07	5.67	4.64	4.50	5.46	..
Oil		17.57	8.26	9.55	9.33	9.23	9.50	..
Gas		–	1.79	4.22	4.42	5.44	5.35	..
Comb. Renewables & Wastes[2]		0.33	1.08	1.53	1.60	2.07	2.15	..
Nuclear		–	–	–	–	–	–	..
Hydro		0.00	0.00	0.00	0.00	–	–	..
Geothermal		–	0.00	0.00	0.00	–	0.00	..
Solar / Wind / Other[3]		–	0.06	0.26	0.27	0.59	0.78	..
Electricity Trade[5]		–0.02	0.61	–0.37	–0.20	–0.88	–1.48	..
Shares (%)								
Coal		*9.7*	*34.0*	*27.2*	*23.1*	*21.5*	*25.1*	..
Oil		*88.7*	*46.2*	*45.8*	*46.5*	*44.1*	*43.6*	..
Gas		–	*10.0*	*20.2*	*22.0*	*26.0*	*24.6*	..
Comb. Renewables & Wastes		*1.7*	*6.0*	*7.3*	*8.0*	*9.9*	*9.9*	..
Nuclear		–	–	–	–	–	–	..
Hydro		–	–	–	–	–	–	..
Geothermal		–	–	–	–	–	–	..
Solar / Wind / Other		–	*0.3*	*1.2*	*1.4*	*2.8*	*3.6*	..
Electricity Trade		–0.1	3.4	–1.8	–1.0	–4.2	–6.8	..

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

Please note: TPES for a given year strongly depends on the amount of net import of electricity, which may vary substantially from year to year. Forecast data for 2005 and 2010 are based on the 1999 submission.

Unit:Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	1998	1999	2005	2010	2020
TFC	**16.15**	**14.06**	**15.67**	**15.64**	**15.83**	**16.24**	**..**
Coal[1]	0.34	0.39	0.34	0.30	0.34	0.34	..
Oil	14.26	8.00	7.92	8.00	7.66	7.88	..
Gas	0.12	1.13	1.72	1.74	2.09	2.12	..
Comb. Renewables & Wastes[2]	0.05	0.20	0.51	0.51	0.57	0.57	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	0.00	0.01	0.01	0.01	0.01	..
Electricity	1.39	2.50	2.76	2.76	2.77	2.88	..
Heat	–	1.84	2.41	2.32	2.41	2.45	..
Shares (%)							
Coal	*2.1*	*2.8*	*2.2*	*1.9*	*2.1*	*2.1*	..
Oil	*88.3*	*56.9*	*50.6*	*51.1*	*48.4*	*48.5*	..
Gas	*0.7*	*8.0*	*11.0*	*11.1*	*13.2*	*13.0*	..
Comb. Renewables & Wastes	*0.3*	*1.4*	*3.3*	*3.3*	*3.6*	*3.5*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	*8.6*	*17.8*	*17.6*	*17.6*	*17.5*	*17.7*	..
Heat	–	*13.1*	*15.4*	*14.8*	*15.2*	*15.1*	..
TOTAL INDUSTRY[6]	**4.04**	**2.99**	**3.34**	**3.30**	**3.54**	**3.64**	**..**
Coal[1]	0.21	0.31	0.31	0.28	0.31	0.31	..
Oil	3.41	1.30	1.12	1.12	1.05	1.07	..
Gas	0.02	0.53	0.80	0.81	0.99	1.00	..
Comb. Renewables & Wastes[2]	–	0.02	0.12	0.10	0.11	0.12	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	0.40	0.75	0.86	0.85	0.91	0.98	..
Heat	–	0.07	0.14	0.14	0.17	0.17	..
Shares (%)							
Coal	*5.2*	*10.4*	*9.4*	*8.6*	*8.6*	*8.5*	..
Oil	*84.5*	*43.7*	*33.5*	*34.0*	*29.7*	*29.2*	..
Gas	*0.4*	*17.7*	*23.9*	*24.6*	*27.8*	*27.5*	..
Comb. Renewables & Wastes	–	*0.6*	*3.4*	*2.9*	*3.2*	*3.2*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	*9.8*	*25.2*	*25.6*	*25.8*	*25.8*	*26.8*	..
Heat	–	*2.5*	*4.1*	*4.1*	*4.8*	*4.7*	..
TRANSPORT[7]	**3.52**	**4.58**	**4.89**	**5.01**	**5.27**	**5.57**	**..**
TOTAL OTHER SECTORS[8]	**8.59**	**6.50**	**7.44**	**7.33**	**7.03**	**7.03**	**..**
Coal[1]	0.13	0.08	0.03	0.02	0.03	0.03	..
Oil	7.34	2.14	1.94	1.90	1.41	1.31	..
Gas	0.10	0.60	0.92	0.93	1.10	1.12	..
Comb. Renewables & Wastes[2]	0.05	0.18	0.40	0.42	0.45	0.46	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	0.00	0.01	0.01	0.01	0.01	..
Electricity	0.98	1.73	1.88	1.88	1.79	1.84	..
Heat	–	1.76	2.27	2.18	2.24	2.28	..
Shares (%)							
Coal	*1.5*	*1.2*	*0.3*	*0.3*	*0.4*	*0.4*	..
Oil	*85.4*	*33.0*	*26.1*	*25.9*	*20.1*	*18.7*	..
Gas	*1.2*	*9.3*	*12.4*	*12.6*	*15.7*	*15.9*	..
Comb. Renewables & Wastes	*0.6*	*2.8*	*5.4*	*5.7*	*6.5*	*6.5*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	*0.1*	*0.1*	*0.1*	*0.1*	..
Electricity	*11.4*	*26.6*	*25.2*	*25.6*	*25.5*	*26.1*	..
Heat	–	*27.2*	*30.6*	*29.8*	*31.8*	*32.4*	..

Unit:Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	1998	1999	2005	2010	2020
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**4.69**	**7.36**	**9.70**	**9.01**	**9.97**	**11.35**	**..**
OUTPUT (Mtoe)	**1.64**	**2.21**	**3.53**	**3.34**	**3.89**	**4.61**	**..**
(TWh gross)	19.12	25.74	41.10	38.87	45.28	53.58	..
Output Shares (%)							
Coal	*35.8*	*90.6*	*57.5*	*51.6*	*40.1*	*42.3*	..
Oil	*64.1*	*4.1*	*12.1*	*12.5*	*10.0*	*8.8*	..
Gas	–	*2.2*	*19.9*	*23.5*	*28.6*	*26.2*	..
Comb. Renewables & Wastes	–	*0.6*	*3.6*	*4.5*	*8.3*	*7.7*	..
Nuclear	–	–	–	–	–	–	..
Hydro	*0.1*	*0.1*	*0.1*	*0.1*	–	–	..
Geothermal	–	–	–	–	–	–	..
Solar/Wind/Other	–	*2.4*	*6.9*	*7.8*	*13.0*	*14.9*	..
TOTAL LOSSES	**3.74**	**3.77**	**4.87**	**4.54**	**5.12**	**5.52**	**..**
of which:							
Electricity and Heat Generation[10]	3.04	2.85	3.11	2.74	3.16	3.78	..
Other Transformation	0.44	–0.43	–0.12	–0.08	0.00	0.00	..
Own Use and Losses[11]	0.26	1.34	1.88	1.87	1.96	1.74	..
Statistical Differences	**–0.08**	**0.03**	**0.32**	**–0.11**	**–**	**–**	**..**

INDICATORS

	1973	1990	1998	1999	2005	2010	2020
GDP (billion 1995 US$)	128.44	163.49	195.50	199.67	223.54	246.81	..
Population (millions)	5.02	5.14	5.30	5.32	5.40	5.44	..
TPES/GDP[12]	0.15	0.11	0.11	0.10	0.09	0.09	..
Energy Production/TPES	0.02	0.54	0.97	1.18	1.09	0.56	..
Per Capita TPES[13]	3.94	3.47	3.93	3.77	3.88	4.00	..
Oil Supply/GDP[12]	0.14	0.05	0.05	0.05	0.04	0.04	..
TFC/GDP[12]	0.13	0.09	0.08	0.08	0.07	0.07	..
Per Capita TFC[13]	3.22	2.74	2.96	2.94	2.93	2.99	..
Energy–related CO_2 Emissions (Mt CO_2)[14]	57.1	49.7	57.7	53.3	54.5	58.8	..
CO_2 Emissions from Bunkers (Mt CO_2)	4.5	5.0	6.7	6.4	7.1	7.1	..

GROWTH RATES (% per year)

	73–79	79–90	90–98	98–99	99–05	05–10	10–20
TPES	1.2	–1.6	2.0	–3.8	0.7	0.8	..
Coal	14.4	3.1	–0.9	–18.2	–0.5	3.9	..
Oil	–1.4	–5.9	1.8	–2.3	–0.2	0.6	..
Gas	–	–	11.4	4.7	3.5	–0.3	..
Comb. Renewables & Wastes	6.5	7.6	4.5	4.6	4.3	0.8	..
Nuclear	–	–	–	–	–	–	..
Hydro	–	–	–	50.0	–	–	..
Geothermal	–	–	–	–	–	–	..
Solar/Wind/Other	–	44.0	20.8	7.2	11.4	6.3	..
TFC	0.6	–1.6	1.4	–0.2	0.2	0.5	..
Electricity Consumption	4.9	2.8	1.3	–0.1	0.1	0.8	..
Energy Production	15.0	23.8	9.6	17.1	–0.5	–11.8	..
Net Oil Imports	–2.6	–16.4	–	250.3	–13.9	–	..
GDP	1.5	1.4	2.3	2.1	1.9	2.0	..
Growth in the TPES/GDP Ratio	–0.4	–2.9	–0.3	–5.8	–1.2	–1.2	..
Growth in the TFC/GDP Ratio	–0.9	–2.9	–0.9	–2.3	–1.7	–1.5	..

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

FINLAND

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit:Mtoe

SUPPLY

		1973	1990	1998	1999	2005	2010	2020
TOTAL PRODUCTION		**4.9**	**11.7**	**13.6**	**15.4**	**15.5**	**15.7**	**16.3**
Coal[1]		–	–	–	–	–	–	–
Peat		0.1	1.8	0.4	2.0	1.8	1.7	1.8
Oil		–	–	0.1	0.1	–	–	–
Gas		–	–	–	–	–	–	–
Comb. Renewables & Wastes[2]		3.9	4.0	6.1	6.3	6.9	7.2	7.8
Nuclear		–	5.0	5.7	6.0	5.7	5.7	5.5
Hydro		0.9	0.9	1.3	1.1	1.1	1.1	1.1
Geothermal		–	–	–	–	–	–	–
Solar / Wind / Other[3]		–	–	0.0	0.0	0.0	0.0	0.1
TOTAL NET IMPORTS[4]		**16.6**	**17.7**	**17.8**	**16.8**	**19.0**	**20.1**	**21.7**
Coal[1]	Exports	0.0	0.0	–	–	–	–	–
	Imports	2.4	4.4	3.3	2.7	4.6	5.2	5.8
	Net Imports	2.4	4.4	3.3	2.7	4.6	5.2	5.8
Peat	Exports	–	–	0.0	0.0	–	–	–
	Imports	–	–	–	–	–	–	–
	Net Imports	–	–	–0.0	–0.0	–	–	–
Oil	Exports	0.2	1.7	4.9	5.2	–	–	–
	Imports	14.0	12.5	15.8	15.7	8.5	8.4	8.2
	Bunkers	0.1	0.6	0.5	0.6	–	–	–
	Net Imports	13.8	10.2	10.4	9.9	8.5	8.4	8.2
Gas	Exports	–	–	–	–	–	–	–
	Imports	–	2.2	3.3	3.3	5.4	6.1	7.3
	Net Imports	–	2.2	3.3	3.3	5.4	6.1	7.3
Electricity	Exports	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Imports	0.4	0.9	0.8	1.0	0.6	0.5	0.5
	Net Imports	0.4	0.9	0.8	1.0	0.6	0.5	0.5
TOTAL STOCK CHANGES		**–0.1**	**–0.6**	**2.1**	**1.2**	**–**	**–**	**–**
TOTAL SUPPLY (TPES)		**21.3**	**28.8**	**33.5**	**33.4**	**34.5**	**35.8**	**38.0**
Coal[1]		2.5	4.1	3.6	3.7	4.6	5.2	5.8
Peat		0.0	1.2	1.9	1.6	1.8	1.7	1.8
Oil		13.6	10.3	10.7	10.4	8.5	8.4	8.2
Gas		–	2.2	3.3	3.3	5.4	6.1	7.3
Comb. Renewables & Wastes[2]		3.9	4.2	6.1	6.3	6.9	7.2	7.8
Nuclear		–	5.0	5.7	6.0	5.7	5.7	5.5
Hydro		0.9	0.9	1.3	1.1	1.1	1.1	1.1
Geothermal		–	–	–	–	–	–	–
Solar / Wind / Other[3]		–	–	0.0	0.0	0.0	0.0	0.1
Electricity Trade[5]		0.4	0.9	0.8	1.0	0.6	0.5	0.5
Shares (%)								
Coal		*11.8*	*14.2*	*10.7*	*10.9*	*13.3*	*14.4*	*15.2*
Peat		*0.2*	*4.2*	*5.6*	*4.9*	*5.3*	*4.8*	*4.6*
Oil		*63.6*	*35.6*	*32.1*	*31.2*	*24.5*	*23.5*	*21.6*
Gas		–	*7.6*	*10.0*	*10.0*	*15.6*	*16.9*	*19.2*
Comb. Renewables & Wastes		*18.5*	*14.6*	*18.3*	*18.8*	*20.0*	*20.1*	*20.5*
Nuclear		–	*17.4*	*17.0*	*17.9*	*16.4*	*15.8*	*14.6*
Hydro		*4.2*	*3.2*	*3.9*	*3.3*	*3.2*	*3.1*	*2.9*
Geothermal		–	–	–	–	–	–	–
Solar / Wind / Other		–	–	–	–	*0.1*	*0.1*	*0.2*
Electricity Trade		*1.7*	*3.2*	*2.4*	*2.9*	*1.6*	*1.3*	*1.2*

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

Unit:Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	1998	1999	2005	2010	2020
TFC	**19.4**	**22.6**	**25.0**	**25.2**	**26.9**	**27.7**	**29.4**
Coal[1]	1.0	1.2	0.8	0.9	1.0	1.1	1.3
Peat	0.0	0.4	0.5	0.4	0.4	0.4	0.4
Oil	11.5	9.7	8.7	8.7	8.0	7.9	7.7
Gas	0.0	1.2	1.5	1.5	2.6	2.8	3.3
Comb. Renewables & Wastes[2]	3.9	3.2	4.6	4.6	5.2	5.3	5.8
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	2.3	5.1	6.3	6.4	7.1	7.5	8.3
Heat	0.6	1.9	2.5	2.8	2.6	2.6	2.7
Shares (%)							
Coal	*5.3*	*5.2*	*3.4*	*3.6*	*3.8*	*3.9*	*4.4*
Peat	*0.1*	*1.8*	*2.0*	*1.4*	*1.5*	*1.4*	*1.3*
Oil	*59.2*	*42.8*	*34.8*	*34.3*	*29.7*	*28.6*	*26.2*
Gas	*0.1*	*5.4*	*6.1*	*6.0*	*9.7*	*10.2*	*11.2*
Comb. Renewables & Wastes	*20.3*	*14.0*	*18.5*	*18.3*	*19.2*	*19.3*	*19.6*
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	*11.9*	*22.5*	*25.0*	*25.3*	*26.6*	*27.1*	*28.0*
Heat	*3.1*	*8.5*	*10.1*	*11.0*	*9.5*	*9.5*	*9.3*
TOTAL INDUSTRY[6]	**7.6**	**10.7**	**12.1**	**12.4**	**13.6**	**14.4**	**15.9**
Coal[1]	0.9	1.2	0.8	0.9	1.0	1.1	1.3
Peat	0.0	0.4	0.5	0.3	0.4	0.4	0.4
Oil	5.0	2.6	2.0	2.0	1.4	1.4	1.4
Gas	0.0	1.2	1.5	1.4	2.5	2.7	3.2
Comb. Renewables & Wastes[2]	–	2.5	3.5	3.5	4.1	4.3	4.7
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	1.6	2.8	3.5	3.6	4.0	4.2	4.7
Heat	0.1	0.2	0.4	0.6	0.3	0.3	0.3
Shares (%)							
Coal	*12.1*	*10.8*	*7.0*	*7.4*	*7.5*	*7.6*	*8.1*
Peat	*0.2*	*3.6*	*3.8*	*2.7*	*2.8*	*2.5*	*2.3*
Oil	*66.2*	*24.2*	*16.5*	*16.4*	*10.0*	*10.0*	*9.0*
Gas	*0.1*	*10.9*	*12.0*	*11.5*	*18.4*	*19.1*	*20.0*
Comb. Renewables & Wastes	–	*22.9*	*28.8*	*28.1*	*30.0*	*29.7*	*29.6*
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	*20.4*	*26.1*	*28.9*	*28.7*	*29.4*	*29.4*	*29.4*
Heat	*1.0*	*1.6*	*2.9*	*5.2*	*1.9*	*1.8*	*1.6*
TRANSPORT[7]	**2.6**	**4.4**	**4.4**	**4.6**	**4.3**	**4.3**	**4.3**
TOTAL OTHER SECTORS[8]	**9.3**	**7.5**	**8.5**	**8.2**	**9.0**	**9.1**	**9.3**
Coal[1]	0.1	0.0	0.0	0.0	–0.0	0.0	0.0
Peat	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oil	3.9	2.7	2.4	2.1	2.4	2.3	2.1
Gas	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Comb. Renewables & Wastes[2]	3.9	0.7	1.1	1.1	1.1	1.1	1.1
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	0.8	2.2	2.7	2.8	3.1	3.2	3.5
Heat	0.5	1.7	2.2	2.1	2.3	2.4	2.5
Shares (%)							
Coal	*1.1*	*0.1*	–	–	–	–	*0.1*
Peat	*0.1*	*0.2*	*0.3*	*0.3*	*0.3*	*0.3*	*0.3*
Oil	*42.3*	*36.7*	*27.9*	*25.8*	*27.1*	*25.4*	*22.6*
Gas	–	*0.6*	*0.7*	*0.8*	*0.7*	*0.7*	*0.8*
Comb. Renewables & Wastes	*42.6*	*9.3*	*13.4*	*13.6*	*12.1*	*11.7*	*11.5*
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	*8.2*	*29.9*	*32.0*	*33.6*	*34.4*	*35.6*	*38.0*
Heat	*5.7*	*23.2*	*25.7*	*25.9*	*25.5*	*26.3*	*26.7*

Unit:Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	1998	1999	2005	2010	2020
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**3.5**	**11.9**	**14.4**	**14.6**	**16.8**	**17.8**	**19.1**
OUTPUT (Mtoe)	**2.2**	**4.7**	**6.0**	**6.0**	**6.8**	**7.3**	**8.0**
(TWh gross)	26.1	54.4	70.2	69.4	79.3	84.5	93.1
Output Shares (%)							
Coal	*18.7*	*18.5*	*12.2*	*13.9*	*21.0*	*22.8*	*24.0*
Peat	*9.4*	*14.6*	*7.0*	*7.0*	*6.9*	*6.0*	*5.6*
Oil	*31.6*	*3.1*	*1.6*	*1.3*	*1.9*	*2.0*	*2.1*
Gas	–	*8.6*	*12.6*	*13.7*	*13.7*	*15.0*	*17.3*
Comb. Renewables & Wastes	–	–	*13.9*	*12.5*	*12.4*	*12.6*	*13.4*
Nuclear	–	*35.3*	*31.1*	*33.1*	*27.4*	*25.7*	*22.9*
Hydro	*40.3*	*20.0*	*21.4*	*18.4*	*16.4*	*15.4*	*14.0*
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	*0.0*	*0.1*	*0.3*	*0.5*	*0.8*
TOTAL LOSSES	**2.0**	**6.9**	**7.8**	**7.8**	**7.6**	**8.1**	**8.6**
of which:							
Electricity and Heat Generation[10]	0.6	5.1	5.6	5.7	7.1	7.5	8.0
Other Transformation	0.5	0.6	0.8	0.8	–	–	–
Own Use and Losses[11]	0.9	1.2	1.4	1.3	0.5	0.5	0.6
Statistical Differences	**–0.1**	**–0.7**	**0.7**	**0.3**	**–**	**–**	**–**

INDICATORS

	1973	1990	1998	1999	2005	2010	2020
GDP (billion 1995 US$)	81.40	133.73	150.56	156.83	189.46	211.23	262.59
Population (millions)	4.67	4.99	5.15	5.17	5.22	5.26	5.29
TPES/GDP[12]	0.26	0.22	0.22	0.21	0.18	0.17	0.14
Energy Production/TPES	0.23	0.41	0.41	0.46	0.45	0.44	0.43
Per Capita TPES[13]	4.57	5.78	6.49	6.46	6.61	6.81	7.19
Oil Supply/GDP[12]	0.17	0.08	0.07	0.07	0.04	0.04	0.03
TFC/GDP[12]	0.24	0.17	0.17	0.16	0.14	0.13	0.11
Per Capita TFC[13]	4.16	4.53	4.85	4.88	5.15	5.27	5.56
Energy–related CO_2 Emissions (Mt CO_2)[14]	49.0	53.4	59.7	57.8	61.5	64.5	69.5
CO_2 Emissions from Bunkers (Mt CO_2)	0.5	2.8	2.7	2.9	..	..	..

GROWTH RATES (% per year)

	73–79	79–90	90–98	98–99	99–05	05–10	10–20
TPES	2.3	1.5	1.9	–0.3	0.6	0.7	0.6
Coal	7.4	0.6	–1.6	1.7	3.9	2.3	1.1
Peat	48.1	10.6	5.6	–13.2	2.0	–1.4	0.3
Oil	–0.5	–2.3	0.6	–3.0	–3.4	–0.2	–0.2
Gas	–	9.4	5.4	0.1	8.2	2.5	1.9
Comb. Renewables & Wastes	–2.4	1.9	4.8	2.7	1.5	0.8	0.8
Nuclear	–	10.0	1.6	5.1	–0.9	–	–0.2
Hydro	0.6	–0.0	4.2	–15.1	0.3	–	–
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	100.0	32.9	9.7	5.9
TFC	0.4	1.2	1.3	0.8	1.1	0.6	0.6
Electricity Consumption	4.7	4.7	2.7	1.9	1.9	1.0	0.9
Energy Production	4.7	5.6	1.9	13.3	0.1	0.2	0.4
Net Oil Imports	1.1	–3.3	0.2	–5.3	–2.5	–0.2	–0.2
GDP	2.4	3.3	1.5	4.2	3.2	2.2	2.2
Growth in the TPES/GDP Ratio	–0.1	–1.7	0.4	–4.2	–2.6	–1.4	–1.6
Growth in the TFC/GDP Ratio	–1.9	–2.1	–0.2	–3.2	–2.1	–1.6	–1.6

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

FRANCE

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit:Mtoe

SUPPLY		1973	1990	1998	1999	2005	2010	2020
TOTAL PRODUCTION		**36.1**	**110.7**	**125.7**	**127.6**	**..**	**129.3**	**118.6**
Coal[1]		18.0	8.2	3.7	3.5	..	–	–
Oil		2.1	3.5	2.0	1.9	..	–	–
Gas		6.3	2.5	1.8	1.7	..	–	–
Comb. Renewables & Wastes[2]		1.7	9.8	11.4	11.4	..	11.4	12.5
Nuclear		3.8	81.9	101.1	102.7	..	111.4	99.5
Hydro		4.1	4.6	5.3	6.2	..	6.5	6.5
Geothermal		–	0.1	0.1	0.1	..	..	..
Solar / Wind / Other[3]		0.0	0.1	0.1	0.1	..	..	..
TOTAL NET IMPORTS[4]		**142.8**	**117.1**	**127.7**	**128.4**	**..**	**178.5**	**215.7**
Coal[1]	Exports	1.3	0.6	0.4	0.4	..	–	–
	Imports	10.8	13.7	13.2	12.3	..	10.8	11.5
	Net Imports	9.5	13.0	12.8	11.9	..	10.8	11.5
Oil	Exports	13.7	14.8	21.6	19.8	..	6.3	5.6
	Imports	145.1	100.9	114.1	109.7	..	121.3	135.1
	Bunkers	5.3	2.5	2.9	2.9	..	2.7	3.4
	Net Imports	126.0	83.6	89.7	87.1	..	112.3	126.1
Gas	Exports	0.1	0.3	0.7	0.7	..	–	–
	Imports	7.6	24.7	30.8	35.5	..	59.7	82.4
	Net Imports	7.6	24.4	30.1	34.8	..	59.7	82.4
Electricity	Exports	0.6	4.5	5.3	5.9	..	4.3	4.3
	Imports	0.4	0.6	0.4	0.4	..	–	–
	Net Imports	–0.2	–3.9	–5.0	–5.4	..	–4.3	–4.3
TOTAL STOCK CHANGES		**–2.4**	**–1.7**	**1.1**	**–0.9**	**..**	**–**	**–**
TOTAL SUPPLY (TPES)		**176.6**	**226.1**	**254.4**	**255.0**	**..**	**307.8**	**334.2**
Coal[1]		29.2	20.2	17.2	15.3	..	10.8	11.5
Oil		124.3	87.3	90.7	90.2	..	112.3	126.1
Gas		13.6	26.0	33.4	34.5	..	59.7	82.4
Comb. Renewables & Wastes[2]		1.7	9.8	11.4	11.4	..	11.4	12.5
Nuclear		3.8	81.9	101.1	102.7	..	111.4	99.5
Hydro		4.1	4.6	5.3	6.2	..	6.5	6.5
Geothermal		–	0.1	0.1	0.1	..	..	..
Solar / Wind / Other[3]		0.0	0.1	0.1	0.1	..	..	..
Electricity Trade[5]		–0.2	–3.9	–5.0	–5.4	..	–4.3	–4.3
Shares (%)								
Coal		*16.6*	*8.9*	*6.8*	*6.0*	..	*3.5*	*3.4*
Oil		*70.4*	*38.6*	*35.6*	*35.4*	..	*36.5*	*37.7*
Gas		*7.7*	*11.5*	*13.1*	*13.5*	..	*19.4*	*24.7*
Comb. Renewables & Wastes		*1.0*	*4.3*	*4.5*	*4.5*	..	*3.7*	*3.7*
Nuclear		*2.2*	*36.2*	*39.7*	*40.3*	..	*36.2*	*29.8*
Hydro		*2.3*	*2.0*	*2.1*	*2.4*	..	*2.1*	*2.0*
Geothermal		–	*0.1*	*0.1*	–	..	..	..
Solar / Wind / Other		–	–	–	–	..	..	..
Electricity Trade		*–0.1*	*–1.7*	*–1.9*	*–2.1*	..	*–1.4*	*–1.3*

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

Please note: Forecast data for combustible renewables and waste include final consumption of solar. Forecasts do not include inputs and outputs from geothermal, solar, wind and combustible renewables and waste to electricity and heat generation. All forecast data are based on the 1999 submission.

Unit:Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	1998	1999	2005	2010	2020
TFC	**138.1**	**146.3**	**167.5**	**169.7**	**..**	**204.5**	**231.2**
Coal[1]	13.1	7.5	5.2	4.8	..	7.9	7.9
Oil	99.4	79.5	88.9	89.6	..	105.2	118.8
Gas	11.2	23.9	31.4	32.5	..	40.5	45.8
Comb. Renewables & Wastes[2]	1.7	8.5	9.8	9.7	..	11.4	12.5
Geothermal	–	–	–	–	..	–	–
Solar / Wind / Other	–	0.0	0.0	0.0	..	..	..
Electricity	12.8	26.0	31.6	32.2	..	39.5	46.1
Heat	–	0.8	0.8	0.7	..	..	..
Shares (%)							
Coal	*9.5*	*5.1*	*3.1*	*2.9*	..	*3.9*	*3.4*
Oil	*72.0*	*54.3*	*53.0*	*52.8*	..	*51.5*	*51.4*
Gas	*8.1*	*16.4*	*18.7*	*19.2*	..	*19.8*	*19.8*
Comb. Renewables & Wastes	*1.2*	*5.8*	*5.8*	*5.7*	..	*5.6*	*5.4*
Geothermal	–	–	–	–	..	–	–
Solar / Wind / Other	–	–	–	–	..	..	..
Electricity	*9.3*	*17.7*	*18.8*	*19.0*	..	*19.3*	*20.0*
Heat	–	*0.6*	*0.5*	*0.4*	..	..	..
TOTAL INDUSTRY[6]	**55.7**	**46.2**	**51.5**	**51.5**	**..**	**63.6**	**70.5**
Coal[1]	7.2	5.9	4.4	4.1	..	6.3	5.6
Oil	35.3	18.0	20.0	19.9	..	26.3	28.9
Gas	5.8	11.1	14.1	14.2	..	15.1	16.5
Comb. Renewables & Wastes[2]	0.2	1.4	1.7	1.8	..	2.0	2.6
Geothermal	–	–	–	–	..	–	–
Solar / Wind / Other	–	–	–	–	..	..	..
Electricity	7.2	9.9	11.4	11.4	..	13.8	16.9
Heat	–	–	–	–	..	..	..
Shares (%)							
Coal	12.9	12.7	8.5	8.0	..	10.0	8.0
Oil	63.4	38.9	38.9	38.6	..	41.4	41.0
Gas	10.4	24.0	27.3	27.6	..	23.8	23.4
Comb. Renewables & Wastes	0.4	3.1	3.3	3.6	..	3.1	3.7
Geothermal	–	–	–	–	..	–	–
Solar / Wind / Other	–	–	–	–	..	..	..
Electricity	13.0	21.3	22.0	22.1	..	21.7	24.0
Heat	–	–	–	–	..	..	..
TRANSPORT[7]	**27.1**	**42.8**	**50.8**	**51.8**	**..**	**62.4**	**75.4**
TOTAL OTHER SECTORS[8]	**55.4**	**57.2**	**65.3**	**66.5**	**..**	**78.5**	**85.2**
Coal[1]	5.8	1.7	0.8	0.7	..	1.6	2.3
Oil	37.6	19.5	19.3	19.2	..	17.9	16.1
Gas	5.4	12.8	17.3	18.3	..	25.4	29.3
Comb. Renewables & Wastes[2]	1.5	7.1	7.9	7.7	..	9.1	9.6
Geothermal	–	–	–	–	..	–	–
Solar / Wind / Other	–	0.0	0.0	0.0	..	..	..
Electricity	5.0	15.3	19.3	19.9	..	24.6	27.9
Heat	–	0.8	0.8	0.7	..	..	..
Shares (%)							
Coal	*10.5*	*2.9*	*1.2*	*1.1*	..	*2.0*	*2.7*
Oil	*68.0*	*34.0*	*29.5*	*28.8*	..	*22.7*	*18.9*
Gas	*9.7*	*22.4*	*26.5*	*27.6*	..	*32.3*	*34.4*
Comb. Renewables & Wastes	*2.7*	*12.4*	*12.1*	*11.5*	..	*11.6*	*11.3*
Geothermal	–	–	–	–	..	–	–
Solar / Wind / Other	–	–	–	–	..	..	..
Electricity	*9.0*	*26.8*	*29.5*	*29.9*	..	*31.3*	*32.8*
Heat	–	*1.5*	*1.2*	*1.1*	..	..	..

Unit:Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	1998	1999	2005	2010	2020
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**35.9**	**98.5**	**120.1**	**121.3**	**..**	**137.6**	**142.9**
OUTPUT (Mtoe)	**15.7**	**35.8**	**43.6**	**44.7**	**..**	**52.7**	**57.8**
(TWh gross)	182.5	416.8	507.1	519.8	..	612.7	672.1
Output Shares (%)							
Coal	*19.4*	*8.5*	*7.4*	*6.2*	*..*	*1.5*	*1.9*
Oil	*40.2*	*2.1*	*2.3*	*2.0*	*..*	*0.2*	*0.1*
Gas	*5.5*	*0.7*	*1.0*	*1.4*	*..*	*16.3*	*29.8*
Comb. Renewables & Wastes	*0.4*	*0.4*	*0.5*	*0.6*	*..*	*..*	*..*
Nuclear	*8.1*	*75.4*	*76.5*	*75.8*	*..*	*69.8*	*56.8*
Hydro	*26.1*	*12.8*	*12.2*	*13.9*	*..*	*12.3*	*11.3*
Geothermal	*–*	*0.0*	*–*	*–*	*..*	*–*	*–*
Solar/Wind/Other	*0.3*	*0.1*	*0.1*	*0.1*	*..*	*..*	*..*
TOTAL LOSSES	**37.6**	**75.2**	**89.7**	**89.7**	**..**	**103.2**	**103.1**
of which:							
Electricity and Heat Generation[10]	20.2	61.8	75.7	75.9	..	86.4	85.7
Other Transformation	5.4	1.6	0.3	0.3	..	..	..
Own Use and Losses[11]	12.0	11.8	13.7	13.5	..	16.9	17.4
Statistical Differences	**0.9**	**4.5**	**–2.8**	**–4.4**	**..**	**–**	**–**

INDICATORS	1973	1990	1998	1999	2005	2010	2020
GDP (billion 1995 US$)	961.43	1473.22	1649.35	1697.58	1945.73	2180.02	2736.64
Population (millions)	53.42	58.15	60.03	60.27	60.80	61.70	63.50
TPES/GDP[12]	0.18	0.15	0.15	0.15	..	0.14	0.12
Energy Production/TPES	0.20	0.49	0.49	0.50	..	0.42	0.35
Per Capita TPES[13]	3.31	3.89	4.24	4.23	..	4.99	5.26
Oil Supply/GDP[12]	0.13	0.06	0.05	0.05	..	0.05	0.05
TFC/GDP[12]	0.14	0.10	0.10	0.10	..	0.09	0.08
Per Capita TFC[13]	2.58	2.52	2.79	2.82	..	3.31	3.64
Energy-related CO_2 Emissions (Mt CO_2)14	490.4	364.0	371.7	361.4	..	461.5	553.4
CO_2 Emissions from Bunkers (Mt CO_2)	22.7	17.7	23.0	25.0	..	24.3	26.5

GROWTH RATES (% per year)

	73–79	79–90	90–98	98–99	99–05	05–10	10–20
TPES	1.0	1.7	1.5	0.2	..	..	0.8
Coal	1.7	–4.2	–2.0	–11.3	..	..	0.6
Oil	–1.4	–2.4	0.5	–0.5	..	..	1.2
Gas	7.4	2.0	3.2	3.2	..	..	3.3
Comb. Renewables & Wastes	7.6	12.7	1.9	–0.4	..	..	0.9
Nuclear	18.1	20.6	2.7	1.6	..	..	–1.1
Hydro	5.7	–2.0	1.9	16.7	..	..	0.1
Geothermal	–	–	0.9	–15.2	..	..	–
Solar/Wind/Other	–1.8	3.2	1.7	1.4	..	..	–
TFC	0.7	0.2	1.7	1.3	..	..	1.2
Electricity Consumption	5.4	3.7	2.5	2.0	..	..	1.6
Energy Production	2.1	9.4	1.6	1.5	..	..	–0.9
Net Oil Imports	–1.4	–2.9	0.9	–2.9	..	..	1.2
GDP	2.8	2.4	1.4	2.9	2.3	2.3	2.3
Growth in the TPES/GDP Ratio	–1.8	–0.6	0.1	–2.6	..	..	–1.4
Growth in the TFC/GDP Ratio	–2.1	–2.2	0.3	–1.6	..	..	–1.0

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

GERMANY

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit:Mtoe

SUPPLY		1973	1990	1998	1999	2005	2010	2020
TOTAL PRODUCTION		171,7	185.5	131.6	133.0	124.3	116.9	..
Coal[1]		141.4	121.8	64.1	62.2	52.6	51.0	..
Oil		6.8	4.7	3.5	3.4	2.0	1.6	..
Gas		16.4	13.5	15.7	16.7	14.4	13.1	..
Comb. Renewables & Wastes[2]		2.5	4.1	4.1	4.1	7.8	8.3	..
Nuclear		3.2	39.8	42.1	44.3	44.2	39.1	..
Hydro		1.3	1.5	1.5	1.7	1.8	1.9	..
Geothermal		–	0.0	0.0	0.0	–	–	..
Solar / Wind / Other[3]		–	0.0	0.5	0.6	1.4	2.0	..
TOTAL NET IMPORTS[4]		**167.3**	**165.4**	**212.7**	**201.8**	**226.6**	**233.5**	**..**
Coal[1]	Exports	18.3	8.2	0.6	0.4	0.2	0.1	..
	Imports	15.2	11.5	17.9	17.5	23.7	23.1	..
	Net Imports	–3.1	3.3	17.4	17.1	23.5	23.0	..
Oil	Exports	9.9	10.2	16.7	18.7	14.8	14.6	..
	Imports	171.1	132.9	158.1	148.1	155.4	154.7	..
	Bunkers	4.1	2.5	2.1	2.1	1.9	1.8	..
	Net Imports	157.1	120.2	139.3	127.4	138.7	138.4	..
Gas	Exports	0.1	0.9	3.3	4.3	2.7	2.9	..
	Imports	12.4	42.7	59.3	61.6	66.2	74.1	..
	Net Imports	12.3	41.7	56.0	57.3	63.5	71.2	..
Electricity	Exports	0.7	2.6	3.4	3.4	1.9	1.7	..
	Imports	1.7	2.7	3.3	3.5	2.8	2.6	..
	Net Imports	1.0	0.1	–0.1	0.1	0.9	0.9	..
TOTAL STOCK CHANGES		**–1.1**	**4.7**	**0.6**	**2.4**	**–**	**–**	**..**
TOTAL SUPPLY (TPES)		**337.9**	**355.5**	**344.8**	**337.2**	**350.8**	**350.4**	**..**
Coal[1]		139.4	128.5	84.0	79.4	76.1	74.0	..
Oil		161.9	126.5	139.9	135.1	140.7	140.0	..
Gas		28.7	55.0	72.7	72.0	78.0	84.2	..
Comb. Renewables & Wastes[2]		2.5	4.1	4.1	4.1	7.8	8.3	..
Nuclear		3.2	39.8	42.1	44.3	44.2	39.1	..
Hydro		1.3	1.5	1.5	1.7	1.8	1.9	..
Geothermal		–	0.0	0.0	0.0	–	–	..
Solar / Wind / Other[3]		–	0.0	0.5	0.6	1.4	2.0	..
Electricity Trade[5]		1.0	0.1	–0.1	0.1	0.9	0.9	..
Shares (%)								
Coal		*41.2*	*36.2*	*24.4*	*23.5*	*21.7*	*21.1*	..
Oil		*47.9*	*35.6*	*40.6*	*40.1*	*40.1*	*39.9*	..
Gas		*8.5*	*15.5*	*21.1*	*21.3*	*22.2*	*24.0*	..
Comb. Renewables & Wastes		*0.7*	*1.2*	*1.2*	*1.2*	*2.2*	*2.4*	..
Nuclear		*0.9*	*11.2*	*12.2*	*13.1*	*12.6*	*11.2*	..
Hydro		*0.4*	*0.4*	*0.4*	*0.5*	*0.5*	*0.5*	..
Geothermal		–	–	–	–	–	–	..
Solar / Wind / Other		–	–	*0.1*	*0.2*	*0.4*	*0.6*	..
Electricity Trade		*0.3*	–	–	–	*0.3*	*0.3*	..

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

Please note: All data include the new Laender of Germany. In the forecast data, gas-works gas is included with coal instead of with gas. Statistical differences in both coal and gas are due to differences between production and consumption in the German "Energiebilanzen". Forecast data for 2005 and 2010 are based on the 1999 submission.

Unit:Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	1998	1999	2005	2010	2020
TFC	**246.6**	**246.6**	**244.5**	**239.7**	**260.0**	**261.7**	**..**
Coal[1]	53.1	37.3	11.5	10.4	13.2	11.6	..
Oil	138.2	117.7	129.1	125.3	131.0	130.3	..
Gas	21.1	41.0	54.0	54.3	59.6	61.7	..
Comb. Renewables & Wastes[2]	1.7	2.3	1.4	1.4	4.3	4.3	..
Geothermal	–	0.0	0.0	0.0	–	–	..
Solar / Wind / Other	–	0.0	0.1	0.1	0.3	0.5	..
Electricity	26.9	39.1	40.1	40.2	42.9	44.6	..
Heat	5.5	9.1	8.3	8.0	8.6	8.6	..
Shares (%)							
Coal	*21.5*	*15.1*	*4.7*	*4.3*	*5.1*	*4.4*	..
Oil	*56.0*	*47.7*	*52.8*	*52.3*	*50.4*	*49.8*	..
Gas	*8.6*	*16.6*	*22.1*	*22.7*	*22.9*	*23.6*	..
Comb. Renewables & Wastes	*0.7*	*0.9*	*0.6*	*0.6*	*1.6*	*1.6*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	*0.1*	*0.2*	..
Electricity	*10.9*	*15.9*	*16.4*	*16.8*	*16.5*	*17.1*	..
Heat	*2.2*	*3.7*	*3.4*	*3.4*	*3.3*	*3.3*	..
TOTAL INDUSTRY[6]	**105.9**	**88.7**	**78.0**	**76.8**	**86.4**	**88.8**	**..**
Coal[1]	28.7	20.7	9.7	9.0	12.2	11.0	..
Oil	46.9	27.3	29.0	28.0	30.9	31.8	..
Gas	13.3	19.7	20.1	20.9	23.3	25.1	..
Comb. Renewables & Wastes[2]	0.0	–	0.1	0.1	0.3	0.3	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	15.3	18.6	17.9	17.7	18.1	18.9	..
Heat	1.6	2.4	1.1	1.1	1.6	1.7	..
Shares (%)							
Coal	*27.1*	*23.3*	*12.5*	*11.7*	*14.1*	*12.3*	..
Oil	*44.3*	*30.8*	*37.2*	*36.4*	*35.7*	*35.9*	..
Gas	*12.6*	*22.2*	*25.8*	*27.3*	*27.0*	*28.3*	..
Comb. Renewables & Wastes	–	–	*0.2*	*0.2*	*0.3*	*0.3*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	*14.5*	*21.0*	*23.0*	*23.1*	*21.0*	*21.3*	..
Heat	1.5	2.7	1.4	1.4	1.9	1.9	..
TRANSPORT[7]	**39.7**	**60.0**	**66.2**	**68.3**	**67.3**	**67.4**	**..**
TOTAL OTHER SECTORS[8]	**101.0**	**97.9**	**100.3**	**94.7**	**106.2**	**105.5**	**..**
Coal[1]	22.7	16.6	1.7	1.4	1.0	0.7	..
Oil	54.2	31.6	35.3	30.4	34.5	33.0	..
Gas	7.8	21.3	33.9	33.4	36.3	36.6	..
Comb. Renewables & Wastes[2]	1.7	2.3	1.3	1.3	3.9	3.9	..
Geothermal	–	0.0	0.0	0.0	–	–	..
Solar / Wind / Other	–	0.0	0.1	0.1	0.3	0.5	..
Electricity	10.7	19.3	20.8	21.1	23.2	24.0	..
Heat	3.9	6.7	7.2	7.0	7.0	6.9	..
Shares (%)							
Coal	*22.5*	*16.9*	*1.7*	*1.5*	*1.0*	*0.6*	..
Oil	*53.6*	*32.3*	*35.2*	*32.1*	*32.5*	*31.3*	..
Gas	*7.7*	*21.8*	*33.8*	*35.3*	*34.2*	*34.6*	..
Comb. Renewables & Wastes	*1.7*	*2.3*	*1.3*	*1.4*	*3.7*	*3.7*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	*0.1*	*0.1*	*0.3*	*0.5*	..
Electricity	*10.6*	*19.8*	*20.7*	*22.3*	*21.8*	*22.8*	..
Heat	*3.9*	*6.9*	*7.2*	*7.4*	*6.6*	*6.5*	..

Unit:Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	1998	1999	2005	2010	2020
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**98.6**	**141.2**	**132.3**	**131.8**	**129.3**	**128.8**	**..**
OUTPUT (Mtoe)	**32.2**	**47.1**	**47.5**	**47.4**	**49.4**	**51.4**	**..**
(TWh gross)	374.4	547.6	552.4	551.3	574.9	598.0	..
Output Shares (%)							
Coal	*69.0*	*58.8*	*54.2*	*51.9*	*51.9*	*50.5*	..
Oil	*12.0*	*1.9*	*1.2*	*1.1*	*0.8*	*0.8*	..
Gas	*10.9*	*7.4*	*9.8*	*10.0*	*9.8*	*14.5*	..
Comb. Renewables & Wastes	*0.8*	*0.9*	*1.6*	*1.7*	*2.2*	*2.7*	..
Nuclear	*3.2*	*27.8*	*29.3*	*30.8*	*29.5*	*25.1*	..
Hydro	*4.1*	*3.2*	*3.1*	*3.5*	*3.6*	*3.6*	..
Geothermal	–	–	–	–	–	–	..
Solar/Wind/Other	–	*0.0*	*0.8*	*1.0*	*2.2*	*2.9*	..
TOTAL LOSSES	**90.7**	**112.0**	**100.0**	**99.0**	**89.1**	**86.5**	**..**
of which:							
Electricity and Heat Generation[10]	60.0	83.4	75.6	75.5	71.4	69.3	..
Other Transformation	7.0	8.0	6.1	5.5	1.0	0.9	..
Own Use and Losses[11]	23.7	20.5	18.3	18.0	16.7	16.3	..
Statistical Differences	0.5	–3.0	0.3	–1.5	1.8	2.2	..

INDICATORS

	1973	1990	1998	1999	2005	2010	2020
GDP (billion 1995 US$)	1574.08	2270.26	2563.27	2603.18	3090.27	3479.34	..
Population (millions)	78.96	79.36	82.03	82.09	79.70	78.60	–
TPES/GDP[12]	0.21	0.16	0.13	0.13	0.11	0.10	..
Energy Production/TPES	0.51	0.52	0.38	0.39	0.35	0.33	..
Per Capita TPES[13]	4.28	4.48	4.20	4.11	4.40	4.46	..
Oil Supply/GDP[12]	0.10	0.06	0.05	0.05	0.05	0.04	..
TFC/GDP[12]	0.16	0.11	0.10	0.09	0.08	0.08	..
Per Capita TFC[13]	3.12	3.11	2.98	2.92	3.26	3.33	..
Energy-related CO_2 Emissions (Mt CO_2)[14]	1064.7	966.5	857.7	821.7	836.9	838.1	..
CO_2 Emissions from Bunkers (Mt CO_2)	21.8	22.1	25.5	27.1	26.5	26.2	..

GROWTH RATES (% per year)

	73–79	79–90	90–98	98–99	99–05	05–10	10–20
TPES	1.5	–0.4	–0.4	–2.2	0.7	–0.0	–
Coal	–0.2	–0.6	–5.2	–5.5	–0.7	–0.6	–
Oil	–0.1	–2.2	1.3	–3.4	0.7	–0.1	–
Gas	10.2	0.6	3.6	–1.0	1.3	1.6	–
Comb. Renewables & Wastes	6.2	1.2	–	–0.1	11.3	1.3	–
Nuclear	27.5	10.3	0.7	5.2	–0.0	–2.4	–
Hydro	3.2	–0.5	–0.2	12.8	1.2	0.8	–
Geothermal	–	–	4.6	–	–	–	–
Solar/Wind/Other	–	–	54.1	15.7	17.0	6.9	–
TFC	1.2	–0.7	–0.1	–1.9	1.4	0.1	–
Electricity Consumption	3.8	1.4	0.3	0.2	1.1	0.8	–
Energy Production	1.0	0.2	–4.2	1.1	–1.1	–1.2	–
Net Oil Imports	0.2	–2.5	1.9	–8.6	1.4	–0.0	–
GDP	2.4	2.1	1.5	1.6	2.9	2.4	–
Growth in the TPES/GDP Ratio	–0.8	–2.4	–1.9	–3.7	–2.2	–2.4	–
Growth in the TFC/GDP Ratio	–1.1	–2.7	–1.6	–3.4	–1.5	–2.2	–

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

GREECE

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit:Mtoe

SUPPLY		1973	1990	1998	1999	2005	2010	2020
TOTAL PRODUCTION		**2.33**	**8.79**	**9.86**	**9.81**	**9.59**	**12.00**	**..**
Coal[1]		1.69	7.12	8.13	8.28	8.09	10.36	..
Oil		–	0.84	0.29	0.02	–	–	..
Gas		–	0.14	0.04	0.00	–	–	..
Comb. Renewables & Wastes[2]		0.45	0.46	0.96	0.98	0.95	0.95	..
Nuclear		–	–	–	–	–	–	..
Hydro		0.19	0.15	0.32	0.40	0.39	0.40	..
Geothermal		–	0.00	0.00	0.00	0.00	0.11	..
Solar / Wind / Other[3]		–	0.08	0.12	0.14	0.16	0.18	..
TOTAL NET IMPORTS[4]		**11.12**	**12.74**	**17.37**	**16.43**	**26.93**	**32.50**	**..**
Coal[1]	Exports	0.02	–	0.05	0.05	–	–	..
	Imports	0.47	0.92	0.89	0.78	1.02	1.02	..
	Net Imports	0.45	0.92	0.85	0.73	1.02	1.02	..
Oil	Exports	4.95	7.56	3.29	3.84	6.00	6.00	..
	Imports	16.51	21.87	22.48	21.42	32.30	37.48	..
	Bunkers	0.89	2.55	3.50	3.12	3.50	3.50	..
	Net Imports	10.67	11.76	15.70	14.47	22.80	27.98	..
Gas	Exports	–	–	–	–	–	–	..
	Imports	–	–	0.69	1.22	2.96	3.50	..
	Net Imports	–	–	0.69	1.22	2.96	3.50	..
Electricity	Exports	0.00	0.05	0.08	0.14	0.10	–	..
	Imports	0.01	0.11	0.22	0.16	0.25	–	..
	Net Imports	0.00	0.06	0.14	0.01	0.15	–	..
TOTAL STOCK CHANGES		**–1.10**	**0.24**	**–0.82**	**0.65**	**–**	**–**	**..**
TOTAL SUPPLY (TPES)		**12.36**	**21.77**	**26.41**	**26.89**	**36.52**	**44.50**	**..**
Coal[1]		2.10	8.07	8.93	8.81	9.11	11.38	..
Oil		9.61	12.81	15.22	15.34	22.80	27.98	..
Gas		–	0.14	0.73	1.22	2.96	3.50	..
Comb. Renewables & Wastes[2]		0.45	0.46	0.96	0.98	0.95	0.95	..
Nuclear		–	–	–	–	–	–	..
Hydro		0.19	0.15	0.32	0.40	0.39	0.40	..
Geothermal		–	0.00	0.00	0.00	0.00	0.11	..
Solar / Wind / Other[3]		–	0.08	0.12	0.14	0.16	0.18	..
Electricity Trade[5]		0.00	0.06	0.14	0.01	0.15	–	..
Shares (%)								
Coal		*17.0*	*37.1*	*33.8*	*32.8*	*24.9*	*25.6*	..
Oil		*77.7*	*58.8*	*57.6*	*57.1*	*62.4*	*62.9*	..
Gas		–	*0.6*	*2.7*	*4.5*	*8.1*	*7.9*	..
Comb. Renewables & Wastes		*3.6*	*2.1*	*3.6*	*3.6*	*2.6*	*2.1*	..
Nuclear		–	–	–	–	–	–	..
Hydro		*1.5*	*0.7*	*1.2*	*1.5*	*1.1*	*0.9*	..
Geothermal		–	–	–	–	–	*0.2*	..
Solar / Wind / Other		–	*0.3*	*0.5*	*0.5*	*0.4*	*0.4*	..
Electricity Trade		–	*0.3*	*0.5*	*0.1*	*0.4*	–	..

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

Please note: Forecast data are based on the 1999 submission.

Unit:Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	1998	1999	2005	2010	2020
TFC	**9.21**	**15.05**	**19.08**	**18.99**	**27.12**	**33.05**	**..**
Coal[1]	0.52	1.20	0.95	0.75	1.02	1.02	..
Oil	7.15	10.75	13.36	13.33	19.22	24.44	..
Gas	0.00	0.11	0.34	0.35	1.45	1.72	..
Comb. Renewables & Wastes[2]	0.45	0.46	0.91	0.91	0.91	0.91	..
Geothermal	–	0.00	0.00	0.00	0.00	–	..
Solar / Wind / Other	–	0.08	0.12	0.12	0.12	0.12	..
Electricity	1.09	2.45	3.38	3.49	4.40	4.84	..
Heat	–	–	0.03	0.03	–	–	..
Shares (%)							
Coal	*5.6*	*8.0*	*5.0*	*4.0*	*3.8*	*3.1*	..
Oil	*77.6*	*71.4*	*70.0*	*70.2*	*70.9*	*73.9*	..
Gas	–	*0.7*	*1.8*	*1.8*	*5.3*	*5.2*	..
Comb. Renewables & Wastes	*4.9*	*3.1*	*4.8*	*4.8*	*3.4*	*2.8*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	*0.5*	*0.6*	*0.7*	*0.4*	*0.4*	..
Electricity	*11.9*	*16.3*	*17.7*	*18.4*	*16.2*	*14.6*	..
Heat	–	–	*0.1*	*0.1*	–	–	..
TOTAL INDUSTRY[6]	**3.49**	**4.62**	**5.07**	**4.76**	**6.86**	**8.18**	**..**
Coal[1]	0.46	1.18	0.92	0.73	1.00	1.00	..
Oil	2.39	2.18	2.51	2.37	3.21	4.41	..
Gas	–	0.10	0.33	0.34	1.02	1.02	..
Comb. Renewables & Wastes[2]	–	0.12	0.21	0.21	0.21	0.21	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	0.63	1.04	1.11	1.11	1.42	1.54	..
Heat	–	–	–	–	–	–	..
Shares (%)							
Coal	*13.1*	*25.4*	*18.1*	*15.4*	*14.6*	*12.2*	..
Oil	*68.7*	*47.2*	*49.5*	*49.7*	*46.8*	*53.9*	..
Gas	–	*2.2*	*6.5*	*7.1*	*14.9*	*12.5*	..
Comb. Renewables & Wastes	–	*2.6*	*4.0*	*4.4*	*3.1*	*2.6*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	*18.2*	*22.5*	*21.9*	*23.3*	*20.7*	*18.8*	..
Heat	–	–	–	–	–	–	..
TRANSPORT[7]	**2.70**	**5.95**	**7.46**	**7.62**	**10.78**	**13.24**	**..**
TOTAL OTHER SECTORS[8]	**3.03**	**4.48**	**6.56**	**6.62**	**9.48**	**11.63**	**..**
Coal[1]	0.04	0.03	0.03	0.02	0.02	0.02	..
Oil	2.08	2.63	3.41	3.36	5.24	6.81	..
Gas	0.00	0.01	0.01	0.01	0.43	0.70	..
Comb. Renewables & Wastes[2]	0.45	0.34	0.70	0.70	0.70	0.70	..
Geothermal	–	0.00	0.00	0.00	0.00	–	..
Solar / Wind / Other	–	0.08	0.12	0.12	0.12	0.12	..
Electricity	0.46	1.40	2.26	2.37	2.97	3.28	..
Heat	–	–	0.03	0.03	–	–	..
Shares (%)							
Coal	*1.4*	*0.6*	*0.5*	*0.3*	*0.2*	*0.2*	..
Oil	*68.6*	*58.7*	*52.0*	*50.8*	*55.3*	*58.6*	..
Gas	*0.1*	*0.2*	*0.2*	*0.2*	*4.5*	*6.0*	..
Comb. Renewables & Wastes	*14.9*	*7.7*	*10.7*	*10.6*	*7.4*	*6.0*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	*1.7*	*1.8*	*1.9*	*1.3*	*1.0*	..
Electricity	*15.0*	*31.2*	*34.4*	*35.8*	*31.3*	*28.2*	..
Heat	–	–	*0.4*	*0.4*	–	–	.

Unit:Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	1998	1999	2005	2010	2020
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**3.34**	**8.90**	**10.56**	**11.41**	**12.45**	**15.10**	**..**
OUTPUT (Mtoe)	**1.27**	**2.99**	**3.97**	**4.25**	**4.73**	**5.76**	**..**
(TWh gross)	14.82	34.78	46.18	49.38	55.02	66.97	..
Output Shares (%)							
Coal	*35.5*	*72.4*	*70.3*	*65.6*	*55.3*	*60.5*	..
Oil	*49.5*	*22.3*	*17.5*	*16.5*	*19.4*	*15.8*	..
Gas	–	*0.3*	*3.7*	*7.9*	*16.2*	*15.4*	..
Comb. Renewables & Wastes	–	–	*0.3*	*0.4*	*0.2*	*0.2*	..
Nuclear	–	–	–	–	–	–	..
Hydro	*15.0*	*5.1*	*8.0*	*9.3*	*8.1*	*6.9*	..
Geothermal	–	–	–	–	–	*0.2*	..
Solar/Wind/Other	–	*0.0*	*0.2*	*0.3*	*0.8*	*1.0*	..
TOTAL LOSSES	**3.14**	**7.00**	**7.59**	**8.16**	**9.40**	**11.46**	**..**
of which:							
Electricity and Heat Generation[10]	2.07	5.91	6.57	7.13	7.43	9.35	..
Other Transformation	0.44	–0.23	–0.64	–0.56	0.21	0.22	..
Own Use and Losses[11]	0.64	1.31	1.66	1.58	1.76	1.89	..
Statistical Differences	**0.00**	**–0.28**	**–0.26**	**–0.26**	**–**	**–**	**..**

INDICATORS

	1973	1990	1998	1999	2005	2010	2020
GDP (billion 1995 US$)	74.44	110.49	128.37	132.68	167.88	204.26	..
Population (millions)	8.93	10.16	10.52	10.53	10.80	11.00	..
TPES/GDP[12]	0.17	0.20	0.21	0.20	0.22	0.22	..
Energy Production/TPES	0.19	0.40	0.37	0.36	0.26	0.27	..
Per Capita TPES[13]	1.38	2.14	2.51	2.55	3.38	4.05	..
Oil Supply/GDP[12]	0.13	0.12	0.12	0.12	0.14	0.14	..
TFC/GDP[12]	0.12	0.14	0.15	0.14	0.16	0.16	..
Per Capita TFC[13]	1.03	1.48	1.81	1.80	2.51	3.00	..
Energy–related CO_2 Emissions (Mt CO_2)[14]	34.5	69.0	80.9	81.5	107.8	133.8	..
CO_2 Emissions from Bunkers (Mt CO_2)	4.5	10.5	13.6	12.7	13.9	13.9	..

GROWTH RATES (% per year)

	73–79	79–90	90–98	98–99	99–05	05–10	10–20
TPES	4.4	2.8	2.4	1.8	5.2	4.0	..
Coal	8.7	8.0	1.3	–1.3	0.6	4.6	..
Oil	3.5	0.7	2.2	0.8	6.8	4.2	..
Gas	–	–	23.0	68.0	16.0	3.4	..
Comb. Renewables & Wastes	–	0.3	9.5	2.2	–0.4	–	..
Nuclear	–	–	–	–	–	–	..
Hydro	8.2	–6.2	9.8	23.4	–0.4	0.8	..
Geothermal	–	–	9.1	–	12.2	94.0	..
Solar/Wind/Other	–	–	6.5	10.5	2.6	2.4	..
TFC	4.0	2.4	3.0	–0.5	6.1	4.0	..
Electricity Consumption	7.0	3.7	4.1	3.3	3.9	1.9	..
Energy Production	8.3	8.0	1.4	–0.5	–0.4	4.6	..
Net Oil Imports	2.5	–0.4	3.7	–7.8	7.9	4.2	..
GDP	3.7	1.6	1.9	3.4	4.0	4.0	..
Growth in the TPES/GDP Ratio	0.7	1.2	0.5	–1.5	1.2	0.0	..
Growth in the TFC/GDP Ratio	0.2	0.7	1.1	–3.7	2.0	0.0	..

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

HUNGARY

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit:Mtoe

SUPPLY		1973	1990	1998	1999	2005	2010	2020
TOTAL PRODUCTION		**12.84**	**14.22**	**11.86**	**11.49**	**10.42**	**10.26**	**9.42**
Coal[1]		6.05	4.14	3.05	3.00	1.90	2.20	2.10
Oil		2.02	2.27	1.82	1.78	1.20	0.90	0.70
Gas		4.03	3.81	2.97	2.62	2.22	1.91	1.50
Comb. Renewables & Wastes[2]		0.73	0.40	0.38	0.39	0.39	0.51	0.40
Nuclear		–	3.58	3.64	3.67	3.78	3.78	3.75
Hydro		0.01	0.02	0.01	0.02	0.02	0.02	0.02
Geothermal		–	–	–	0.00	0.91	0.96	0.96
Solar / Wind / Other[3]		–	–	–	–	–	–	–
TOTAL NET IMPORTS[4]		**8.66**	**14.17**	**14.15**	**13.73**	**15.90**	**17.09**	**18.72**
Coal[1]	Exports	0.11	–	0.13	0.11	0.13	–	–
	Imports	1.74	1.63	1.25	1.18	1.86	1.11	1.14
	Net Imports	1.63	1.63	1.12	1.07	1.73	1.11	1.14
Oil	Exports	0.92	1.52	1.85	1.95	1.80	1.80	1.80
	Imports	7.39	7.96	7.74	7.20	7.83	8.48	9.27
	Bunkers	–	–	–	–	–	–	–
	Net Imports	6.48	6.44	5.89	5.25	6.03	6.68	7.47
Gas	Exports	0.01	0.02	0.00	0.00	–	–	–
	Imports	0.17	5.19	7.08	7.32	7.98	9.15	9.80
	Net Imports	0.15	5.17	7.08	7.31	7.98	9.15	9.80
Electricity	Exports	0.09	0.19	0.23	0.20	0.16	0.16	0.16
	Imports	0.49	1.14	0.29	0.29	0.32	0.31	0.47
	Net Imports	0.40	0.96	0.06	0.09	0.16	0.16	0.31
TOTAL STOCK CHANGES		**–0.02**	**0.06**	**–0.72**	**0.07**	**–**	**–**	**–**
TOTAL SUPPLY (TPES)		**21.47**	**28.44**	**25.28**	**25.29**	**26.31**	**27.35**	**28.14**
Coal[1]		7.91	6.12	4.17	4.22	3.63	3.31	3.24
Oil		8.21	8.51	7.25	7.00	7.23	7.58	8.17
Gas		4.17	8.91	9.77	9.90	10.20	11.06	11.30
Comb. Renewables & Wastes[2]		0.78	0.35	0.38	0.39	0.39	0.51	0.40
Nuclear		–	3.58	3.64	3.67	3.78	3.78	3.75
Hydro		0.01	0.02	0.01	0.02	0.02	0.02	0.02
Geothermal		–	–	–	0.00	0.91	0.96	0.96
Solar / Wind / Other[3]		–	–	–	–	–	–	–
Electricity Trade[5]		0.40	0.96	0.06	0.09	0.16	0.16	0.31
Shares (%)								
Coal		*36.8*	*21.5*	*16.5*	*16.7*	*13.8*	*12.1*	*11.5*
Oil		*38.2*	*29.9*	*28.7*	*27.7*	*27.5*	*27.7*	*29.0*
Gas		*19.4*	*31.3*	*38.7*	*39.2*	*38.8*	*40.4*	*40.1*
Comb. Renewables & Wastes		*3.6*	*1.2*	*1.5*	*1.5*	*1.5*	*1.8*	*1.4*
Nuclear		–	*12.6*	*14.4*	*14.5*	*14.3*	*13.8*	*13.3*
Hydro		–	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*
Geothermal		–	–	–	–	*3.5*	*3.5*	*3.4*
Solar / Wind / Other		–	–	–	–	–	–	–
Electricity Trade		*1.9*	*3.4*	*0.3*	*0.4*	*0.6*	*0.6*	*1.1*

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

Unit:Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	1998	1999	2005	2010	2020
TFC	**17.28**	**20.93**	**17.22**	**17.10**	**17.90**	**18.91**	**19.75**
Coal[1]	4.17	2.68	0.63	0.65	0.75	0.76	0.75
Oil	6.71	7.41	5.54	5.41	5.51	5.80	6.40
Gas	3.08	6.20	6.69	6.71	6.92	7.46	7.70
Comb. Renewables & Wastes[2]	0.76	0.34	0.36	0.36	0.55	0.56	0.45
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	1.51	2.72	2.49	2.49	2.62	2.78	2.89
Heat	1.06	1.59	1.51	1.49	1.55	1.55	1.56
Shares (%)							
Coal	*24.1*	*12.8*	*3.7*	*3.8*	*4.2*	*4.0*	*3.8*
Oil	*38.8*	*35.4*	*32.1*	*31.6*	*30.8*	*30.7*	*32.4*
Gas	*17.8*	*29.6*	*38.9*	*39.2*	*38.7*	*39.4*	*39.0*
Comb. Renewables & Wastes	*4.4*	*1.6*	*2.1*	*2.1*	*3.1*	*2.9*	*2.3*
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	*8.7*	*13.0*	*14.5*	*14.6*	*14.6*	*14.7*	*14.6*
Heat	*6.1*	*7.6*	*8.8*	*8.7*	*8.7*	*8.2*	*7.9*
TOTAL INDUSTRY[6]	**7.90**	**8.06**	**5.17**	**4.62**	**4.97**	**5.33**	**5.45**
Coal[1]	1.87	0.80	0.38	0.39	0.50	0.50	0.50
Oil	2.34	2.11	1.69	1.37	1.51	1.60	1.80
Gas	2.29	3.76	1.96	1.68	1.67	1.90	1.90
Comb. Renewables & Wastes[2]	0.02	0.00	–	–	0.11	0.11	–
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	0.92	1.18	0.71	0.73	0.78	0.82	0.85
Heat	0.46	0.21	0.43	0.45	0.40	0.40	0.40
Shares (%)							
Coal	*23.6*	*9.9*	*7.3*	*8.4*	*10.1*	*9.4*	*9.2*
Oil	*29.6*	*26.2*	*32.7*	*29.7*	*30.4*	*30.0*	*33.0*
Gas	*29.0*	*46.6*	*37.9*	*36.3*	*33.6*	*35.7*	*34.9*
Comb. Renewables & Wastes	*0.2*	–	–	–	*2.1*	*2.0*	–
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	*11.7*	*14.7*	*13.8*	*15.8*	*15.8*	*15.4*	*15.6*
Heat	*5.9*	*2.6*	*8.3*	*9.8*	*8.0*	*7.5*	*7.3*
TRANSPORT[7]	**2.37**	**3.15**	**3.14**	**3.33**	**3.28**	**3.48**	**3.68**
TOTAL OTHER SECTORS[8]	**7.02**	**9.72**	**8.92**	**9.15**	**9.64**	**10.10**	**10.62**
Coal[1]	1.93	1.88	0.25	0.26	0.25	0.26	0.25
Oil	2.45	2.25	0.79	0.80	0.80	0.80	1.00
Gas	0.78	2.44	4.73	5.03	5.25	5.56	5.80
Comb. Renewables & Wastes[2]	0.74	0.34	0.36	0.36	0.44	0.45	0.45
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	0.52	1.43	1.70	1.67	1.75	1.88	1.95
Heat	0.60	1.38	1.09	1.04	1.15	1.15	1.16
Shares (%)							
Coal	*27.5*	*19.4*	*2.8*	*2.8*	*2.6*	*2.6*	*2.4*
Oil	*34.9*	*23.1*	*8.9*	*8.7*	*8.3*	*7.9*	*9.4*
Gas	*11.2*	*25.1*	*53.1*	*55.0*	*54.4*	*55.0*	*54.6*
Comb. Renewables & Wastes	*10.5*	*3.5*	*4.0*	*3.9*	*4.6*	*4.5*	*4.3*
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	*7.4*	*14.7*	*19.0*	*18.3*	*18.1*	*18.6*	*18.4*
Heat	*8.5*	*14.2*	*12.2*	*11.3*	*12.0*	*11.4*	*11.*

Unit:Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	1998	1999	2005	2010	2020
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**6.37**	**10.21**	**10.83**	**11.51**	**11.51**	**12.11**	**12.02**
OUTPUT (Mtoe)	**1.52**	**2.45**	**3.20**	**3.20**	**3.25**	**3.46**	**3.44**
(TWh gross)	17.64	28.44	37.19	37.15	37.80	40.20	39.95
Output Shares (%)							
Coal	*66.0*	*30.5*	*26.0*	*25.9*	*22.2*	*20.9*	*20.5*
Oil	*17.2*	*4.8*	*16.0*	*14.3*	*16.4*	*16.2*	*16.3*
Gas	*16.2*	*15.8*	*19.7*	*21.1*	*22.0*	*25.9*	*26.0*
Comb. Renewables & Wastes	–	–	*0.3*	*0.3*	*0.5*	*0.5*	*0.6*
Nuclear	–	*48.3*	*37.5*	*37.9*	*38.4*	*36.1*	*36.0*
Hydro	*0.6*	*0.6*	*0.4*	*0.5*	*0.5*	*0.5*	*0.5*
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
TOTAL LOSSES	**4.48**	**7.97**	**8.00**	**8.80**	**8.42**	**8.44**	**8.39**
of which:							
Electricity and Heat Generation[10]	3.67	6.00	5.96	6.61	6.55	6.94	6.86
Other Transformation	–0.17	–0.05	0.02	0.10	0.16	–0.24	–0.24
Own Use and Losses[11]	0.99	2.02	2.02	2.09	1.72	1.74	1.77
Statistical Differences	**–0.29**	**–0.45**	**0.07**	**–0.61**	**–**	**–**	**–**

INDICATORS

	1973	1990	1998	1999	2005	2010	2020
GDP (billion 1995 US$)	34.03	50.35	49.64	51.82	65.57	79.77	118.08
Population (millions)	10.43	10.37	10.14	10.07	9.82	9.62	9.26
TPES/GDP[12]	0.63	0.56	0.51	0.49	0.40	0.34	0.24
Energy Production/TPES	0.60	0.50	0.47	0.45	0.40	0.38	0.33
Per Capita TPES[13]	2.06	2.74	2.49	2.51	2.68	2.84	3.04
Oil Supply/GDP[12]	0.24	0.17	0.15	0.14	0.11	0.09	0.07
TFC/GDP[12]	0.51	0.42	0.35	0.33	0.27	0.24	0.17
Per Capita TFC[13]	1.66	2.02	1.70	1.70	1.82	1.97	2.13
Energy-related CO_2 Emissions (Mt CO_2)[14]	64.0	67.6	57.4	57.9	56.8	58.6	60.4
CO_2 Emissions from Bunkers (Mt CO_2)	0.2	0.5	0.6	0.6	0.6	0.6	0.6

GROWTH RATES (% per year)

	73–79	79–90	90–98	98–99	99–05	05–10	10–20
TPES	4.9	–0.1	–1.5	0.0	0.7	0.8	0.3
Coal	1.2	–3.0	–4.7	1.2	–2.5	–1.8	–0.2
Oil	5.6	–2.6	–2.0	–3.5	0.5	0.9	0.8
Gas	10.0	1.7	1.2	1.3	0.5	1.6	0.2
Comb. Renewables & Wastes	0.9	–7.4	1.0	2.4	–0.0	5.3	–2.3
Nuclear	–	–	0.2	1.1	0.5	–	–0.1
Hydro	6.3	1.3	–1.8	23.1	1.0	–	–
Geothermal	–	–	–	–	177.3	1.0	–
Solar/Wind/Other	–	–	–	–	–	–	–
TFC	4.6	–0.7	–2.4	–0.7	0.8	1.1	0.4
Electricity Consumption	6.0	2.2	–1.1	–0.1	0.8	1.3	0.4
Energy Production	2.6	–0.4	–2.2	–3.1	–1.6	–0.3	–0.9
Net Oil Imports	7.1	–3.8	–1.1	–10.8	2.3	2.1	1.1
GDP	4.3	1.3	–0.2	4.4	4.0	4.0	4.0
Growth in the TPES/GDP Ratio	0.6	–1.3	–1.3	–4.2	–3.2	–3.1	–3.6
Growth in the TFC/GDP Ratio	0.3	–2.0	–2.2	–4.9	–3.1	–2.8	–3.4

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

IRELAND

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit:Mtoe

SUPPLY

		1973	1990	1998	1999	2005	2010	2020
TOTAL PRODUCTION		**1.120**	**3.359**	**2.465**	**2.513**	**3.433**	**3.102**	**..**
Coal[1]		0.045	0.016	–	–	–	–	..
Peat		1.020	1.411	0.813	1.153	0.926	0.881	..
Oil		–	–	–	–	–	–	..
Gas		–	1.872	1.406	1.103	2.068	1.697	..
Comb. Renewables & Wastes[2]		–	–	0.152	0.167	0.261	0.304	..
Nuclear		–	–	–	–	–	–	..
Hydro		0.055	0.060	0.079	0.073	0.071	0.073	..
Geothermal		–	–	–	–	–	–	..
Solar/Wind/Other[3]		–	–	0.015	0.016	0.107	0.147	..
TOTAL NET IMPORTS[4]		**5.901**	**7.353**	**10.698**	**11.737**	**13.014**	**14.607**	**..**
Coal[1]	Exports	0.073	0.023	0.019	0.023	0.015	0.010	..
	Imports	0.578	2.286	1.926	1.582	1.773	0.938	..
	Net Imports	0.505	2.263	1.907	1.559	1.758	0.928	..
Peat	Exports	–	–	–	–	–	–	..
	Imports	–	–	–	–	–	–	..
	Net Imports	–	–	–	–	–	–	..
Oil	Exports	0.472	0.680	1.259	1.091	1.341	1.341	..
	Imports	5.956	5.788	8.808	9.529	9.956	10.455	..
	Bunkers	0.092	0.018	0.160	0.174	0.200	0.200	..
	Net Imports	5.392	5.090	7.389	8.264	8.415	8.914	..
Gas	Exports	–	–	–	–	–	–	..
	Imports	–	–	1.395	1.893	2.841	4.765	..
	Net Imports	–	–	1.395	1.893	2.841	4.765	..
Electricity	Exports	0.002	–	0.006	0.004	–	–	..
	Imports	0.006	–	0.013	0.025	–	–	..
	Net Imports	0.004	–	0.007	0.021	–	–	..
TOTAL STOCK CHANGES		**0.168**	**–0.250**	**0.094**	**–0.271**	**–**	**–**	**..**
TOTAL SUPPLY (TPES)		**7.189**	**10.463**	**13.258**	**13.979**	**16.447**	**17.709**	**..**
Coal[1]		0.565	2.371	1.937	1.602	1.758	0.928	..
Peat		1.020	1.288	1.001	0.887	0.926	0.881	..
Oil		5.545	4.871	7.266	8.216	8.415	8.914	..
Gas		–	1.872	2.802	2.996	4.909	6.462	..
Comb. Renewables & Wastes[2]		–	–	0.152	0.167	0.261	0.304	..
Nuclear		–	–	–	–	–	–	..
Hydro		0.055	0.060	0.079	0.073	0.071	0.073	..
Geothermal		–	–	–	–	–	–	..
Solar/Wind/Other[3]		–	–	0.015	0.016	0.107	0.147	..
Electricity Trade[5]		0.004	–	0.007	0.021	–	–	..
Shares (%)								
Coal		*7.9*	*22.7*	*14.6*	*11.5*	*10.7*	*5.2*	..
Peat		*14.2*	*12.3*	*7.6*	*6.3*	*5.6*	*5.0*	..
Oil		*77.1*	*46.6*	*54.8*	*58.8*	*51.2*	*50.3*	..
Gas		–	*17.9*	*21.1*	*21.4*	*29.8*	*36.5*	..
Comb. Renewables & Wastes		–	–	*1.1*	*1.2*	*1.6*	*1.7*	..
Nuclear		–	–	–	–	–	–	..
Hydro		*0.8*	*0.6*	*0.6*	*0.5*	*0.4*	*0.4*	..
Geothermal		–	–	–	–	–	–	..
Solar/Wind/Other		–	–	*0.1*	*0.1*	*0.7*	*0.8*	..
Electricity Trade		*0.1*	–	*0.1*	*0.2*	–	–	..

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

Unit:Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	1998	1999	2005	2010	2020
TFC	**5.416**	**7.732**	**9.970**	**10.590**	**12.640**	**14.168**	**..**
Coal[1]	0.520	1.137	0.513	0.445	0.439	0.294	..
Peat	0.408	0.427	0.240	0.134	0.139	0.132	..
Oil	3.856	4.149	6.144	6.814	7.724	8.728	..
Gas	0.103	0.998	1.423	1.444	2.080	2.388	..
Comb. Renewables & Wastes[2]	–	–	0.130	0.135	0.130	0.130	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	0.529	1.021	1.519	1.617	2.098	2.466	..
Heat	–	–	–	–	0.030	0.030	..
Shares (%)							
Coal	*9.6*	*14.7*	*5.1*	*4.2*	*3.5*	*2.1*	..
Peat	*7.5*	*5.5*	*2.4*	*1.3*	*1.1*	*0.9*	..
Oil	*71.2*	*53.7*	*61.6*	*64.3*	*61.1*	*61.6*	..
Gas	*1.9*	*12.9*	*14.3*	*13.6*	*16.5*	*16.9*	..
Comb. Renewables & Wastes	–	–	*1.3*	*1.3*	*1.0*	*0.9*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	*9.8*	*13.2*	*15.2*	*15.3*	*16.6*	*17.4*	..
Heat	–	–	–	–	*0.2*	*0.2*	..
TOTAL INDUSTRY[6]	**1.920**	**2.324**	**2.661**	**2.699**	**2.818**	**2.917**	**..**
Coal[1]	0.044	0.272	0.080	0.065	0.081	0.041	..
Peat	–	–	–	–	–	–	..
Oil	1.662	0.879	1.021	1.104	0.688	0.669	..
Gas	0.025	0.787	0.859	0.813	1.153	1.209	..
Comb. Renewables & Wastes[2]	–	–	0.091	0.092	0.087	0.087	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	0.189	0.386	0.609	0.625	0.809	0.911	..
Heat	–	–	–	–	–	–	..
Shares (%)							
Coal	*2.3*	*11.7*	*3.0*	*2.4*	*2.9*	*1.4*	..
Peat	–	–	–	–	–	–	..
Oil	*86.6*	*37.8*	*38.4*	*40.9*	*24.4*	*22.9*	..
Gas	*1.3*	*33.9*	*32.3*	*30.1*	*40.9*	*41.4*	..
Comb. Renewables & Wastes	–	–	*3.4*	*3.4*	*3.1*	*3.0*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	*9.8*	*16.6*	*22.9*	*23.2*	*28.7*	*31.2*	..
Heat	–	–	–	–	–	–	..
TRANSPORT[7]	**1.406**	**2.031**	**3.372**	**3.765**	**4.705**	**5.537**	**..**
TOTAL OTHER SECTORS[8]	**2.090**	**3.377**	**3.937**	**4.126**	**5.117**	**5.714**	**..**
Coal[1]	0.476	0.865	0.433	0.380	0.358	0.253	..
Peat	0.408	0.427	0.240	0.134	0.139	0.132	..
Oil	0.788	1.240	1.754	1.948	2.334	2.525	..
Gas	0.078	0.211	0.564	0.631	0.927	1.179	..
Comb. Renewables & Wastes[2]	–	–	0.039	0.043	0.043	0.043	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	0.340	0.634	0.908	0.990	1.286	1.552	..
Heat	–	–	–	–	0.030	0.030	..
Shares (%)							
Coal	*22.8*	*25.6*	*11.0*	*9.2*	*7.0*	*4.4*	..
Peat	*19.5*	*12.6*	*6.1*	*3.2*	*2.7*	*2.3*	..
Oil	*37.7*	*36.7*	*44.6*	*47.2*	*45.6*	*44.2*	..
Gas	*3.7*	*6.2*	*14.3*	*15.3*	*18.1*	*20.6*	..
Comb. Renewables & Wastes	–	–	*1.0*	*1.0*	*0.8*	*0.8*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	*16.3*	*18.8*	*23.1*	*24.0*	*25.1*	*27.2*	..
Heat	–	–	–	–	*0.6*	*0.5*	.

Unit:Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	1998	1999	2005	2010	2020
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**1.766**	**3.135**	**4.593**	**4.885**	**5.746**	**5.919**	**..**
OUTPUT (Mtoe)	**0.632**	**1.224**	**1.796**	**1.875**	**2.474**	**2.862**	**..**
(TWh gross)	7.348	14.229	20.882	21.807	28.773	33.280	..
Output Shares (%)							
Coal	*1.0*	*41.6*	*32.2*	*26.7*	*23.5*	*12.7*	..
Peat	*23.9*	*15.8*	*8.1*	*7.7*	*5.9*	*5.1*	..
Oil	*66.3*	*10.0*	*23.2*	*28.3*	*9.0*	*1.3*	..
Gas	–	*27.7*	*30.8*	*31.9*	*53.7*	*72.1*	..
Comb. Renewables & Wastes	–	–	*0.4*	*0.6*	*1.6*	*1.8*	..
Nuclear	–	–	–	–	–	–	..
Hydro	*8.8*	*4.9*	*4.4*	*3.9*	*2.8*	*2.5*	..
Geothermal	–	–	–	–	–	–	..
Solar/Wind/Other	–	–	*0.8*	*0.9*	*3.5*	*4.4*	..
TOTAL LOSSES	**1.649**	**2.259**	**3.269**	**3.455**	**3.807**	**3.541**	**..**
of which:							
Electricity and Heat Generation[10]	1.134	1.911	2.796	3.009	3.324	3.015	..
Other Transformation	0.329	0.041	0.052	0.019	0.100	0.098	..
Own Use and Losses[11]	0.186	0.307	0.421	0.427	0.383	0.428	..
Statistical Differences	**0.124**	**0.473**	**0.019**	**–0.067**	**–**	**–**	**..**

INDICATORS

	1973	1990	1998	1999	2005	2010	2020
GDP (billion 1995 US$)	26.92	52.88	85.95	94.39	126.14	155.47	..
Population (millions)	3.07	3.51	3.71	3.75	3.97	4.16	..
TPES/GDP[12]	0.27	0.20	0.15	0.15	0.13	0.11	..
Energy Production/TPES	0.16	0.32	0.19	0.18	0.21	0.18	..
Per Capita TPES[13]	2.34	2.98	3.58	3.73	4.14	4.26	..
Oil Supply/GDP[12]	0.21	0.09	0.08	0.09	0.07	0.06	..
TFC/GDP[12]	0.20	0.15	0.12	0.11	0.10	0.09	..
Per Capita TFC[13]	1.76	2.21	2.69	2.83	3.18	3.41	..
Energy–related CO_2 Emissions (Mt CO_2)[14]	22.5	32.2	38.4	39.9	45.7	47.5	..
CO_2 Emissions from Bunkers (Mt CO_2)	1.1	1.1	1.8	2.1	2.2	2.2	..

GROWTH RATES (% per year)

	73–79	79–90	90–98	98–99	99–05	05–10	10–20
TPES	3.6	1.5	3.0	5.4	2.7	1.5	..
Coal	6.9	9.9	–2.5	–17.3	1.6	–12.0	..
Peat	2.1	1.0	–3.1	–11.4	0.7	–1.0	..
Oil	2.3	–2.4	5.1	13.1	0.4	1.2	..
Gas	–	13.6	5.2	6.9	8.6	5.7	..
Comb. Renewables & Wastes	–	–	–	9.9	7.7	3.1	..
Nuclear	–	–	–	–	–	–	..
Hydro	4.3	–1.5	3.5	–7.6	–0.5	0.6	..
Geothermal	–	–	–	–	–	–	..
Solar/Wind/Other	–	–	–	6.7	32.6	7.9	..
TFC	4.3	0.9	3.2	6.2	3.0	2.3	..
Electricity Consumption	5.8	2.9	5.1	6.5	4.4	3.3	..
Energy Production	4.6	7.8	–3.8	1.9	5.3	–2.0	..
Net Oil Imports	2.9	–2.0	4.8	11.8	0.3	1.2	..
GDP	4.9	3.6	6.3	9.8	5.0	4.3	..
Growth in the TPES/GDP Ratio	–1.3	–2.0	–3.1	–4.0	–2.1	–2.7	..
Growth in the TFC/GDP Ratio	–0.6	–2.6	–2.9	–3.3	–1.9	–1.9	..

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

ITALY

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit: Mtoe

SUPPLY		1973	1990	1998	1999	2005	2010	2020
TOTAL PRODUCTION		**20.1**	**24.7**	**28.9**	**27.8**	**31.3**	**33.3**	**..**
Coal[1]		0.3	0.3	0.0	0.0	0.2	0.2	..
Oil		1.1	4.7	5.8	5.2	5.8	5.5	..
Gas		12.6	14.0	15.6	14.3	13.6	12.4	..
Comb. Renewables & Wastes[2]		0.2	0.9	1.3	1.5	4.5	7.0	..
Nuclear		0.8	–	–	–	–	–	..
Hydro		3.2	2.7	3.5	3.9	3.8	3.9	..
Geothermal		1.8	2.0	2.6	2.7	2.6	2.8	..
Solar/Wind/Other[3]		–	0.0	0.1	0.1	0.9	1.6	..
TOTAL NET IMPORTS[4]		**109.3**	**128.9**	**136.8**	**140.7**	**142.6**	**152.5**	**..**
Coal[1]	Exports	0.4	0.1	0.1	0.1	..	..	..
	Imports	8.2	13.9	11.7	11.9	11.7	12.3	..
	Net Imports	7.7	13.7	11.6	11.8	11.7	12.3	..
Oil	Exports	29.4	20.1	23.4	20.8	..	..	..
	Imports	136.4	109.5	112.5	107.6	85.3	83.0	..
	Bunkers	7.1	2.7	2.7	2.4	2.4	2.4	..
	Net Imports	99.9	86.7	86.5	84.4	82.9	80.6	..
Gas	Exports	–	0.0	0.0	0.0	..	..	..
	Imports	1.6	25.3	34.9	40.5	48.1	59.6	..
	Net Imports	1.6	25.3	34.9	40.5	48.1	59.6	..
Electricity	Exports	0.2	0.1	0.1	0.0	..	..	..
	Imports	0.3	3.1	3.6	3.7	..	..	..
	Net Imports	0.1	3.0	3.5	3.6	..	..	..
TOTAL STOCK CHANGES		**–0.9**	**–1.8**	**0.3**	**0.6**	**–**	**–**	**..**
TOTAL SUPPLY (TPES)		**128.6**	**151.7**	**166.0**	**169.0**	**173.9**	**185.8**	**..**
Coal[1]		8.1	14.6	11.8	11.8	11.9	12.5	..
Oil		100.1	89.3	91.7	89.5	88.6	86.1	..
Gas		14.2	39.0	51.1	55.6	61.7	72.0	..
Comb. Renewables & Wastes[2]		0.2	1.0	1.7	1.9	4.5	7.0	..
Nuclear		0.8	–	–	–	–	–	..
Hydro		3.2	2.7	3.5	3.9	3.8	3.9	..
Geothermal		1.8	2.0	2.6	2.7	2.6	2.8	..
Solar/Wind/Other[3]		–	0.0	0.1	0.1	0.9	1.6	..
Electricity Trade[5]		0.1	3.0	3.5	3.6	–	–	..
Shares (%)								
Coal		*6.3*	*9.6*	*7.1*	*7.0*	*6.8*	*6.7*	..
Oil		*77.9*	*58.9*	*55.2*	*52.9*	*51.0*	*46.4*	..
Gas		*11.1*	*25.7*	*30.8*	*32.9*	*35.5*	*38.8*	..
Comb. Renewables & Wastes		*0.2*	*0.6*	*1.0*	*1.1*	*2.6*	*3.8*	..
Nuclear		*0.6*	–	–	–	–	–	..
Hydro		*2.5*	*1.8*	*2.1*	*2.3*	*2.2*	*2.1*	..
Geothermal		*1.4*	*1.4*	*1.6*	*1.6*	*1.5*	*1.5*	..
Solar/Wind/Other		–	–	*0.1*	*0.1*	*0.5*	*0.8*	..
Electricity Trade		*0.1*	*2.0*	*2.1*	*2.1*	–	–	..

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

Please note: Forecast data for 2010 are based on the 1998 submission and data for 2005 are IEA Secretariat estimates.

Unit:Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	1998	1999	2005	2010	2020
TFC	**98.7**	**117.6**	**128.9**	**131.8**	**130.0**	**133.8**	**..**
Coal[1]	3.3	3.4	2.5	2.5	2.5	2.4	..
Oil	72.1	64.2	65.8	66.7	63.5	63.0	..
Gas	12.8	30.6	37.1	38.6	37.2	38.0	..
Comb. Renewables & Wastes[2]	–	0.8	1.2	1.3	1.9	2.4	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	0.0	0.0	0.0	0.1	0.2	..
Electricity	10.6	18.5	21.9	22.5	24.6	27.4	..
Heat	–	0.2	0.2	0.2	0.3	0.4	..
Shares (%)							
Coal	*3.3*	*2.9*	*2.0*	*1.9*	*1.9*	*1.8*	..
Oil	*73.0*	*54.6*	*51.0*	*50.6*	*48.8*	*47.1*	..
Gas	*12.9*	*26.0*	*28.8*	*29.3*	*28.6*	*28.4*	..
Comb. Renewables & Wastes	–	*0.7*	*1.0*	*1.0*	*1.5*	*1.8*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	*0.1*	..
Electricity	*10.7*	*15.7*	*17.0*	*17.1*	*18.9*	*20.5*	..
Heat	–	*0.2*	*0.2*	*0.2*	*0.2*	*0.3*	..
TOTAL INDUSTRY[6]	**47.6**	**44.6**	**45.3**	**45.9**	**44.8**	**45.5**	**..**
Coal[1]	2.6	3.3	2.5	2.4	2.4	2.3	..
Oil	29.7	16.9	15.3	14.9	13.7	12.7	..
Gas	8.7	14.6	16.3	16.8	15.9	15.9	..
Comb. Renewables & Wastes[2]	–	0.2	0.3	0.3	0.6	0.9	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	6.6	9.5	10.9	11.5	12.3	13.7	..
Heat	–	–	–	–	–	–	..
Shares (%)							
Coal	*5.6*	*7.3*	*5.5*	*5.3*	*5.3*	*5.0*	..
Oil	*62.3*	*37.9*	*33.9*	*32.5*	*30.4*	*27.9*	..
Gas	*18.2*	*32.9*	*35.9*	*36.6*	*35.5*	*35.0*	..
Comb. Renewables & Wastes	–	*0.5*	*0.6*	*0.6*	*1.3*	*2.0*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	*13.9*	*21.4*	*24.1*	*25.1*	*27.4*	*30.1*	..
Heat	–	–	–	–	–	–	..
TRANSPORT[7]	**20.5**	**35.3**	**41.8**	**42.4**	**41.2**	**41.7**	**..**
TOTAL OTHER SECTORS[8]	**30.6**	**37.8**	**41.8**	**43.5**	**44.0**	**46.7**	**..**
Coal[1]	0.5	0.1	0.1	0.1	0.1	0.2	..
Oil	22.5	12.8	9.7	10.4	10.0	10.3	..
Gas	4.0	15.7	20.6	21.5	20.7	21.3	..
Comb. Renewables & Wastes[2]	–	0.6	1.0	1.1	1.3	1.5	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	0.0	0.0	0.0	0.1	0.2	..
Electricity	3.6	8.3	10.3	10.3	11.5	12.8	..
Heat	–	0.2	0.2	0.2	0.3	0.4	..
Shares (%)							
Coal	*1.5*	*0.3*	*0.2*	*0.2*	*0.3*	*0.3*	..
Oil	*73.5*	*33.9*	*23.1*	*23.8*	*22.7*	*22.1*	..
Gas	*13.1*	*41.6*	*49.2*	*49.5*	*47.1*	*45.7*	..
Comb. Renewables & Wastes	–	*1.6*	*2.4*	*2.4*	*3.0*	*3.2*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	*0.1*	*0.4*	..
Electricity	*11.8*	*22.1*	*24.6*	*23.6*	*26.1*	*27.4*	..
Heat	–	*0.5*	*0.5*	*0.5*	*0.7*	*0.9*	..

Unit:Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	1998	1999	2005	2010	2020
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**27.6**	**42.4**	**48.4**	**49.1**	**59.7**	**70.6**	**..**
OUTPUT (Mtoe)	**12.4**	**18.3**	**21.8**	**22.3**	**28.0**	**31.6**	**..**
(TWh gross)	143.9	213.2	253.6	259.2	325.0	367.5	..
Output Shares (%)							
Coal	*3.6*	*16.8*	*11.0*	*10.9*	*9.8*	*9.2*	..
Oil	*62.4*	*48.2*	*42.3*	*35.2*	*29.2*	*22.0*	..
Gas	*3.1*	*18.6*	*27.9*	*33.6*	*38.5*	*43.6*	..
Comb. Renewables & Wastes	*0.9*	*0.1*	*0.5*	*0.7*	*4.6*	*7.6*	..
Nuclear	*2.2*	–	–	–	–	–	..
Hydro	*26.1*	*14.8*	*16.3*	*17.5*	*13.5*	*12.2*	..
Geothermal	*1.7*	*1.5*	*1.7*	*1.7*	*1.2*	*1.1*	..
Solar/Wind/Other	–	*0.0*	*0.4*	*0.4*	*3.1*	*4.3*	..
TOTAL LOSSES	**29.5**	**34.1**	**37.2**	**37.4**	**43.9**	**52.0**	**..**
of which:							
Electricity and Heat Generation[10]	15.3	23.9	26.4	26.5	31.4	38.6	..
Other Transformation	6.0	1.0	0.6	1.1	2.4	2.4	..
Own Use and Losses[11]	8.3	9.2	10.2	9.7	10.1	11.0	..
Statistical Differences	**0.3**	**–0.0**	**–0.0**	**–0.1**	**–**	**–**	**..**

INDICATORS

	1973	1990	1998	1999	2005	2010	2020
GDP (billion 1995 US$)	647.03	1030.05	1152.17	1170.75	1318.45	1455.68	..
Population (millions)	54.72	56.72	57.59	57.63	57.15	57.00	..
TPES/GDP[12]	0.20	0.15	0.14	0.14	0.13	0.13	..
Energy Production/TPES	0.16	0.16	0.17	0.16	0.18	0.18	..
Per Capita TPES[13]	2.35	2.67	2.88	2.93	3.04	3.26	..
Oil Supply/GDP[12]	0.15	0.09	0.08	0.08	0.07	0.06	..
TFC/GDP[12]	0.15	0.11	0.11	0.11	0.10	0.09	..
Per Capita TFC[13]	1.80	2.07	2.24	2.29	2.27	2.35	..
Energy-related CO_2 Emissions (Mt CO_2)[14]	344.5	396.6	420.1	420.5	432.2	451.5	..
CO_2 Emissions from Bunkers (Mt CO_2)	26.3	15.0	17.1	17.7	17.6	17.6	..

GROWTH RATES (% per year)

	73–79	79–90	90–98	98–99	99–05	05–10	10–20
TPES	1.5	0.7	1.1	1.8	0.5	1.3	..
Coal	4.3	3.1	–2.7	–0.0	0.1	1.1	..
Oil	–0.0	–1.0	0.3	–2.4	–0.2	–0.6	..
Gas	8.1	5.1	3.4	8.7	1.8	3.1	..
Comb. Renewables & Wastes	23.4	1.2	7.0	13.5	15.1	9.5	..
Nuclear	–2.9	–	–	–	–	–	..
Hydro	3.4	–3.3	3.4	10.0	–0.5	0.4	..
Geothermal	0.1	1.2	3.2	4.1	–0.8	1.1	..
Solar/Wind/Other	–	–	43.7	9.9	44.8	11.0	..
TFC	1.3	0.9	1.2	2.2	–0.2	0.6	..
Electricity Consumption	4.0	3.0	2.2	2.5	1.5	2.2	..
Energy Production	0.2	1.8	2.0	–4.1	2.0	1.2	..
Net Oil Imports	–0.4	–1.1	–0.0	–2.4	–0.3	–0.6	..
GDP	3.5	2.4	1.4	1.6	2.0	2.0	..
Growth in the TPES/GDP Ratio	–1.9	–1.7	–0.3	0.2	–1.5	–0.7	..
Growth in the TFC/GDP Ratio	–2.1	–1.5	–0.3	0.6	–2.2	–1.4	..

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

JAPAN

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit:Mtoe

SUPPLY		1973	1990	1998	1999	2005	2010	2020
TOTAL PRODUCTION		**29.5**	**75.6**	**108.9**	**104.2**	**..**	**161.4**	**..**
Coal[1]		17.9	4.6	2.0	2.2	..	2.9	..
Oil		0.8	0.7	0.8	0.7	..	0.7	..
Gas		2.3	1.8	2.0	2.0	..	2.0	..
Comb. Renewables & Wastes[2]		–	6.7	5.3	5.4	..	6.0	..
Nuclear		2.5	52.7	86.6	82.5	..	125.1	..
Hydro		5.7	7.7	8.0	7.4	..	9.0	..
Geothermal		0.2	1.5	3.3	3.2	..	11.5	..
Solar / Wind / Other[3]		–	–	0.9	0.8	..	4.2	..
TOTAL NET IMPORTS[4]		**300.7**	**364.2**	**397.5**	**408.1**	**..**	**376.2**	**..**
Coal[1]	Exports	0.4	1.1	1.7	1.9	..	1.7	..
	Imports	41.3	70.0	84.3	86.9	..	77.6	..
	Net Imports	40.9	68.9	82.7	85.0	..	75.9	..
Oil	Exports	2.9	3.8	6.7	5.3	..	14.5	..
	Imports	276.7	262.6	269.4	273.4	..	255.0	..
	Bunkers	16.8	5.1	5.5	5.2	..	5.0	..
	Net Imports	257.0	253.6	257.2	262.9	..	235.5	..
Gas	Exports	–	–	–	–	..	..	..
	Imports	2.8	41.7	57.6	60.3	..	64.8	..
	Net Imports	2.8	41.7	57.6	60.3	..	64.8	..
Electricity	Exports	–	–	–	–	..	–	..
	Imports	–	–	–	–	..	–	..
	Net Imports	–	–	–	–	..	–	..
TOTAL STOCK CHANGES		**–6.6**	**–1.0**	**4.7**	**3.1**	**..**	**..**	**..**
TOTAL SUPPLY (TPES)		**323.6**	**438.8**	**511.0**	**515.4**	**..**	**537.6**	**..**
Coal[1]		57.9	74.0	84.6	87.6	..	78.9	..
Oil		252.2	253.0	262.8	266.4	..	236.2	..
Gas		5.1	43.3	59.6	62.1	..	66.8	..
Comb. Renewables & Wastes[2]		–	6.7	5.3	5.4	..	6.0	..
Nuclear		2.5	52.7	86.6	82.5	..	125.1	..
Hydro		5.7	7.7	8.0	7.4	..	9.0	..
Geothermal		0.2	1.5	3.3	3.2	..	11.5	..
Solar / Wind / Other[3]		–	–	0.9	0.8	..	4.2	..
Electricity Trade[5]		–	–	–	–	..	–	..
Shares (%)								
Coal		*17.9*	*16.9*	*16.6*	*17.0*	..	*14.7*	..
Oil		*77.9*	*57.6*	*51.4*	*51.7*	..	*43.9*	..
Gas		*1.6*	*9.9*	*11.7*	*12.0*	..	*12.4*	..
Comb. Renewables & Wastes		–	*1.5*	*1.0*	*1.0*	..	*1.1*	..
Nuclear		*0.8*	*12.0*	*16.9*	*16.0*	..	*23.3*	..
Hydro		*1.8*	*1.8*	*1.6*	*1.4*	..	*1.7*	..
Geothermal		*0.1*	*0.3*	*0.6*	*0.6*	..	*2.1*	..
Solar / Wind / Other		–	–	*0.2*	*0.2*	..	*0.8*	..
Electricity Trade		–	–	–	–	..	–	..

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

Please note: In 2010, data for electricity generated, production and imports of coal, oil and gas, and bunkers are IEA Secretariat estimates.

Unit:Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	1998	1999	2005	2010	2020
TFC	**234.4**	**294.5**	**335.4**	**342.0**	**..**	**340.6**	**..**
Coal[1]	20.2	22.5	19.4	19.9	..	21.2	..
Oil	171.5	188.3	211.6	215.4	..	191.4	..
Gas	7.0	14.7	21.3	21.8	..	27.6	..
Comb. Renewables & Wastes[2]	–	3.7	2.3	2.3	..	2.9	..
Geothermal	–	–	0.2	0.2	..	0.7	..
Solar / Wind / Other	–	–	0.9	0.8	..	4.2	..
Electricity	35.7	65.1	79.2	81.1	..	91.7	..
Heat	0.0	0.2	0.5	0.5	..	0.9	..
Shares (%)							
Coal	*8.6*	*7.6*	*5.8*	*5.8*	..	*6.2*	..
Oil	*73.2*	*63.9*	*63.1*	*63.0*	..	*56.2*	..
Gas	*3.0*	*5.0*	*6.4*	*6.4*	..	*8.1*	..
Comb. Renewables & Wastes	–	*1.3*	*0.7*	*0.7*	..	*0.9*	..
Geothermal	–	–	*0.1*	*0.1*	..	*0.2*	..
Solar / Wind / Other	–	–	*0.3*	*0.2*	..	*1.2*	..
Electricity	*15.2*	*22.1*	*23.6*	*23.7*	..	*26.9*	..
Heat	–	*0.1*	*0.1*	*0.1*	..	*0.3*	..
TOTAL INDUSTRY[6]	**140.2**	**134.5**	**139.5**	**144.9**	**..**	**155.9**	**..**
Coal[1]	18.2	21.7	18.4	18.9	..	19.9	..
Oil	94.9	73.3	75.6	79.8	..	80.6	..
Gas	2.1	4.6	8.4	8.5	..	9.8	..
Comb. Renewables & Wastes[2]	–	2.5	2.3	2.3	..	2.9	..
Geothermal	–	–	0.1	0.1	..	0.4	..
Solar / Wind / Other	–	–	–	–	..	–	..
Electricity	25.1	32.4	34.7	35.3	..	42.4	..
Heat	–	–	–	–	..	–	..
Shares (%)							
Coal	*13.0*	*16.2*	*13.2*	*13.1*	..	*12.7*	..
Oil	*67.7*	*54.4*	*54.2*	*55.0*	..	*51.7*	..
Gas	*1.5*	*3.4*	*6.1*	*5.9*	..	*6.3*	..
Comb. Renewables & Wastes	–	*1.8*	*1.6*	*1.6*	..	*1.8*	..
Geothermal	–	–	*0.1*	*0.1*	..	*0.3*	..
Solar / Wind / Other	–	–	–	–	..	–	..
Electricity	*17.9*	*24.1*	*24.8*	*24.4*	..	*27.2*	..
Heat	–	–	–	–	..	–	..
TRANSPORT[7]	**42.6**	**74.3**	**92.6**	**93.6**	**..**	**83.2**	**..**
TOTAL OTHER SECTORS[8]	**51.6**	**85.7**	**103.3**	**103.4**	**..**	**101.5**	**..**
Coal[1]	1.8	0.8	1.0	0.9	..	1.3	..
Oil	35.3	42.5	45.2	43.9	..	33.3	..
Gas	5.0	10.1	12.9	13.3	..	14.2	..
Comb. Renewables & Wastes[2]	–	1.2	0.1	0.1	..	0.0	..
Geothermal	–	–	0.1	0.1	..	0.3	..
Solar / Wind / Other	–	–	0.9	0.8	..	4.2	..
Electricity	9.5	30.9	42.7	43.9	..	47.2	..
Heat	0.0	0.2	0.5	0.5	..	0.9	..
Shares (%)							
Coal	*3.4*	*0.9*	*1.0*	*0.9*	..	*1.3*	..
Oil	*68.5*	*49.6*	*43.8*	*42.4*	..	*32.9*	..
Gas	*9.6*	*11.8*	*12.4*	*12.8*	..	*14.0*	..
Comb. Renewables & Wastes	–	*1.4*	*0.1*	*0.1*	..	–	..
Geothermal	–	–	*0.1*	*0.1*	..	*0.3*	..
Solar / Wind / Other	–	–	*0.8*	*0.8*	..	*4.1*	..
Electricity	*18.4*	*36.1*	*41.3*	*42.4*	..	*46.6*	..
Heat	*0.1*	*0.2*	*0.5*	*0.5*	..	*0.9*	..

Unit:Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	1998	1999	2005	2010	2020
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**90.6**	**170.6**	**215.7**	**215.5**	**..**	**252.9**	**..**
OUTPUT (Mtoe)	**40.0**	**73.2**	**89.1**	**90.9**	**..**	**100.1**	**..**
(TWh gross)	465.4	850.8	1036.2	1057.0	..	1163.6	..
Output Shares (%)							
Coal	*8.0*	*14.5*	*19.5*	*21.2*	*..*	*15.4*	*..*
Oil	*73.2*	*29.7*	*16.6*	*16.6*	*..*	*11.4*	*..*
Gas	*2.3*	*19.4*	*21.1*	*22.1*	*..*	*20.5*	*..*
Comb. Renewables & Wastes	*–*	*2.0*	*1.5*	*1.5*	*..*	*1.5*	*..*
Nuclear	*2.1*	*23.8*	*32.1*	*30.0*	*..*	*41.3*	*..*
Hydro	*14.3*	*10.5*	*8.9*	*8.2*	*..*	*9.0*	*..*
Geothermal	*0.1*	*0.2*	*0.3*	*0.3*	*..*	*1.0*	*..*
Solar/Wind/Other	*–*	*0.0*	*0.0*	*0.0*	*..*	*–*	*..*
TOTAL LOSSES	**94.6**	**143.2**	**176.1**	**175.7**	**..**	**197.0**	**..**
of which:							
Electricity and Heat Generation[10]	50.5	97.3	126.1	124.1	..	150.4	..
Other Transformation	25.1	23.3	25.0	26.9	..	23.9	..
Own Use and Losses[11]	19.0	22.6	25.0	24.7	..	22.6	..
Statistical Differences	**–5.4**	**1.1**	**–0.5**	**–2.2**	**..**	**–**	**..**

INDICATORS

	1973	1990	1998	1999	2005	2010	2020
GDP (billion 1995 US$)	2560.93	4782.49	5345.30	5356.14	6284.56	7110.40	..
Population (millions)	108.66	123.54	126.49	126.69	128.89	130.40	..
TPES/GDP[12]	0.13	0.09	0.10	0.10	..	0.08	..
Energy Production/TPES	0.09	0.17	0.21	0.20	..	0.30	..
Per Capita TPES[13]	2.98	3.55	4.04	4.07	..	4.12	..
Oil Supply/GDP[12]	0.10	0.05	0.05	0.05	..	0.03	..
TFC/GDP[12]	0.09	0.06	0.06	0.06	..	0.05	..
Per Capita TFC[13]	2.16	2.38	2.65	2.70	..	2.61	..
Energy–related CO_2 Emissions (Mt CO_2)[14]	905.0	1048.5	1134.6	1158.5	..	1055.7	..
CO_2 Emissions from Bunkers (Mt CO_2)	58.6	29.6	37.0	35.5	..	35.0	..

GROWTH RATES (% per year)

	73–79	79–90	90–98	98–99	99–05	05–10	10–20
TPES	1.5	2.0	1.9	0.9	..	..	..
Coal	–2.0	3.4	1.7	3.5	..	..	..
Oil	0.4	–0.2	0.5	1.4	..	..	..
Gas	24.2	8.0	4.1	4.3	..	..	..
Comb. Renewables & Wastes	–	–	–2.9	1.3	..	..	..
Nuclear	39.1	10.1	6.4	–4.7	..	..	..
Hydro	3.2	0.9	0.4	–6.6	..	..	..
Geothermal	22.3	6.2	10.3	–2.3	..	..	..
Solar/Wind/Other	–	–	–	–9.3	..	..	..
TFC	1.0	1.6	1.6	2.0	..	..	..
Electricity Consumption	3.9	3.4	2.5	2.3	..	..	..
Energy Production	4.9	6.1	4.7	–4.3	..	..	..
Net Oil Imports	0.5	–0.4	0.2	2.2	..	..	..
GDP	3.5	3.9	1.4	0.2	2.7	2.5	..
Growth in the TPES/GDP Ratio	–1.9	–1.9	0.5	0.7	..	..	..
Growth in the TFC/GDP Ratio	–2.4	–2.2	0.2	1.7	..	..	..

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

LUXEMBOURG

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit:Mtoe

SUPPLY		**1973**	**1990**	**1998**	**1999**	**2005**	**2010**	**2020**
TOTAL PRODUCTION		**0.00**	**0.03**	**0.05**	**0.05**	**0.05**	**0.05**	**..**
Coal[1]		–	–	–	–	–	–	..
Oil		–	–	–	–	–	–	..
Gas		–	–	–	–	–	–	..
Comb. Renewables & Wastes[2]		–	0.03	0.04	0.04	0.04	0.04	..
Nuclear		–	–	–	–	–	–	..
Hydro		0.00	0.01	0.01	0.01	0.01	0.01	..
Geothermal		–	–	–	–	–	–	..
Solar / Wind / Other[3]		–	–	–	0.00	0.00	0.00	..
TOTAL NET IMPORTS[4]		**4.51**	**3.55**	**3.31**	**3.40**	**3.74**	**3.67**	**..**
Coal[1]	Exports	–	–	–	–	–	–	..
	Imports	2.44	1.13	0.11	0.11	0.10	0.10	..
	Net Imports	2.44	1.13	0.11	0.11	0.10	0.10	..
Oil	Exports	0.01	0.01	0.02	0.02	–	–	..
	Imports	1.69	1.67	2.12	2.17	1.95	1.80	..
	Bunkers	–	–	–	–	–	–	..
	Net Imports	1.67	1.65	2.10	2.15	1.95	1.80	..
Gas	Exports	–	–	–	–	–	–	..
	Imports	0.22	0.43	0.63	0.66	1.42	1.47	..
	Net Imports	0.22	0.43	0.63	0.66	1.42	1.47	..
Electricity	Exports	0.07	0.06	0.08	0.06	0.18	0.18	..
	Imports	0.24	0.40	0.55	0.53	0.46	0.48	..
	Net Imports	0.18	0.34	0.47	0.48	0.27	0.30	..
TOTAL STOCK CHANGES		**–0.01**	**–0.01**	**–0.04**	**0.05**	**–**	**–**	**..**
TOTAL SUPPLY (TPES)		**4.51**	**3.57**	**3.32**	**3.49**	**3.79**	**3.72**	**..**
Coal[1]		2.44	1.13	0.11	0.11	0.10	0.10	..
Oil		1.67	1.64	2.06	2.20	1.95	1.80	..
Gas		0.22	0.43	0.63	0.66	1.42	1.47	..
Comb. Renewables & Wastes[2]		–	0.03	0.04	0.04	0.04	0.04	..
Nuclear		–	–	–	–	–	–	..
Hydro		0.00	0.01	0.01	0.01	0.01	0.01	..
Geothermal		–	–	–	–	–	–	..
Solar / Wind / Other[3]		–	–	–	0.00	0.00	0.00	..
Electricity Trade[5]		0.18	0.34	0.47	0.48	0.27	0.30	..
Shares (%)								
Coal		*54.1*	*31.7*	*3.4*	*3.2*	*2.6*	*2.7*	..
Oil		*37.1*	*46.0*	*62.1*	*63.0*	*51.4*	*48.4*	..
Gas		*4.9*	*12.0*	*19.1*	*18.8*	*37.3*	*39.5*	..
Comb. Renewables & Wastes		–	*0.7*	*1.1*	*1.0*	*1.1*	*1.1*	..
Nuclear		–	–	–	–	–	–	..
Hydro		*0.1*	*0.2*	*0.3*	*0.2*	*0.2*	*0.2*	..
Geothermal		–	–	–	–	–	–	..
Solar / Wind / Other		–	–	–	*0.1*	*0.1*	*0.1*	..
Electricity Trade		*3.9*	*9.5*	*14.0*	*13.7*	*7.2*	*8.0*	..

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

Please note: Forecast GDP figures are based on the 1993 submission.

Unit:Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	1998	1999	2005	2010	2020
TFC	**2.94**	**2.96**	**3.26**	**3.43**	**3.31**	**3.24**	**..**
Blast Furnace Gas	0.74	0.20	–	–	–	–	–
Other Coal[1]	0.24	0.35	0.11	0.11	0.10	0.10	..
Oil	1.54	1.64	2.06	2.20	1.95	1.80	..
Gas	0.18	0.42	0.59	0.61	0.67	0.72	..
Comb. Renewables & Wastes[2]	–	–	0.02	0.02	0.01	0.01	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	0.26	0.36	0.46	0.47	0.52	0.55	..
Heat	–	–	0.02	0.02	0.06	0.06	..
Shares (%)							
Blast Furnace Gas	*25.1*	*6.8*	–	–	–	–	..
Other Coal	*8.1*	*11.7*	*3.5*	*3.3*	*3.0*	*3.1*	..
Oil	*52.1*	*55.3*	*63.2*	*64.0*	*58.8*	*55.6*	..
Gas	*6.0*	*14.2*	*18.1*	*17.8*	*20.3*	*22.2*	..
Comb. Renewables & Wastes	–	–	*0.5*	*0.4*	*0.4*	*0.4*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	*8.7*	*12.0*	*14.0*	*13.8*	*15.8*	*16.9*	..
Heat	–	–	*0.7*	*0.7*	*1.7*	*1.8*	..
TOTAL INDUSTRY[6]	**2.09**	**1.34**	**0.89**	**0.94**	**1.00**	**1.04**	**..**
Blast Furnace Gas	0.74	0.20	–	–	–	–	–
Other Coal[1]	0.20	0.34	0.11	0.11	0.10	0.10	..
Oil	0.81	0.30	0.10	0.10	0.10	0.09	..
Gas	0.14	0.28	0.37	0.40	0.42	0.45	..
Comb. Renewables & Wastes[2]	–	–	–	–	–	–	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	0.20	0.23	0.28	0.32	0.35	0.37	..
Heat	–	–	0.02	0.02	0.04	0.04	..
Shares (%)							
Blast Furnace Gas	*35.4*	*15.1*	–	–	–	–	..
Other Coal	*9.7*	*25.3*	*12.4*	*11.9*	*9.6*	*9.2*	..
Oil	*38.6*	*22.0*	*11.3*	*10.6*	*9.5*	*8.7*	..
Gas	*6.6*	*20.8*	*42.1*	*42.2*	*41.7*	*42.8*	..
Comb. Renewables & Wastes	–	–	–	–	–	–	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	*9.7*	*16.8*	*31.9*	*33.7*	*34.8*	*35.1*	..
Heat	–	–	*2.1*	*1.8*	*4.3*	*4.2*	..
TRANSPORT[7]	**0.29**	**1.03**	**1.59**	**1.76**	**1.51**	**1.41**	**..**
TOTAL OTHER SECTORS[8]	**0.56**	**0.59**	**0.78**	**0.73**	**0.81**	**0.79**	**..**
Coal[1]	0.03	0.01	0.00	0.00	0.00	0.00	..
Oil	0.44	0.31	0.37	0.35	0.36	0.31	..
Gas	0.04	0.14	0.22	0.21	0.26	0.27	..
Comb. Renewables & Wastes[2]	–	–	0.02	0.02	0.01	0.01	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	0.05	0.13	0.16	0.15	0.17	0.17	..
Heat	–	–	0.01	0.01	0.01	0.02	..
Shares (%)							
Coal	*6.1*	*1.0*	*0.3*	*0.1*	*0.5*	*0.5*	..
Oil	*78.4*	*53.6*	*48.1*	*47.5*	*44.0*	*39.3*	..
Gas	*6.8*	*24.1*	*27.9*	*29.1*	*31.6*	*34.6*	..
Comb. Renewables & Wastes	–	–	*1.9*	*2.1*	*1.7*	*1.8*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	*8.8*	*21.3*	*21.2*	*20.2*	*20.5*	*21.9*	..
Heat	–	–	*0.6*	*0.8*	*1.6*	*1.9*	..

Unit:Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	1998	1999	2005	2010	2020
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**0.44**	**0.20**	**0.07**	**0.07**	**0.58**	**0.58**	**..**
OUTPUT (Mtoe)	**0.12**	**0.05**	**0.03**	**0.03**	**0.29**	**0.30**	**..**
(TWh gross)	1.39	0.62	0.37	0.36	3.35	3.48	..
Output Shares (%)							
Blast Furnace Gas	*58.8*	*76.4*	–	–	–	–	..
Other Coal	–	–	–	–	–	–	..
Oil	*27.6*	*1.4*	–	–	–	–	..
Gas	*10.2*	*5.4*	*55.3*	*57.0*	*94.6*	*94.8*	..
Comb. Renewables & Wastes	–	*5.4*	*12.2*	*14.2*	*1.5*	*1.4*	..
Nuclear	–	–	–	–	–	–	..
Hydro	*3.4*	*11.2*	*31.2*	*23.7*	*2.8*	*2.6*	..
Geothermal	–	–	–	–	–	–	..
Solar/Wind/Other	–	–	*1.4*	*5.0*	*1.1*	*1.1*	..
TOTAL LOSSES	**1.54**	**0.61**	**0.06**	**0.06**	**0.48**	**0.48**	**..**
of which:							
Electricity and Heat Generation[10]	0.32	0.14	0.02	0.02	0.23	0.23	..
Other Transformation	1.08	0.41	–	–	–	–	..
Own Use and Losses[11]	0.14	0.06	0.05	0.04	0.25	0.25	..
Statistical Differences	**0.02**	**0.00**	**0.00**	**0.00**	**–**	**–**	**..**

INDICATORS

	1973	1990	1998	1999	2005	2010	2020
GDP (billion 1990 US$)	8.32	14.01	21.17	22.76	26.08	29.22	..
Population (millions)	0.35	0.39	0.43	0.44	0.45	0.49	..
TPES/GDP[12]	0.54	0.25	0.16	0.15	0.15	0.13	..
Energy Production/TPES	0.00	0.01	0.01	0.01	0.01	0.01	..
Per Capita TPES[13]	12.76	9.28	7.73	8.01	8.43	7.65	..
Oil Supply/GDP[12]	0.20	0.12	0.10	0.10	0.07	0.06	..
TFC/GDP[12]	0.35	0.21	0.15	0.15	0.13	0.11	..
Per Capita TFC[13]	8.34	7.68	7.59	7.88	7.36	6.66	..
Energy–related CO_2 Emissions (Mt CO_2)[14]	16.1	10.5	7.2	7.5	8.5	8.2	..
CO_2 Emissions from Bunkers (Mt CO_2)	0.2	0.4	0.9	1.0	1.0	1.0	..

GROWTH RATES (% per year)

	73–79	79–90	90–97	97–98	98–05	05–10	10–15
TPES	–2.5	–0.8	–0.9	5.3	1.4	–0.4	–
Coal	–4.6	–4.3	–25.0	–	–2.0	–	–
Oil	–4.0	2.1	2.9	6.7	–2.0	–1.6	–
Gas	13.6	–0.8	5.0	3.6	13.7	0.7	–
Comb. Renewables & Wastes	–	3.0	4.3	2.9	2.6	–	–
Nuclear	–	–	–	–	–	–	–
Hydro	12.2	–2.6	6.6	–30.0	2.3	–	–
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	7.0	5.9	–
TFC	–0.1	0.1	1.2	5.5	–0.6	–0.5	–
Electricity Consumption	2.7	1.6	3.2	4.2	1.6	0.9	–
Energy Production	36.6	1.6	4.8	–	2.8	0.4	–
Net Oil Imports	–3.5	1.8	3.0	2.6	–1.6	–1.6	–
GDP	1.3	4.1	5.3	7.5	2.3	2.3	–
Growth in the TPES/GDP Ratio	–3.7	–4.7	–5.9	–2.1	–0.9	–2.6	–
Growth in the TFC/GDP Ratio	–1.3	–3.9	–3.9	–1.9	–2.8	–2.7	–

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

NETHERLANDS

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit: Mtoe

SUPPLY

		1973	1990	1998	1999	2005	2010	2020
TOTAL PRODUCTION		**56.8**	**60.0**	**62.5**	**59.1**	**58.8**	**46.5**	**56.2**
Coal[1]		1.1	–	–	–	–	–	–
Oil		1.6	4.1	2.7	2.6	1.7	1.1	0.6
Gas		53.7	54.6	57.6	54.1	54.5	43.0	52.2
Comb. Renewables & Wastes[2]		–	0.4	1.1	1.2	2.0	2.2	2.7
Nuclear		0.3	0.9	1.0	1.0	0.4	–	–
Hydro		–	0.0	0.0	0.0	0.0	0.0	0.0
Geothermal		–	–	–	–	–	–	0.0
Solar / Wind / Other[3]		–	0.0	0.1	0.1	0.2	0.2	0.6
TOTAL NET IMPORTS[4]		**6.0**	**6.7**	**11.1**	**13.3**	**24.2**	**41.4**	**44.5**
Coal[1]	Exports	1.4	2.2	5.4	4.9	1.7	0.7	0.7
	Imports	2.9	11.6	13.8	12.1	9.0	7.9	5.7
	Net Imports	1.5	9.4	8.3	7.2	7.4	7.2	4.9
Oil	Exports	42.4	59.8	62.9	62.2	40.8	43.9	43.6
	Imports	83.8	91.0	99.6	99.0	86.5	94.7	105.2
	Bunkers	11.6	10.9	12.3	12.7	18.4	21.1	26.8
	Net Imports	29.8	20.3	24.5	24.1	27.4	29.7	34.8
Gas	Exports	25.3	25.8	27.8	27.3	15.1	–	–
	Imports	–	2.0	5.2	7.7	3.8	3.7	3.9
	Net Imports	–25.3	–23.8	–22.7	–19.5	–11.3	3.7	3.9
Electricity	Exports	0.1	0.0	0.0	0.3	0.0	–	–
	Imports	0.0	0.8	1.1	1.9	0.7	0.6	0.7
	Net Imports	–0.1	0.8	1.0	1.6	0.7	0.6	0.7
TOTAL STOCK CHANGES		**–0.3**	**–0.2**	**0.6**	**1.7**	**–**	**–**	**–**
TOTAL SUPPLY (TPES)		**62.4**	**66.5**	**74.3**	**74.1**	**83.0**	**87.9**	**100.7**
Coal[1]		2.9	8.9	8.8	7.5	7.4	7.2	4.9
Oil		30.9	24.7	27.3	28.1	29.0	30.8	35.4
Gas		28.5	30.8	34.9	34.6	43.2	46.7	56.1
Comb. Renewables & Wastes[2]		–	0.4	1.1	1.2	2.1	2.4	2.9
Nuclear		0.3	0.9	1.0	1.0	0.4	–	–
Hydro		–	0.0	0.0	0.0	0.0	0.0	0.0
Geothermal		–	–	–	–	–	–	0.0
Solar / Wind / Other[3]		–	0.0	0.1	0.1	0.2	0.2	0.6
Electricity Trade[5]		–0.1	0.8	1.0	1.6	0.7	0.6	0.7
Shares (%)								
Coal		*4.6*	*13.4*	*11.9*	*10.1*	*8.9*	*8.2*	*4.9*
Oil		*49.5*	*37.1*	*36.8*	*38.0*	*35.0*	*35.0*	*35.2*
Gas		*45.6*	*46.3*	*47.0*	*46.7*	*52.0*	*53.2*	*55.7*
Comb. Renewables & Wastes		–	*0.6*	*1.5*	*1.7*	*2.6*	*2.7*	*2.9*
Nuclear		*0.5*	*1.4*	*1.3*	*1.3*	*0.5*	–	–
Hydro		–	–	–	–	–	–	–
Geothermal		–	–	–	–	–	–	–
Solar / Wind / Other		–	–	*0.1*	*0.1*	*0.2*	*0.2*	*0.6*
Electricity Trade		*–0.2*	*1.2*	*1.4*	*2.1*	*0.9*	*0.7*	*0.7*

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

Unit:Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	1998	1999	2005	2010	2020
TFC	**48.8**	**52.0**	**58.0**	**57.9**	**68.6**	**72.7**	**82.3**
Coal[1]	1.1	1.7	1.5	1.5	2.4	2.4	2.3
Oil	24.7	20.5	22.7	23.3	24.2	25.3	28.8
Gas	19.3	23.0	23.6	22.5	30.8	32.3	34.1
Comb. Renewables & Wastes[2]	–	0.2	0.2	0.3	0.6	0.7	0.7
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	0.0	0.0	0.0	0.0	0.0	0.1
Electricity	3.8	6.3	8.0	8.1	9.3	10.5	14.3
Heat	–	0.2	2.0	2.1	1.3	1.5	2.0
Shares (%)							
Coal	*2.2*	*3.3*	*2.6*	*2.5*	*3.5*	*3.3*	*2.8*
Oil	*50.5*	*39.5*	*39.1*	*40.2*	*35.3*	*34.8*	*35.0*
Gas	*39.5*	*44.2*	*40.7*	*38.9*	*45.0*	*44.5*	*41.4*
Comb. Renewables & Wastes	–	*0.3*	*0.4*	*0.5*	*0.8*	*0.9*	*0.8*
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	*0.1*
Electricity	*7.8*	*12.2*	*13.8*	*14.1*	*13.5*	*14.4*	*17.3*
Heat	–	*0.5*	*3.4*	*3.7*	*1.9*	*2.1*	*2.4*
TOTAL INDUSTRY[6]	**21.2**	**21.7**	**21.5**	**21.8**	**31.3**	**33.1**	**36.8**
Coal[1]	0.8	1.7	1.5	1.4	2.4	2.4	2.3
Oil	10.4	8.4	7.4	7.7	12.1	12.6	13.3
Gas	8.1	8.8	8.3	8.2	12.0	12.8	14.3
Comb. Renewables & Wastes[2]	–	0.0	0.0	0.1	0.1	0.2	0.2
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	0.0
Electricity	2.0	2.9	3.4	3.4	4.0	4.5	5.8
Heat	–	–	0.8	0.9	0.7	0.7	0.9
Shares (%)							
Coal	*3.6*	*7.7*	*6.9*	*6.5*	*7.6*	*7.2*	*6.3*
Oil	*48.8*	*38.6*	*34.6*	*35.4*	*38.7*	*37.9*	*36.1*
Gas	*38.4*	*40.4*	*38.8*	*37.8*	*38.2*	*38.8*	*39.0*
Comb. Renewables & Wastes	–	*0.1*	*0.2*	*0.3*	*0.3*	*0.6*	*0.5*
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	*9.2*	*13.1*	*15.8*	*15.7*	*13.0*	*13.5*	*15.8*
Heat	–	–	*3.8*	*4.3*	*2.1*	*2.0*	*2.4*
TRANSPORT[7]	**7.5**	**10.6**	**14.0**	**14.1**	**11.6**	**12.3**	**15.1**
TOTAL OTHER SECTORS[8]	**20.2**	**19.6**	**22.5**	**21.9**	**25.7**	**27.3**	**30.4**
Coal[1]	0.3	0.1	0.0	0.0	–	–	–
Oil	6.9	1.6	1.4	1.6	0.6	0.6	0.6
Gas	11.1	14.2	15.2	14.3	18.9	19.5	19.8
Comb. Renewables & Wastes[2]	–	0.1	0.2	0.2	0.5	0.5	0.5
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	0.0	0.0	0.0	0.0	0.0	0.1
Electricity	1.8	3.4	4.4	4.6	5.1	5.8	8.3
Heat	–	0.2	1.2	1.2	0.7	0.9	1.1
Shares (%)							
Coal	*1.6*	*0.3*	*0.1*	*0.2*	–	–	–
Oil	*34.2*	*8.3*	*6.4*	*7.3*	*2.3*	*2.2*	*2.0*
Gas	*55.3*	*72.4*	*67.6*	*65.1*	*73.5*	*71.4*	*64.9*
Comb. Renewables & Wastes	–	*0.7*	*0.9*	*1.1*	*1.8*	*1.7*	*1.7*
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	*0.1*	*0.1*	*0.3*
Electricity	*8.8*	*17.1*	*19.7*	*20.8*	*19.7*	*21.4*	*27.3*
Heat	–	*1.2*	*5.2*	*5.5*	*2.6*	*3.2*	*3.7*

Unit:Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	1998	1999	2005	2010	2020
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**12.0**	**15.0**	**19.3**	**19.2**	**19.2**	**21.1**	**27.1**
OUTPUT (Mtoe)	**4.5**	**6.2**	**7.8**	**7.5**	**9.2**	**10.7**	**14.6**
(TWh gross)	52.6	71.9	91.1	86.7	107.2	124.0	169.7
Output Shares (%)							
Coal	*6.0*	*38.3*	*29.9*	*25.5*	*19.9*	*16.6*	*5.6*
Oil	*12.3*	*4.3*	*3.9*	*7.6*	*11.0*	*12.1*	*9.3*
Gas	*79.5*	*51.0*	*56.8*	*56.9*	*61.3*	*64.8*	*76.8*
Comb. Renewables & Wastes	–	*1.3*	*4.1*	*4.6*	*4.7*	*4.6*	*4.8*
Nuclear	*2.1*	*4.9*	*4.2*	*4.4*	*1.4*	–	–
Hydro	–	*0.2*	*0.1*	*0.1*	*0.2*	*0.2*	*0.1*
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	*0.1*	*0.9*	*1.0*	*1.5*	*1.8*	*3.5*
TOTAL LOSSES	**14.3**	**15.2**	**17.6**	**17.0**	**14.5**	**15.2**	**18.3**
of which:							
Electricity and Heat Generation[10]	7.5	8.6	9.1	9.3	7.7	7.9	9.4
Other Transformation	1.6	0.9	1.7	1.4	4.8	5.5	6.4
Own Use and Losses[11]	5.2	5.7	6.8	6.3	1.9	1.7	2.6
Statistical Differences	**–0.7**	**–0.7**	**–1.3**	**–0.8**	**–**	**–**	**–**

INDICATORS

	1973	1990	1998	1999	2005	2010	2020
GDP (billion 1995 US$)	254.58	373.78	459.84	476.28	558.84	638.47	833.38
Population (millions)	13.44	14.95	15.70	15.81	15.99	16.09	17.00
TPES/GDP[12]	0.25	0.18	0.16	0.16	0.15	0.14	0.12
Energy Production/TPES	0.91	0.90	0.84	0.80	0.71	0.53	0.56
Per Capita TPES[13]	4.65	4.45	4.73	4.69	5.19	5.46	5.92
Oil Supply/GDP[12]	0.12	0.07	0.06	0.06	0.05	0.05	0.04
TFC/GDP[12]	0.19	0.14	0.13	0.12	0.12	0.11	0.10
Per Capita TFC[13]	3.64	3.48	3.69	3.66	4.29	4.52	4.84
Energy-related CO_2 Emissions (Mt CO_2)[14]	148.5	156.5	170.9	166.6	175.8	185.7	206.2
CO_2 Emissions from Bunkers (Mt CO_2)	39.3	39.0	48.7	50.3	68.3	77.1	95.0

GROWTH RATES (% per year)

	73–79	79–90	90–98	98–99	99–05	05–10	10–20
TPES	1.7	–0.3	1.4	–0.3	1.9	1.1	1.4
Coal	2.4	9.4	–0.1	–15.5	–0.2	–0.4	–3.7
Oil	0.4	–2.2	1.3	2.9	0.5	1.2	1.4
Gas	2.4	–0.6	1.6	–1.0	3.8	1.6	1.8
Comb. Renewables & Wastes	–	4.0	14.1	15.3	9.5	1.9	2.1
Nuclear	21.0	0.0	1.1	0.5	–14.7	–	–
Hydro	–	–	–1.3	–11.1	15.5	–1.1	1.1
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	39.5	–	10.0	7.1	11.1
TFC	2.0	–0.5	1.4	–0.1	2.9	1.2	1.3
Electricity Consumption	4.4	2.3	2.9	2.1	2.1	2.5	3.2
Energy Production	4.4	–1.8	0.5	–5.5	–0.1	–4.6	1.9
Net Oil Imports	1.0	–4.0	2.4	–1.5	2.2	1.7	1.6
GDP	2.6	2.1	2.6	3.6	2.7	2.7	2.7
Growth in the TPES/GDP Ratio	–0.9	–2.4	–1.2	–3.7	–0.8	–1.5	–1.3
Growth in the TFC/GDP Ratio	–0.6	–2.6	–1.2	–3.6	0.2	–1.5	–1.4

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

NEW ZEALAND

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit:Mtoe

SUPPLY		1973	1990	1998	1999	2005	2010	2020
TOTAL PRODUCTION		**4.05**	**12.22**	**14.31**	**15.14**	**15.32**	**16.05**	**18.69**
Coal[1]		1.29	1.39	1.91	2.21	3.03	3.16	3.88
Oil		0.18	1.96	2.56	2.29	2.15	2.15	2.15
Gas		0.28	3.87	4.15	4.81	3.10	2.97	3.28
Comb. Renewables & Wastes[2]		–	0.68	1.00	1.18	1.32	1.56	2.03
Nuclear		–	–	–	–	–	–	–
Hydro		1.23	2.01	2.10	2.02	2.27	2.27	2.34
Geothermal		1.07	2.32	2.58	2.62	3.44	3.92	4.96
Solar / Wind / Other[3]		–	–	0.00	0.01	0.01	0.03	0.07
TOTAL NET IMPORTS[4]		**4.27**	**1.82**	**3.14**	**3.51**	**4.38**	**4.56**	**6.04**
Coal[1]	Exports	0.02	0.23	0.78	0.97	1.16	1.16	1.16
	Imports	–	0.01	–	–	–	–	–
	Net Imports	–0.02	–0.22	–0.78	–0.97	–1.16	–1.16	–1.16
Oil	Exports	–	1.47	1.92	1.73	–	–	–
	Imports	4.60	3.83	6.18	6.49	5.90	6.10	7.63
	Bunkers	0.31	0.32	0.33	0.28	0.37	0.39	0.43
	Net Imports	4.29	2.04	3.93	4.48	5.53	5.71	7.20
Gas	Exports	–	–	–	–	–	–	–
	Imports	–	–	–	–	–	–	–
	Net Imports	–	–	–	–	–	–	–
Electricity	Exports	–	–	–	–	–	–	–
	Imports	–	–	–	–	–	–	–
	Net Imports	–	–	–	–	–	–	–
TOTAL STOCK CHANGES		**–0.05**	**–0.06**	**–0.10**	**–0.48**	**–**	**–**	**–**
TOTAL SUPPLY (TPES)		**8.27**	**13.98**	**17.35**	**18.18**	**19.70**	**20.61**	**24.74**
Coal[1]		1.26	1.13	1.06	1.08	1.87	2.00	2.72
Oil		4.42	3.98	6.46	6.46	7.68	7.86	9.35
Gas		0.28	3.87	4.15	4.81	3.10	2.97	3.28
Comb. Renewables & Wastes[2]		–	0.68	1.00	1.18	1.32	1.56	2.03
Nuclear		–	–	–	–	–	–	–
Hydro		1.23	2.01	2.10	2.02	2.27	2.27	2.34
Geothermal		1.07	2.32	2.58	2.62	3.44	3.92	4.96
Solar / Wind / Other[3]		–	–	0.00	0.01	0.01	0.03	0.07
Electricity Trade[5]		–	–	–	–	–	–	–
Shares (%)								
Coal		*15.3*	*8.1*	*6.1*	*5.9*	*9.5*	*9.7*	*11.0*
Oil		*53.5*	*28.5*	*37.2*	*35.5*	*39.0*	*38.1*	*37.8*
Gas		*3.4*	*27.7*	*23.9*	*26.5*	*15.8*	*14.4*	*13.3*
Comb. Renewables & Wastes		–	*4.9*	*5.8*	*6.5*	*6.7*	*7.6*	*8.2*
Nuclear		–	–	–	–	–	–	–
Hydro		*14.9*	*14.4*	*12.1*	*11.1*	*11.5*	*11.0*	*9.4*
Geothermal		*12.9*	*16.6*	*14.9*	*14.4*	*17.5*	*19.0*	*20.1*
Solar / Wind / Other		–	–	–	–	*0.1*	*0.1*	*0.3*
Electricity Trade		–	–	–	–	–	–	–

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

Please note: All forecast data, except GDP and Population, refer to the fiscal year.

Unit:Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	1998	1999	2005	2010	2020
TFC	**6.05**	**9.91**	**12.38**	**13.00**	**13.87**	**14.44**	**16.96**
Coal[1]	0.87	1.01	0.88	0.82	1.00	1.04	1.09
Oil	3.67	4.43	5.49	5.72	6.85	7.48	8.94
Gas	0.14	1.30	2.43	2.69	1.78	1.30	1.51
Comb. Renewables & Wastes[2]	–	0.51	0.53	0.70	0.78	0.84	0.97
Geothermal	–	0.27	0.31	0.33	0.38	0.40	0.47
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	1.37	2.39	2.74	2.76	3.10	3.39	3.98
Heat	–	–	–	–	–	–	–
Shares (%)							
Coal	*14.4*	*10.2*	*7.1*	*6.3*	*7.2*	*7.2*	*6.4*
Oil	*60.6*	*44.7*	*44.3*	*44.0*	*49.3*	*51.8*	*52.7*
Gas	*2.4*	*13.1*	*19.6*	*20.7*	*12.8*	*9.0*	*8.9*
Comb. Renewables & Wastes	–	*5.1*	*4.3*	*5.4*	*5.6*	*5.8*	*5.7*
Geothermal	–	*2.7*	*2.5*	*2.5*	*2.7*	*2.8*	*2.8*
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	*22.6*	*24.1*	*22.2*	*21.2*	*22.3*	*23.5*	*23.5*
Heat	–	–	–	–	–	–	–
TOTAL INDUSTRY[6]	**2.18**	**4.07**	**5.21**	**5.57**	**5.22**	**4.97**	**5.57**
Coal[1]	0.69	0.86	0.75	0.70	0.79	0.83	0.87
Oil	0.96	0.59	0.55	0.57	0.63	0.66	0.72
Gas	0.05	1.06	2.19	2.43	1.45	0.95	1.10
Comb. Renewables & Wastes[2]	–	0.39	0.41	0.55	0.62	0.67	0.78
Geothermal	–	0.22	0.25	0.27	0.30	0.32	0.38
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	0.48	0.96	1.06	1.07	1.43	1.53	1.74
Heat	–	–	–	–	–	–	–
Shares (%)							
Coal	*31.5*	*21.1*	*14.3*	*12.5*	*15.2*	*16.6*	*15.6*
Oil	*43.9*	*14.4*	*10.5*	*10.2*	*12.1*	*13.4*	*13.0*
Gas	*2.4*	*25.9*	*42.1*	*43.6*	*27.7*	*19.2*	*19.6*
Comb. Renewables & Wastes	–	*9.6*	*7.9*	*9.8*	*11.9*	*13.5*	*13.9*
Geothermal	–	*5.4*	*4.9*	*4.8*	*5.8*	*6.5*	*6.7*
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	*22.2*	*23.6*	*20.4*	*19.1*	*27.4*	*30.9*	*31.2*
Heat	–	–	–	–	–	–	–
TRANSPORT[7]	**2.15**	**3.54**	**4.62**	**4.83**	**5.73**	**6.29**	**7.60**
TOTAL OTHER SECTORS[8]	**1.72**	**2.30**	**2.55**	**2.60**	**2.92**	**3.19**	**3.78**
Coal[1]	0.19	0.15	0.13	0.12	0.21	0.21	0.22
Oil	0.57	0.37	0.37	0.36	0.50	0.54	0.63
Gas	0.09	0.18	0.23	0.25	0.32	0.34	0.41
Comb. Renewables & Wastes[2]	–	0.12	0.12	0.15	0.16	0.17	0.19
Geothermal	–	0.05	0.06	0.06	0.08	0.08	0.09
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	0.88	1.42	1.65	1.66	1.66	1.85	2.24
Heat	–	–	–	–	–	–	–
Shares (%)							
Coal	*10.7*	*6.6*	*5.0*	*4.5*	*7.0*	*6.5*	*5.8*
Oil	*32.8*	*16.0*	*14.4*	*13.7*	*17.1*	*16.9*	*16.5*
Gas	*5.3*	*7.8*	*8.8*	*9.6*	*11.1*	*10.7*	*10.9*
Comb. Renewables & Wastes	–	*5.2*	*4.7*	*5.9*	*5.3*	*5.2*	*5.1*
Geothermal	–	*2.3*	*2.4*	*2.4*	*2.6*	*2.5*	*2.5*
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	*51.2*	*62.0*	*64.7*	*64.0*	*56.9*	*58.1*	*59.2*
Heat	–	–	–	–	–	–	–

Unit:Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	1998	1999	2005	2010	2020
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**3.16**	**5.37**	**6.41**	**6.86**	**7.73**	**8.81**	**10.97**
OUTPUT (Mtoe)	**1.59**	**2.77**	**3.25**	**3.28**	**3.62**	**3.97**	**4.65**
(TWh gross)	18.53	32.27	37.77	38.10	42.09	46.15	54.04
Output Shares (%)							
Coal	*8.5*	*1.7*	*4.2*	*4.8*	*7.7*	*7.8*	*13.3*
Oil	*6.1*	*0.0*	–	–	*0.0*	*0.1*	*0.2*
Gas	*1.4*	*17.6*	*22.9*	*25.1*	*16.5*	*20.0*	*18.2*
Comb. Renewables & Wastes	–	*1.5*	*1.7*	*1.7*	*4.8*	*5.9*	*7.3*
Nuclear	–	–	–	–	–	–	–
Hydro	*77.3*	*72.3*	*64.6*	*61.7*	*62.6*	*57.1*	*50.3*
Geothermal	*6.7*	*6.8*	*6.5*	*6.6*	*8.0*	*8.4*	*9.2*
Solar/Wind/Other	–	–	*0.1*	*0.1*	*0.3*	*0.7*	*1.4*
TOTAL LOSSES	**2.35**	**4.07**	**4.69**	**5.03**	**5.83**	**6.16**	**7.78**
of which:							
Electricity and Heat Generation[10]	1.57	2.60	3.16	3.59	4.33	5.08	6.59
Other Transformation	0.36	0.60	0.41	0.35	0.61	0.44	0.44
Own Use and Losses[11]	0.43	0.87	1.11	1.10	0.89	0.65	0.75
Statistical Differences	**–0.13**	**0.00**	**0.28**	**0.14**	**–**	**–**	**–**

INDICATORS

	1973	1990	1998	1999	2005	2010	2020
GDP (billion 1995 US$)	42.62	51.66	62.82	65.58	78.31	90.78	122.00
Population (millions)	2.97	3.36	3.79	3.81	3.87	4.03	4.39
TPES/GDP[12]	0.19	0.27	0.28	0.28	0.25	0.23	0.20
Energy Production/TPES	0.49	0.87	0.82	0.83	0.78	0.78	0.76
Per Capita TPES[13]	2.78	4.16	4.57	4.77	5.10	5.11	5.63
Oil Supply/GDP[12]	0.10	0.08	0.10	0.10	0.10	0.09	0.08
TFC/GDP[12]	0.14	0.19	0.20	0.20	0.18	0.16	0.14
Per Capita TFC[13]	2.04	2.95	3.26	3.41	3.59	3.58	3.86
Energy-related CO_2 Emissions (Mt CO_2)[14]	17.7	23.0	29.5	30.6	34.1	35.2	43.0
CO_2 Emissions from Bunkers (Mt CO_2)	1.6	2.4	2.8	2.9	3.1	3.2	3.3

GROWTH RATES (% per year)

	73–79	79–90	90–98	98–99	99–05	05–10	10–20
TPES	1.5	4.0	2.7	4.8	1.3	0.9	1.8
Coal	–4.5	1.5	–0.8	2.1	9.6	1.3	3.1
Oil	–0.9	–0.5	6.2	–0.0	2.9	0.5	1.7
Gas	20.0	14.8	0.9	15.9	–7.0	–0.9	1.0
Comb. Renewables & Wastes	–	3.1	4.9	18.2	1.8	3.5	2.6
Nuclear	–	–	–	–	–	–	–
Hydro	4.6	2.0	0.6	–3.6	1.9	–	0.3
Geothermal	–2.2	8.6	1.4	1.5	4.6	2.6	2.4
Solar/Wind/Other	–	–	–	150.0	15.7	19.3	8.7
TFC	2.1	3.4	2.8	5.1	1.1	0.8	1.6
Electricity Consumption	3.0	3.5	1.7	0.7	1.9	1.8	1.6
Energy Production	4.5	7.9	2.0	5.8	0.2	0.9	1.5
Net Oil Imports	–2.5	–5.3	8.6	14.0	3.6	0.6	2.3
GDP	0.0	1.7	2.5	4.4	3.0	3.0	3.0
Growth in the TPES/GDP Ratio	1.4	2.3	0.3	0.4	–1.6	–2.0	–1.1
Growth in the TFC/GDP Ratio	2.0	1.7	0.3	0.6	–1.9	–2.1	–1.3

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

NORWAY

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit:Mtoe

SUPPLY		1973	1990	1998	1999	2005	2010	2020
TOTAL PRODUCTION		**8.19**	**120.14**	**206.67**	**209.77**	**..**	**..**	**..**
Coal[1]		0.29	0.20	0.22	0.33	..	..	..
Oil		1.64	84.35	153.92	153.42	..	..	..
Gas		–	24.14	41.34	44.13	..	..	..
Comb. Renewables & Wastes[2]		–	1.03	1.26	1.49	..	..	..
Nuclear		–	–	–	–	..	..	..
Hydro		6.27	10.42	9.92	10.40	..	..	..
Geothermal		–	–	–	–	..	..	..
Solar / Wind / Other[3]		–	0.00	0.00	0.01	..	..	..
TOTAL NET IMPORTS[4]		**6.48**	**–96.80**	**–181.64**	**–183.16**	**..**	**..**	**..**
Coal[1]	Exports	0.09	0.17	0.20	0.20	..	..	..
	Imports	0.67	0.84	1.04	0.91	..	..	..
	Net Imports	0.58	0.67	0.84	0.71	..	..	..
Oil	Exports	3.69	77.95	150.15	148.75	..	..	..
	Imports	10.68	4.47	5.29	5.26	..	..	..
	Bunkers	0.64	0.45	0.90	0.86	..	..	..
	Net Imports	6.35	–73.93	–145.76	–144.36	..	..	..
Gas	Exports	–	22.17	37.04	39.37	..	..	..
	Imports	–	–	–	–	..	..	..
	Net Imports	–	–22.17	–37.04	–39.37	..	..	..
Electricity	Exports	0.45	1.40	0.38	0.71	..	..	..
	Imports	0.01	0.03	0.69	0.56	..	..	..
	Net Imports	–0.45	–1.37	0.31	–0.16	..	..	..
TOTAL STOCK CHANGES		**0.44**	**–1.87**	**0.38**	**–0.00**	**..**	**..**	**..**
TOTAL SUPPLY (TPES)		**15.11**	**21.48**	**25.41**	**26.61**	**..**	**..**	**..**
Coal[1]		0.91	0.86	1.07	1.06	..	..	..
Oil		8.38	8.56	8.53	9.05	..	..	..
Gas		–	1.98	4.31	4.76	..	..	..
Comb. Renewables & Wastes[2]		–	1.03	1.27	1.50	..	..	..
Nuclear		–	–	–	–	..	..	..
Hydro		6.27	10.42	9.92	10.40	..	..	..
Geothermal		–	–	–	–	..	..	..
Solar / Wind / Other[3]		–	0.00	0.00	0.01	..	..	..
Electricity Trade[5]		–0.45	–1.37	0.31	–0.16	..	..	..
Shares (%)								
Coal		*6.0*	*4.0*	*4.2*	*4.0*	..	..	..
Oil		*55.5*	*39.9*	*33.6*	*34.0*	..	..	..
Gas		–	*9.2*	*16.9*	*17.9*	..	..	..
Comb. Renewables & Wastes		–	*4.8*	*5.0*	*5.6*	..	..	..
Nuclear		–	–	–	–	..	..	..
Hydro		*41.5*	*48.5*	*39.1*	*39.1*	..	..	..
Geothermal		–	–	–	–	..	..	..
Solar / Wind / Other		–	–	–	–	..	..	..
Electricity Trade		*–3.0*	*–6.4*	*1.2*	*–0.6*	..	..	..

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

Unit:Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	1998	1999	2005	2010	2020
TFC	**13.73**	**18.03**	**20.13**	**20.33**	**..**	**..**	**..**
Coal[1]	0.81	0.78	1.04	0.98	..	..	..
Oil	7.68	7.96	8.46	8.59	..	..	..
Gas	0.01	–	–	–	..	..	..
Comb. Renewables & Wastes[2]	–	0.90	1.10	1.33	..	..	..
Geothermal	–	–	–	–	..	..	..
Solar / Wind / Other	–	–	–	–	..	..	..
Electricity	5.23	8.33	9.41	9.30	..	..	..
Heat	–	0.07	0.12	0.13	..	..	..
Shares (%)							
Coal	*5.9*	*4.3*	*5.1*	*4.8*	..	..	..
Oil	*55.9*	*44.1*	*42.0*	*42.2*	..	..	..
Gas	*0.1*	–	–	–	..	..	..
Comb. Renewables & Wastes	–	*5.0*	*5.5*	*6.5*	..	..	..
Geothermal	–	–	–	–	..	..	..
Solar / Wind / Other	–	–	–	–	..	..	..
Electricity	*38.1*	*46.2*	*46.8*	*45.7*	..	..	..
Heat	–	*0.4*	*0.6*	*0.7*	..	..	..
TOTAL INDUSTRY[6]	**6.96**	**7.90**	**8.28**	**8.27**	**..**	**..**	**..**
Coal[1]	0.76	0.77	1.03	0.98	..	..	..
Oil	3.01	2.79	2.50	2.35	..	..	..
Gas	0.00	–	–	–	..	..	..
Comb. Renewables & Wastes[2]	–	0.38	0.49	0.76	..	..	..
Geothermal	–	–	–	–	..	..	..
Solar / Wind / Other	–	–	–	–	..	..	..
Electricity	3.20	3.94	4.23	4.17	..	..	..
Heat	–	0.02	0.02	0.02	..	..	..
Shares (%)							
Coal	*10.9*	*9.7*	*12.5*	*11.8*	..	..	..
Oil	*43.2*	*35.3*	*30.2*	*28.4*	..	..	..
Gas	–	–	–	–	..	..	..
Comb. Renewables & Wastes	–	*4.8*	*6.0*	*9.1*	..	..	..
Geothermal	–	–	–	–	..	..	..
Solar / Wind / Other	–	–	–	–	..	..	..
Electricity	*45.9*	*49.9*	*51.1*	*50.4*	..	..	..
Heat	–	*0.2*	*0.2*	*0.2*	..	..	..
TRANSPORT[7]	**2.62**	**4.22**	**4.84**	**5.12**	**..**	**..**	**..**
TOTAL OTHER SECTORS[8]	**4.15**	**5.92**	**7.00**	**6.94**	**..**	**..**	**..**
Coal[1]	0.06	0.01	0.00	0.00	..	..	..
Oil	2.10	1.02	1.27	1.27	..	..	..
Gas	0.01	–	–	–	..	..	..
Comb. Renewables & Wastes[2]	–	0.52	0.61	0.57	..	..	..
Geothermal	–	–	–	–	..	..	..
Solar / Wind / Other	–	–	–	–	..	..	..
Electricity	1.98	4.31	5.02	4.98	..	..	..
Heat	–	0.06	0.10	0.11	..	..	..
Shares (%)							
Coal	*1.3*	*0.2*	–	–	..	..	..
Oil	*50.6*	*17.2*	*18.1*	*18.3*	..	..	..
Gas	*0.2*	–	–	–	..	..	..
Comb. Renewables & Wastes	–	*8.7*	*8.7*	*8.3*	..	..	..
Geothermal	–	–	–	–	..	..	..
Solar / Wind / Other	–	–	–	–	..	..	..
Electricity	*47.8*	*72.9*	*71.7*	*71.7*	..	..	..
Heat	–	*1.0*	*1.4*	*1.6*	..	..	..

Unit:Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	1998	1999	2005	2010	2020
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**6.31**	**10.59**	**10.18**	**10.68**	**..**	**..**	**..**
OUTPUT (Mtoe)	**6.28**	**10.46**	**9.99**	**10.47**	**..**	**..**	**..**
(TWh gross)	73.03	121.61	116.12	121.72	..	..	..
Output Shares (%)							
Coal	*0.0*	*0.2*	*0.2*	*0.2*	..	..	..
Oil	*0.2*	*0.0*	*0.0*	*0.0*	..	..	..
Gas	–	–	*0.2*	*0.2*	..	..	..
Comb. Renewables & Wastes	–	*0.2*	*0.3*	*0.2*	..	..	..
Nuclear	–	–	–	–	..	..	..
Hydro	*99.8*	*99.6*	*99.4*	*99.3*	..	..	..
Geothermal	–	–	–	–	..	..	..
Solar/Wind/Other	–	–	*0.0*	*0.0*	..	..	..
TOTAL LOSSES	**1.34**	**3.65**	**6.12**	**6.57**	**..**	**..**	**..**
of which:							
Electricity and Heat Generation[10]	0.03	0.04	0.05	0.04	..	..	..
Other Transformation	0.57	–0.05	–0.18	–0.26	..	..	..
Own Use and Losses[11]	0.73	3.66	6.24	6.79	..	..	..
Statistical Differences	**0.05**	**–0.20**	**–0.83**	**–0.30**	**..**	**..**	**..**

INDICATORS

	1973	1990	1998	1999	2005	2010	2020
GDP (billion 1995 US$)	70.07	122.33	164.22	165.65	..	..	..
Population (millions)	3.96	4.24	4.43	4.46	..	..	..
TPES/GDP[12]	0.22	0.18	0.15	0.16	..	..	..
Energy Production/TPES	0.54	5.59	8.13	7.88	..	..	..
Per Capita TPES[13]	3.82	5.06	5.73	5.96	..	..	..
Oil Supply/GDP[12]	0.12	0.07	0.05	0.05	..	..	..
TFC/GDP[12]	0.20	0.15	0.12	0.12	..	..	..
Per Capita TFC[13]	3.47	4.25	4.54	4.56	..	..	..
Energy-related CO_2 Emissions (Mt CO_2)[14]	25.6	28.5	34.3	37.1	..	..	..
CO_2 Emissions from Bunkers (Mt CO_2)	2.8	2.7	4.4	4.4	..	..	..

GROWTH RATES (% per year)

	73–79	79–90	90–98	98–99	99–05	05–10	10–20
TPES	3.7	1.2	2.1	4.7	..	..	..
Coal	1.4	–1.3	2.7	–1.1	..	..	..
Oil	1.8	–0.8	–0.1	6.1	..	..	..
Gas	–	9.8	10.2	10.5	..	..	..
Comb. Renewables & Wastes	–	5.6	2.7	18.2	..	..	..
Nuclear	–	–	–	–	..	..	..
Hydro	3.3	2.9	–0.6	4.8	..	..	..
Geothermal	–	–	–	–	..	..	..
Solar/Wind/Other	–	–	–	–	..	..	..
TFC	3.5	0.6	1.4	1.0	..	..	..
Electricity Consumption	3.6	2.3	1.5	–1.2	..	..	..
Energy Production	33.7	8.9	7.0	1.5	..	..	..
Net Oil Imports	–	19.9	8.9	–1.0	..	..	..
GDP	4.6	2.6	3.7	0.9	..	..	..
Growth in the TPES/GDP Ratio	–0.9	–1.4	–1.6	3.8	..	..	..
Growth in the TFC/GDP Ratio	–1.1	–2.0	–2.3	0.1	..	..	..

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

PORTUGAL

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit:Mtoe

SUPPLY		1973	1990	1998	1999	2005	2010	2020
TOTAL PRODUCTION		**1.40**	**2.07**	**2.32**	**1.94**	**2.35**	**2.51**	**..**
Coal[1]		0.13	0.12	–	–	–	–	..
Oil		–	–	–	–	–	–	..
Gas		–	–	–	–	–	–	..
Comb. Renewables & Wastes[2]		0.64	1.15	1.12	1.22	1.14	1.22	..
Nuclear		–	–	–	–	–	–	..
Hydro		0.63	0.79	1.12	0.63	1.04	1.09	..
Geothermal		–	0.00	0.05	0.07	0.04	0.04	..
Solar / Wind / Other[3]		–	0.01	0.03	0.03	0.12	0.15	..
TOTAL NET IMPORTS[4]		**5.69**	**14.82**	**19.60**	**21.95**	**20.72**	**22.68**	**..**
Coal[1]	Exports	0.01	0.01	0.05	0.05	–	–	..
	Imports	0.28	3.00	3.19	3.79	3.58	3.62	..
	Net Imports	0.27	2.99	3.14	3.74	3.58	3.62	..
Oil	Exports	0.23	2.50	1.98	1.43	–	–	..
	Imports	6.44	14.93	18.10	18.35	14.57	14.71	..
	Bunkers	0.80	0.61	0.38	0.59	1.08	1.36	..
	Net Imports	5.42	11.82	15.74	16.33	13.49	13.35	..
Gas	Exports	–	–	–	–	–	–	..
	Imports	–	–	0.70	1.95	3.65	5.71	..
	Net Imports	–	–	0.70	1.95	3.65	5.71	..
Electricity	Exports	0.01	0.15	0.32	0.39	–	–	..
	Imports	0.01	0.15	0.34	0.31	–	–	..
	Net Imports	–0.00	0.00	0.02	–0.07	–	–	..
TOTAL STOCK CHANGES		**0.14**	**–0.47**	**–0.01**	**–0.26**	**–**	**–**	**..**
TOTAL SUPPLY (TPES)		**7.23**	**16.42**	**21.91**	**23.63**	**23.07**	**25.18**	**..**
Coal[1]		0.51	2.76	3.11	3.79	3.58	3.62	..
Oil		5.45	11.71	15.77	16.03	13.49	13.35	..
Gas		–	–	0.70	1.94	3.65	5.71	..
Comb. Renewables & Wastes[2]		0.64	1.15	1.12	1.22	1.14	1.22	..
Nuclear		–	–	–	–	–	–	..
Hydro		0.63	0.79	1.12	0.63	1.04	1.09	..
Geothermal		–	0.00	0.05	0.07	0.04	0.04	..
Solar / Wind / Other[3]		–	0.01	0.03	0.03	0.12	0.15	..
Electricity Trade[5]		–0.00	0.00	0.02	–0.07	–	–	..
Shares (%)								
Coal		*7.0*	*16.8*	*14.2*	*16.0*	*15.5*	*14.4*	..
Oil		*75.4*	*71.3*	*72.0*	*67.9*	*58.5*	*53.0*	..
Gas		–	–	*3.2*	*8.2*	*15.8*	*22.7*	..
Comb. Renewables & Wastes		*8.8*	*7.0*	*5.1*	*5.1*	*5.0*	*4.8*	..
Nuclear		–	–	–	–	–	–	..
Hydro		*8.7*	*4.8*	*5.1*	*2.6*	*4.5*	*4.3*	..
Geothermal		–	–	*0.2*	*0.3*	*0.2*	*0.2*	..
Solar / Wind / Other		–	*0.1*	*0.1*	*0.1*	*0.5*	*0.6*	..
Electricity Trade		–	–	*0.1*	*–0.3*	–	–	..

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

Please note: Forecast data for 2005 and 2010 are based on the 1999 submission.

Unit:Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	1998	1999	2005	2010	2020
TFC	**6.11**	**12.68**	**17.17**	**17.81**	**18.26**	**19.61**	**..**
Coal[1]	0.19	0.59	0.37	0.36	0.50	0.54	..
Oil	4.59	8.97	12.52	12.71	11.32	11.55	..
Gas	0.05	0.05	0.30	0.56	1.44	1.80	..
Comb. Renewables & Wastes[2]	0.58	1.00	0.97	0.97	0.86	0.82	..
Geothermal	–	–	0.00	0.00	0.00	0.00	..
Solar / Wind / Other	–	0.01	0.02	0.02	0.06	0.07	..
Electricity	0.70	2.03	2.91	3.11	3.88	4.53	..
Heat	–	0.03	0.08	0.09	0.19	0.32	..
Shares (%)							
Coal	*3.1*	*4.7*	*2.2*	*2.0*	*2.7*	*2.7*	..
Oil	*75.1*	*70.7*	*72.9*	*71.4*	*62.0*	*58.9*	..
Gas	*0.8*	*0.4*	*1.7*	*3.1*	*7.9*	*9.2*	..
Comb. Renewables & Wastes	*9.5*	*7.9*	*5.6*	*5.5*	*4.7*	*4.2*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	*0.1*	*0.1*	*0.1*	*0.3*	*0.3*	..
Electricity	*11.5*	*16.0*	*17.0*	*17.4*	*21.3*	*23.1*	..
Heat	–	*0.2*	*0.5*	*0.5*	*1.1*	*1.6*	..
TOTAL INDUSTRY[6]	**2.71**	**6.22**	**7.53**	**7.62**	**6.92**	**7.39**	**..**
Coal[1]	0.14	0.59	0.37	0.36	0.50	0.54	..
Oil	1.81	3.96	5.07	4.91	3.05	2.98	..
Gas	0.00	–	0.22	0.44	0.98	1.16	..
Comb. Renewables & Wastes[2]	0.32	0.59	0.54	0.54	0.45	0.43	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	0.44	1.05	1.25	1.30	1.76	1.97	..
Heat	–	0.03	0.08	0.08	0.19	0.32	..
Shares (%)							
Coal	*5.1*	*9.5*	*4.9*	*4.7*	*7.2*	*7.3*	..
Oil	*66.9*	*63.7*	*67.4*	*64.4*	*44.0*	*40.3*	..
Gas	*0.1*	–	*2.9*	*5.7*	*14.1*	*15.7*	..
Comb. Renewables & Wastes	*11.8*	*9.5*	*7.1*	*7.1*	*6.5*	*5.8*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	*16.2*	*16.9*	*16.6*	*17.0*	*25.4*	*26.6*	..
Heat	–	*0.5*	*1.0*	*1.1*	*2.8*	*4.3*	..
TRANSPORT[7]	**1.95**	**3.82**	**5.84**	**6.19**	**6.99**	**7.36**	**..**
TOTAL OTHER SECTORS[8]	**1.46**	**2.63**	**3.80**	**4.00**	**4.35**	**4.87**	**..**
Coal[1]	0.04	0.00	–	–	–	–	..
Oil	0.87	1.21	1.64	1.65	1.32	1.26	..
Gas	0.05	0.05	0.08	0.12	0.47	0.64	..
Comb. Renewables & Wastes[2]	0.26	0.41	0.43	0.43	0.41	0.39	..
Geothermal	–	–	0.00	0.00	0.00	0.00	..
Solar / Wind / Other	–	0.01	0.02	0.02	0.06	0.07	..
Electricity	0.25	0.95	1.63	1.78	2.09	2.52	..
Heat	–	–	0.00	0.00	–	–	..
Shares (%)							
Coal	*2.4*	–	–	–	–	–	..
Oil	*59.7*	*46.0*	*43.3*	*41.2*	*30.4*	*25.9*	..
Gas	*3.2*	*2.0*	*2.1*	*3.0*	*10.7*	*13.1*	..
Comb. Renewables & Wastes	*17.9*	*15.6*	*11.3*	*10.9*	*9.4*	*7.9*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	*0.4*	*0.4*	*0.5*	*1.3*	*1.4*	..
Electricity	*16.8*	*36.0*	*42.8*	*44.4*	*48.1*	*51.6*	..
Heat	–	–	*0.1*	*0.1*	–	–	..

Unit:Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	1998	1999	2005	2010	2020
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**1.33**	**5.10**	**6.65**	**7.96**	**8.23**	**9.75**	**..**
OUTPUT (Mtoe)	**0.84**	**2.44**	**3.35**	**3.69**	**4.43**	**5.28**	**..**
(TWh gross)	9.79	28.36	38.91	42.93	51.49	61.41	..
Output Shares (%)							
Coal	*3.9*	*32.1*	*31.0*	*35.2*	*27.9*	*23.4*	..
Oil	*19.2*	*33.1*	*27.5*	*25.6*	*15.2*	*9.7*	..
Gas	–	–	*5.2*	*18.8*	*28.4*	*41.7*	..
Comb. Renewables & Wastes	*2.0*	*2.4*	*2.6*	*2.9*	*3.5*	*2.9*	..
Nuclear	–	–	–	–	–	–	..
Hydro	*74.8*	*32.3*	*33.4*	*16.9*	*23.4*	*20.7*	..
Geothermal	–	*0.0*	*0.1*	*0.2*	*0.1*	*0.1*	..
Solar / Wind / Other	–	*0.0*	*0.2*	*0.3*	*1.6*	*1.5*	..
TOTAL LOSSES	**1.23**	**3.21**	**4.54**	**5.70**	**4.82**	**5.57**	**..**
of which:							
Electricity and Heat Generation[10]	0.49	2.63	3.22	4.18	3.61	4.15	..
Other Transformation	0.23	–0.38	0.15	0.17	0.08	0.08	..
Own Use and Losses[11]	0.51	0.96	1.17	1.35	1.13	1.33	..
Statistical Differences	**–0.11**	**0.53**	**0.20**	**0.12**	**–**	**–**	**..**

INDICATORS

	1973	1990	1998	1999	2005	2010	2020
GDP (billion 1995 US$)	58.19	98.60	119.95	123.51	151.08	180.30	..
Population (millions)	8.64	9.90	9.97	9.98	10.10	10.20	..
TPES / GDP[12]	0.12	0.17	0.18	0.19	0.15	0.14	..
Energy Production / TPES	0.19	0.13	0.11	0.08	0.10	0.10	..
Per Capita TPES[13]	0.84	1.66	2.20	2.37	2.28	2.47	..
Oil Supply / GDP[12]	0.09	0.12	0.13	0.13	0.09	0.07	..
TFC / GDP[12]	0.11	0.13	0.14	0.14	0.12	0.11	..
Per Capita TFC[13]	0.71	1.28	1.72	1.78	1.81	1.92	..
Energy-related CO_2 Emissions (Mt CO_2)[14]	16.5	39.9	54.6	61.1	57.0	61.5	..
CO_2 Emissions from Bunkers (Mt CO_2)	3.5	3.5	2.7	3.5	5.1	5.9	..

GROWTH RATES (% per year)

	73–79	79–90	90–98	98–99	99–05	05–10	10–20
TPES	5.5	4.6	3.7	7.8	–0.4	1.8	..
Coal	–2.4	18.2	1.5	22.0	–0.9	0.2	..
Oil	6.1	3.8	3.8	1.7	–2.8	–0.2	..
Gas	–	–	–	178.2	11.1	9.4	..
Comb. Renewables & Wastes	3.2	3.7	–0.3	8.3	–1.0	1.3	..
Nuclear	–	–	–	–	–	–	..
Hydro	7.3	–1.8	4.5	–44.0	8.8	1.1	..
Geothermal	–	–	42.5	37.3	–7.4	–	..
Solar / Wind / Other	–	–	10.8	16.0	27.4	3.9	..
TFC	4.7	4.2	3.9	3.7	0.4	1.4	..
Electricity Consumption	8.5	5.3	4.6	6.7	3.8	3.1	..
Energy Production	4.4	1.2	1.4	–16.2	3.2	1.3	..
Net Oil Imports	8.1	2.9	3.6	3.7	–3.1	–0.2	..
GDP	2.9	3.3	2.5	3.0	3.4	3.6	..
Growth in the TPES / GDP Ratio	2.5	1.3	1.2	4.7	–3.7	–1.8	..
Growth in the TFC / GDP Ratio	1.8	0.9	1.4	0.7	–2.9	–2.1	..

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

SPAIN

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit:Mtoe

SUPPLY		1973	1990	1998	1999	2005	2010	2020
TOTAL PRODUCTION		**11.3**	**34.0**	**31.9**	**30.7**	**..**	**..**	**..**
Coal[1]		6.5	11.9	9.2	8.6	..	..	..
Oil		0.7	1.2	0.5	0.3	..	..	..
Gas		0.0	1.3	0.1	0.1	..	..	..
Comb. Renewables & Wastes[2]		0.0	3.4	3.7	4.1	..	..	..
Nuclear		1.7	14.1	15.4	15.3	..	..	..
Hydro		2.5	2.2	2.9	2.0	..	..	..
Geothermal		–	–	0.0	0.0	..	..	..
Solar / Wind / Other[3]		–	0.0	0.1	0.3	..	..	..
TOTAL NET IMPORTS[4]		**42.5**	**56.6**	**82.6**	**89.3**	**..**	**..**	**..**
Coal[1]	Exports	0.0	0.0	0.3	0.3	..	..	..
	Imports	2.2	7.1	8.6	11.3	..	..	..
	Net Imports	2.2	7.1	8.2	11.0	..	..	..
Oil	Exports	4.3	12.3	9.0	7.1	..	..	..
	Imports	45.3	61.8	77.0	76.9	..	..	..
	Bunkers	1.4	3.7	6.0	5.9	..	..	..
	Net Imports	39.6	45.9	62.0	63.9	..	..	..
Gas	Exports	–	–	–	–	..	..	..
	Imports	0.9	3.7	12.1	13.9	..	..	..
	Net Imports	0.9	3.7	12.1	13.9	..	..	..
Electricity	Exports	0.2	0.3	0.5	0.5	..	..	..
	Imports	0.0	0.3	0.8	1.0	..	..	..
	Net Imports	–0.2	–0.0	0.3	0.5	..	..	..
TOTAL STOCK CHANGES		**–1.5**	**–0.1**	**–1.8**	**–1.5**	**..**	**..**	**..**
TOTAL SUPPLY (TPES)		**52.4**	**90.5**	**112.8**	**118.5**	**128.3**	**135.0**	**..**
Coal[1]		9.0	19.4	17.3	19.3	13.2	11.4	..
Oil		38.4	46.5	61.5	63.8	66.8	67.2	..
Gas		0.9	5.0	11.6	13.3	20.6	22.9	..
Comb. Renewables & Wastes[2]		0.0	3.4	3.7	4.1	6.6	11.0	..
Nuclear		1.7	14.1	15.4	15.3	16.4	16.4	..
Hydro		2.5	2.2	2.9	2.0	3.2	3.3	..
Geothermal		–	–	0.0	0.0	0.0	0.0	..
Solar / Wind / Other[3]		–	0.0	0.1	0.3	1.2	2.4	..
Electricity Trade[5]		–0.2	–0.0	0.3	0.5	0.4	0.4	..
Shares (%)								
Coal		*17.2*	*21.5*	*15.3*	*16.3*	*10.3*	*8.4*	..
Oil		*73.3*	*51.3*	*54.5*	*53.8*	*52.0*	*49.8*	..
Gas		*1.8*	*5.5*	*10.3*	*11.2*	*16.0*	*17.0*	..
Comb. Renewables & Wastes		–	*3.7*	*3.2*	*3.4*	*5.1*	*8.1*	..
Nuclear		*3.3*	*15.6*	*13.6*	*12.9*	*12.8*	*12.2*	..
Hydro		*4.7*	*2.4*	*2.6*	*1.7*	*2.5*	*2.4*	..
Geothermal		–	–	–	–	–	–	..
Solar / Wind / Other		–	–	*0.1*	*0.2*	*0.9*	*1.8*	..
Electricity Trade		*–0.3*	–	*0.3*	*0.4*	*0.3*	*0.3*	..

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

Unit:Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	1998	1999	2005	2010	2020
TFC	**39.9**	**61.4**	**80.5**	**83.2**	**93.9**	**97.8**	**..**
Coal[1]	4.0	3.2	1.5	1.3	2.3	2.2	..
Oil	30.1	39.9	52.8	53.4	58.0	58.1	..
Gas	0.7	4.6	9.2	10.1	12.1	13.3	..
Comb. Renewables & Wastes[2]	–	2.8	2.6	3.0	4.0	4.9	..
Geothermal	–	–	0.0	0.0	0.0	0.0	..
Solar / Wind / Other	–	–	0.0	0.0	0.1	0.3	..
Electricity	5.1	10.8	14.2	15.2	17.4	19.0	..
Heat	–	0.0	0.1	0.1	–	–	..
Shares (%)							
Coal	*9.9*	*5.3*	*1.9*	*1.6*	*2.5*	*2.3*	..
Oil	*75.6*	*65.0*	*65.6*	*64.2*	*61.7*	*59.4*	..
Gas	*1.8*	*7.5*	*11.5*	*12.1*	*12.9*	*13.6*	..
Comb. Renewables & Wastes	–	*4.5*	*3.3*	*3.7*	*4.3*	*5.0*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	*0.1*	*0.3*	..
Electricity	*12.7*	*17.6*	*17.6*	*18.3*	*18.5*	*19.4*	..
Heat	–	–	*0.1*	*0.1*	–	–	..
TOTAL INDUSTRY[6]	**20.7**	**24.4**	**30.6**	**30.3**	**36.0**	**37.5**	**..**
Coal[1]	3.6	2.9	1.3	1.2	2.2	2.1	..
Oil	13.4	11.3	15.1	13.8	14.7	14.5	..
Gas	0.4	3.8	7.2	7.7	9.2	9.9	..
Comb. Renewables & Wastes[2]	–	0.9	0.8	1.0	1.8	2.3	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	0.0	–	–	–	..
Electricity	3.3	5.4	6.1	6.6	8.1	8.7	..
Heat	–	–	0.1	0.1	–	–	..
Shares (%)							
Coal	*17.5*	*12.1*	*4.3*	*3.9*	*6.1*	*5.7*	..
Oil	*64.7*	*46.4*	*49.2*	*45.4*	*40.9*	*38.6*	..
Gas	*2.0*	*15.5*	*23.6*	*25.4*	*25.5*	*26.5*	..
Comb. Renewables & Wastes	–	*3.7*	*2.7*	*3.4*	*4.9*	*6.1*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	*15.8*	*22.3*	*20.0*	*21.7*	*22.5*	*23.1*	..
Heat	–	–	*0.2*	*0.2*	–	–	..
TRANSPORT[7]	**11.9**	**22.8**	**31.2**	**32.7**	**34.7**	**35.6**	**..**
TOTAL OTHER SECTORS[8]	7.2	14.2	18.7	20.2	23.2	24.6	..
Coal[1]	0.3	0.3	0.2	0.1	0.1	0.1	..
Oil	4.9	6.1	6.9	7.3	9.0	8.9	..
Gas	0.3	0.8	2.0	2.4	2.9	3.3	..
Comb. Renewables & Wastes[2]	–	1.9	1.8	2.0	2.1	2.1	..
Geothermal	–	–	0.0	0.0	0.0	0.0	..
Solar / Wind / Other	–	–	0.0	0.0	0.1	0.3	..
Electricity	1.7	5.1	7.7	8.4	8.9	9.9	..
Heat	–	0.0	–	–	–	–	..
Shares (%)							
Coal	*4.3*	*2.1*	*1.1*	*0.7*	*0.5*	*0.4*	..
Oil	*68.2*	*43.0*	*36.9*	*36.0*	*39.0*	*36.0*	..
Gas	*4.1*	*5.9*	*10.7*	*11.8*	*12.7*	*13.6*	..
Comb. Renewables & Wastes	–	*13.3*	*9.8*	*10.0*	*8.9*	*8.5*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	*0.1*	*0.1*	*0.4*	*1.4*	..
Electricity	*23.4*	*35.7*	*41.4*	*41.3*	*38.4*	*40.1*	..
Heat	–	–	–	–	–	–	..

Unit:Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	1998	1999	2005	2010	2020
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**12.6**	**33.4**	**38.9**	**42.9**	**..**	**..**	**..**
OUTPUT (Mtoe)	**6.5**	**13.0**	**16.6**	**17.7**	**20.2**	**22.2**	**..**
(TWh gross)	75.7	151.2	193.5	206.3	235.0	257.9	..
Output Shares (%)							
Coal	*18.9*	*40.1*	*32.6*	*36.6*	*18.6*	*14.2*	..
Oil	*33.2*	*5.7*	*9.0*	*11.8*	*7.5*	*7.6*	..
Gas	*1.0*	*1.0*	*8.4*	*9.2*	*23.3*	*24.1*	..
Comb. Renewables & Wastes	*0.1*	*0.5*	*1.2*	*1.4*	*3.1*	*6.3*	..
Nuclear	*8.7*	*35.9*	*30.5*	*28.5*	*26.8*	*24.4*	..
Hydro	*38.2*	*16.8*	*17.6*	*11.1*	*15.6*	*14.7*	..
Geothermal	–	–	–	–	–	–	..
Solar/Wind/Other	–	*0.0*	*0.7*	*1.3*	*5.1*	*8.6*	..
TOTAL LOSSES	**12.5**	**28.8**	**31.4**	**34.2**	**..**	**..**	**..**
of which:							
Electricity and Heat Generation[10]	6.1	20.4	22.2	25.0	..	..	..
Other Transformation	2.7	2.3	1.7	1.4	..	..	..
Own Use and Losses[11]	3.7	6.1	7.5	7.8	..	..	..
Statistical Differences	**0.0**	**0.3**	**0.8**	**1.1**	**..**	**..**	**..**

INDICATORS

	1973	1990	1998	1999	2005	2010	2020
GDP (billion 1995 US$)	350.50	546.53	648.85	674.95	779.53	878.96	..
Population (millions)	34.81	38.85	39.37	39.42	39.60	39.80	..
TPES/GDP[12]	0.15	0.17	0.17	0.18	0.16	0.15	..
Energy Production/TPES	0.22	0.38	0.28	0.26	..	..	..
Per Capita TPES[13]	1.50	2.33	2.86	3.01	3.24	3.39	..
Oil Supply/GDP[12]	0.11	0.09	0.09	0.09	0.09	0.08	..
TFC/GDP[12]	0.11	0.11	0.12	0.12	0.12	0.11	..
Per Capita TFC[13]	1.15	1.58	2.04	2.11	2.37	2.46	..
Energy–related CO_2 Emissions (Mt CO_2)[14]	144.4	211.5	254.0	272.0	289.6	289.3	..
CO_2 Emissions from Bunkers (Mt CO_2)	7.0	15.0	26.6	26.4	..	..	..

GROWTH RATES (% per year)

	73–79	79–90	90–98	98–99	99–05	05–10	10–20
TPES	4.1	2.8	2.8	5.0	1.3	1.0	..
Coal	3.0	5.5	–1.4	11.3	–6.1	–2.9	..
Oil	4.1	–0.5	3.6	3.7	0.8	0.1	..
Gas	6.7	12.3	11.2	14.5	7.6	2.2	..
Comb. Renewables & Wastes	24.8	47.0	0.9	11.9	8.3	10.7	..
Nuclear	0.4	20.9	1.0	–0.2	1.1	–	..
Hydro	8.2	–5.3	3.7	–32.8	8.2	0.8	..
Geothermal	–	–	–	25.0	–8.2	–	..
Solar/Wind/Other	–	–	70.5	85.3	28.6	14.8	..
TFC	4.1	1.7	3.5	3.3	2.0	0.8	..
Electricity Consumption	6.4	3.6	3.5	7.3	2.2	1.8	..
Energy Production	5.5	7.3	–0.8	–3.9	..	..	..
Net Oil Imports	3.2	–0.4	3.8	3.0	..	..	..
GDP	2.3	2.8	2.2	4.0	2.4	2.4	..
Growth in the TPES/GDP Ratio	1.8	–0.0	0.6	1.0	–1.1	–1.4	..
Growth in the TFC/GDP Ratio	1.8	–1.1	1.3	–0.7	–0.4	–1.6	..

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

SWEDEN

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit:Mtoe

SUPPLY		1973	1990	1998	1999	2005	2010	2020
TOTAL PRODUCTION		**9.3**	**29.8**	**34.2**	**34.5**	**31.6**	**33.1**	**..**
Coal[1]		0.0	0.0	–	–	–	–	..
Peat		–	0.2	0.3	0.3	0.4	0.4	..
Oil		–	0.0	–	–	–	–	..
Gas		–	–	–	–	–	–	..
Comb. Renewables & Wastes[2]		3.5	5.5	7.9	8.6	8.1	9.0	..
Nuclear		0.6	17.8	19.2	19.1	17.4	17.8	..
Hydro		5.1	6.2	6.4	6.2	5.7	5.8	..
Geothermal		–	–	–	–	–	–	..
Solar/Wind/Other[3]		–	0.0	0.4	0.4	0.0	0.2	..
TOTAL NET IMPORTS[4]		**29.6**	**16.7**	**17.2**	**15.6**	**21.0**	**19.7**	**..**
Coal[1]	Exports	0.0	0.0	0.1	0.1	0.1	0.1	..
	Imports	1.7	2.6	2.3	2.2	2.3	2.3	..
	Net Imports	1.7	2.6	2.3	2.2	2.3	2.2	..
Peat	Exports	–	–	–	–	–	–	..
	Imports	–	–	–	–	–	–	..
	Net Imports	–	–	–	–	–	–	..
Oil	Exports	1.4	8.7	9.4	9.9	9.6	9.4	..
	Imports	30.4	23.1	26.1	24.7	28.3	26.9	..
	Bunkers	1.1	0.7	1.6	1.5	1.2	1.4	..
	Net Imports	27.8	13.8	15.1	13.3	17.5	16.0	..
Gas	Exports	–	–	–	–	–	–	..
	Imports	–	0.5	0.7	0.7	1.0	1.0	..
	Net Imports	–	0.5	0.7	0.7	1.0	1.0	..
Electricity	Exports	0.4	1.3	1.4	1.4	–	–	..
	Imports	0.5	1.1	0.5	0.7	0.3	0.5	..
	Net Imports	0.1	–0.2	–0.9	–0.7	0.3	0.5	..
TOTAL STOCK CHANGES		**0.5**	**0.2**	**–0.6**	**1.0**	**–**	**–**	**..**
TOTAL SUPPLY (TPES)		**39.3**	**46.7**	**50.8**	**51.1**	**52.6**	**52.8**	**..**
Coal[1]		1.6	2.7	2.4	2.3	2.3	2.2	..
Peat		–	0.2	0.3	0.3	0.4	0.4	..
Oil		28.4	13.8	14.5	14.3	17.5	16.0	..
Gas		–	0.5	0.7	0.7	1.0	1.0	..
Comb. Renewables & Wastes[2]		3.5	5.5	7.9	8.6	8.1	9.0	..
Nuclear		0.6	17.8	19.2	19.1	17.4	17.8	..
Hydro		5.1	6.2	6.4	6.2	5.7	5.8	..
Geothermal		–	–	–	–	–	–	..
Solar/Wind/Other[3]		–	0.0	0.4	0.4	0.0	0.2	..
Electricity Trade[5]		0.1	–0.2	–0.9	–0.7	0.3	0.5	..
Shares (%)								
Coal		*4.1*	*5.8*	*4.7*	*4.5*	*4.3*	*4.2*	..
Peat		–	*0.5*	*0.7*	*0.5*	*0.7*	*0.7*	..
Oil		*72.2*	*29.6*	*28.5*	*27.9*	*33.3*	*30.4*	..
Gas		–	*1.1*	*1.4*	*1.4*	*1.9*	*1.8*	..
Comb. Renewables & Wastes		*9.0*	*11.8*	*15.5*	*16.9*	*15.5*	*17.1*	..
Nuclear		*1.4*	*38.1*	*37.8*	*37.3*	*33.0*	*33.7*	..
Hydro		*13.1*	*13.4*	*12.6*	*12.1*	*10.8*	*10.9*	..
Geothermal		–	–	–	–	–	–	..
Solar/Wind/Other		–	–	*0.8*	*0.8*	*0.1*	*0.3*	..
Electricity Trade		*0.2*	*–0.3*	*–1.8*	*–1.3*	*0.5*	*0.9*	..

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

Unit:Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	1998	1999	2005	2010	2020
TFC	**35.3**	**32.1**	**35.3**	**35.4**	**37.9**	**38.2**	**..**
Coal[1]	0.9	1.0	0.7	0.6	1.7	1.6	..
Peat	–	0.0	0.0	0.0	–	–	..
Oil	24.8	14.0	14.5	14.5	14.9	14.0	..
Gas	0.1	0.4	0.4	0.5	0.5	0.5	..
Comb. Renewables & Wastes[2]	3.5	4.6	5.4	5.3	5.5	6.2	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	0.0	0.0	0.0	–	0.0	..
Electricity	6.0	10.4	10.6	10.8	11.5	11.8	..
Heat	–	1.7	3.7	3.8	3.8	4.1	..
Shares (%)							
Coal	*2.6*	*3.3*	*1.9*	*1.7*	*4.4*	*4.1*	..
Peat	–	–	–	–	–	–	..
Oil	*70.4*	*43.7*	*41.0*	*40.8*	*39.5*	*36.7*	..
Gas	*0.3*	*1.1*	*1.2*	*1.3*	*1.3*	*1.3*	..
Comb. Renewables & Wastes	*9.8*	*14.4*	*15.3*	*15.1*	*14.4*	*16.3*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	*16.9*	*32.2*	*30.1*	*30.4*	*30.3*	*30.8*	..
Heat	–	*5.3*	*10.5*	*10.7*	*10.1*	*10.8*	..
TOTAL INDUSTRY[6]	**15.5**	**13.3**	**14.2**	**13.9**	**15.5**	**16.6**	**..**
Coal[1]	0.9	1.0	0.7	0.6	1.7	1.6	..
Peat	–	0.0	0.0	0.0	–	–	..
Oil	8.3	3.5	3.8	3.7	3.8	3.9	..
Gas	0.0	0.3	0.2	0.3	0.3	0.3	..
Comb. Renewables & Wastes[2]	2.9	3.7	4.4	4.4	4.5	5.3	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	3.4	4.6	4.7	4.6	4.9	5.0	..
Heat	–	0.2	0.4	0.3	0.4	0.4	..
Shares (%)							
Coal	*5.7*	*7.6*	*4.8*	*4.3*	*10.7*	*9.5*	..
Peat	–	–	–	*0.1*	–	–	..
Oil	*53.4*	*26.5*	*26.7*	*26.7*	*24.5*	*23.8*	..
Gas	*0.1*	*1.9*	*1.7*	*2.1*	*2.1*	*1.9*	..
Comb. Renewables & Wastes	*18.9*	*27.7*	*31.2*	*31.6*	*28.7*	*31.7*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	*21.9*	*35.0*	*33.0*	*33.0*	*31.5*	*30.4*	..
Heat	–	*1.3*	*2.5*	*2.2*	*2.5*	*2.7*	..
TRANSPORT[7]	**5.5**	**7.4**	**7.9**	**8.2**	**8.6**	**8.0**	**..**
TOTAL OTHER SECTORS[8]	**14.3**	**11.5**	**13.2**	**13.4**	**13.7**	**13.6**	**..**
Coal[1]	0.0	0.0	0.0	0.0	0.0	–	..
Peat	–	–	–	–	–	–	..
Oil	11.2	3.3	3.0	2.9	2.8	2.3	..
Gas	0.1	0.1	0.2	0.2	0.2	0.2	..
Comb. Renewables & Wastes[2]	0.5	1.0	1.0	1.0	1.0	1.0	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	0.0	0.0	0.0	–	0.0	..
Electricity	2.4	5.5	5.7	5.9	6.3	6.5	..
Heat	–	1.5	3.4	3.5	3.4	3.7	..
Shares (%)							
Coal	*0.3*	*0.4*	–	–	–	–	..
Peat	–	–	–	–	–	–	..
Oil	*78.7*	*28.9*	*22.7*	*21.3*	*20.3*	*17.1*	..
Gas	*0.7*	*1.0*	*1.3*	*1.2*	*1.3*	*1.4*	..
Comb. Renewables & Wastes	*3.6*	*8.4*	*7.4*	*7.2*	*7.4*	*7.0*	..
Geothermal	–	–	–	–	–	–	..
Solar / Wind / Other	–	–	–	–	–	–	..
Electricity	*16.6*	*47.9*	*43.2*	*44.4*	*46.0*	*47.4*	..
Heat	–	*13.4*	*25.4*	*25.9*	*25.0*	*27.1*	..

Unit:Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	1998	1999	2005	2010	2020
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**8.2**	**26.7**	**30.4**	**30.6**	**28.5**	**28.6**	**..**
OUTPUT (Mtoe)	**6.7**	**12.6**	**13.6**	**13.3**	**12.9**	**13.2**	**..**
(TWh gross)	78.1	146.0	158.2	155.2	150.0	153.0	..
Output Shares (%)							
Coal	*0.6*	*1.2*	*2.0*	*2.1*	*3.3*	*2.3*	..
Peat	–	*0.0*	*0.0*	*0.0*	*0.1*	*0.1*	..
Oil	*19.4*	*0.8*	*2.1*	*1.9*	*4.1*	*3.4*	..
Gas	–	*0.3*	*0.3*	*0.3*	*0.9*	*0.6*	..
Comb. Renewables & Wastes	*0.5*	*1.3*	*2.0*	*2.2*	*3.1*	*3.9*	..
Nuclear	*2.7*	*46.7*	*46.5*	*47.2*	*44.4*	*44.7*	..
Hydro	*76.7*	*49.7*	*47.0*	*46.1*	*43.9*	*43.8*	..
Geothermal	–	–	–	–	–	–	..
Solar/Wind/Other	–	*0.0*	*0.2*	*0.2*	*0.3*	*1.3*	..
TOTAL LOSSES	**3.4**	**15.2**	**16.1**	**16.2**	**14.7**	**14.5**	**..**
of which:							
Electricity and Heat Generation[10]	1.5	12.2	13.5	13.9	11.0	10.7	..
Other Transformation	1.0	0.2	0.0	–0.2	1.2	1.4	..
Own Use and Losses[11]	1.0	2.8	2.6	2.5	2.5	2.4	..
Statistical Differences	**0.6**	**–0.7**	**–0.7**	**–0.6**	**–**	**–**	**..**

INDICATORS

	1973	1990	1998	1999	2005	2010	2020
GDP (billion 1995 US$)	169.22	233.42	256.68	267.28	304.56	334.61	..
Population (millions)	8.14	8.57	8.85	8.86	8.97	9.00	..
TPES/GDP[12]	0.23	0.20	0.20	0.19	0.17	0.16	..
Energy Production/TPES	0.24	0.64	0.67	0.68	0.60	0.63	..
Per Capita TPES[13]	4.83	5.45	5.74	5.77	5.86	5.86	..
Oil Supply/GDP[12]	0.17	0.06	0.06	0.05	0.06	0.05	..
TFC/GDP[12]	0.21	0.14	0.14	0.13	0.12	0.11	..
Per Capita TFC[13]	4.33	3.75	3.99	4.00	4.22	4.25	..
Energy-related CO_2 Emissions (Mt CO_2)[14]	88.3	48.5	49.6	48.2	57.2	52.9	..
CO_2 Emissions from Bunkers (Mt CO_2)	3.9	3.0	6.4	6.3	5.4	6.1	..

GROWTH RATES (% per year)

	73–79	79–90	90–98	98–99	99–05	05–10	10–20
TPES	1.5	0.8	1.1	0.6	0.5	0.1	..
Coal	1.6	3.9	–1.7	–3.8	–0.2	–0.5	..
Peat	–	–	4.5	–23.0	5.4	–	..
Oil	–1.3	–5.7	0.6	–1.3	3.5	–1.7	..
Gas	–	–	3.8	0.3	5.7	–0.6	..
Comb. Renewables & Wastes	1.8	3.1	4.6	9.3	–0.9	2.1	..
Nuclear	46.7	11.3	1.0	–0.5	–1.6	0.5	..
Hydro	0.3	1.6	0.3	–3.7	–1.4	0.4	..
Geothermal	–	–	–	–	–	–	..
Solar/Wind/Other	–	–	29.7	15.6	2.5	32.0	..
TFC	0.4	–1.1	1.2	0.3	1.1	0.2	..
Electricity Consumption	3.5	3.2	0.3	1.4	1.1	0.5	..
Energy Production	8.0	6.6	1.7	1.0	–1.5	1.0	..
Net Oil Imports	–0.2	–6.1	1.2	–11.9	4.7	–1.7	..
GDP	1.8	2.0	1.2	4.1	2.2	1.9	..
Growth in the TPES/GDP Ratio	–0.3	–1.2	–0.1	–3.4	–1.7	–1.8	..
Growth in the TFC/GDP Ratio	–1.3	–3.0	–0.0	–3.7	–1.1	–1.7	..

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

SWITZERLAND

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit:Mtoe

SUPPLY

		1973	1990	1998	1999	2005	2010	2020
TOTAL PRODUCTION		**4.28**	**9.78**	**11.25**	**11.81**	**11.15**	**11.21**	**10.18**
Coal[1]		–	–	–	–	–	–	–
Oil		–	–	–	–	–	–	–
Gas		–	0.00	–	–	–	–	–
Comb. Renewables & Wastes[2]		0.24	0.98	1.51	1.50	1.96	2.03	1.78
Nuclear		1.64	6.18	6.75	6.75	6.31	6.29	5.52
Hydro		2.40	2.56	2.88	3.44	2.88	2.88	2.88
Geothermal		–	0.06	0.09	0.09	–	–	–
Solar/Wind/Other[3]		–	–	0.02	0.02	0.00	0.00	0.01
TOTAL NET IMPORTS[4]		**15.23**	**15.16**	**15.58**	**14.26**	**15.59**	**15.86**	**16.20**
Coal[1]	Exports	0.02	0.01	–	–	–	–	–
	Imports	0.24	0.35	0.06	0.06	0.10	0.10	0.10
	Net Imports	0.22	0.34	0.06	0.06	0.10	0.10	0.10
Oil	Exports	0.23	0.16	0.47	0.55	–	–	–
	Imports	15.38	13.54	14.14	13.19	13.05	13.04	12.94
	Bunkers	–	0.02	0.01	0.01	–	–	–
	Net Imports	15.16	13.36	13.66	12.63	13.05	13.04	12.94
Gas	Exports	–	–	–	–	–	–	–
	Imports	0.15	1.63	2.36	2.45	2.74	2.85	2.99
	Net Imports	0.15	1.63	2.36	2.45	2.74	2.85	2.99
Electricity	Exports	0.90	1.97	2.54	2.75	0.30	0.12	0.17
	Imports	0.60	1.79	2.03	1.87	..	..	..
	Net Imports	–0.30	–0.18	–0.51	–0.88	–0.30	–0.12	0.17
TOTAL STOCK CHANGES		**0.22**	**0.12**	**–0.14**	**0.63**	**–**	**–**	**–**
TOTAL SUPPLY (TPES)		**19.72**	**25.06**	**26.69**	**26.69**	**26.74**	**27.07**	**26.38**
Coal[1]		0.33	0.36	0.09	0.10	0.10	0.10	0.10
Oil		15.26	13.46	13.50	13.22	13.05	13.04	12.94
Gas		0.15	1.63	2.36	2.45	2.74	2.85	2.99
Comb. Renewables & Wastes[2]		0.24	0.99	1.52	1.50	1.96	2.03	1.78
Nuclear		1.64	6.18	6.75	6.75	6.31	6.29	5.52
Hydro		2.40	2.56	2.88	3.44	2.88	2.88	2.88
Geothermal		–	0.06	0.09	0.09	–	–	–
Solar/Wind/Other[3]		–	–	0.02	0.02	0.00	0.00	0.01
Electricity Trade[5]		–0.30	–0.18	–0.51	–0.88	–0.30	–0.12	0.17
Shares (%)								
Coal		*1.7*	*1.4*	*0.3*	*0.4*	*0.4*	*0.4*	*0.4*
Oil		*77.4*	*53.7*	*50.6*	*49.5*	*48.8*	*48.2*	*49.1*
Gas		*0.8*	*6.5*	*8.8*	*9.2*	*10.2*	*10.5*	*11.3*
Comb. Renewables & Wastes		*1.2*	*4.0*	*5.7*	*5.6*	*7.3*	*7.5*	*6.8*
Nuclear		*8.3*	*24.7*	*25.3*	*25.3*	*23.6*	*23.2*	*20.9*
Hydro		*12.2*	*10.2*	*10.8*	*12.9*	*10.8*	*10.6*	*10.9*
Geothermal		*–*	*0.2*	*0.3*	*0.3*	*–*	*–*	*–*
Solar/Wind/Other		*–*	*–*	*0.1*	*0.1*	*–*	*–*	*–*
Electricity Trade		*–1.5*	*–0.7*	*–1.9*	*–3.3*	*–1.1*	*–0.5*	*0.6*

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

Unit:Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	1998	1999	2005	2010	2020
TFC	**17.57**	**19.65**	**21.03**	**21.42**	**21.42**	**21.76**	**21.62**
Coal[1]	0.29	0.35	0.09	0.10	0.10	0.10	0.10
Oil	14.30	12.85	13.27	13.41	12.66	12.65	12.56
Gas	0.24	1.52	2.17	2.25	2.57	2.68	2.77
Comb. Renewables & Wastes[2]	0.24	0.60	0.79	0.73	1.24	1.31	1.11
Geothermal	–	0.06	0.09	0.09	–	–	–
Solar / Wind / Other	–	–	0.02	0.02	–	–	–
Electricity	2.50	4.04	4.27	4.48	4.58	4.76	4.83
Heat	–	0.25	0.35	0.34	0.27	0.27	0.26
Shares (%)							
Coal	*1.6*	*1.8*	*0.4*	*0.4*	*0.5*	*0.5*	*0.5*
Oil	*81.4*	*65.4*	*63.1*	*62.6*	*59.1*	*58.1*	*58.1*
Gas	*1.3*	*7.7*	*10.3*	*10.5*	*12.0*	*12.3*	*12.8*
Comb. Renewables & Wastes	*1.4*	*3.0*	*3.7*	*3.4*	*5.8*	*6.0*	*5.1*
Geothermal	–	*0.3*	*0.4*	*0.4*	–	–	–
Solar / Wind / Other	–	–	*0.1*	*0.1*	–	–	–
Electricity	*14.2*	*20.6*	*20.3*	*20.9*	*21.4*	*21.9*	*22.3*
Heat	–	*1.3*	*1.6*	*1.6*	*1.3*	*1.2*	*1.2*
TOTAL INDUSTRY[6]	**4.78**	**3.93**	**4.17**	**4.65**	**4.79**	**4.85**	**4.87**
Coal[1]	0.08	0.33	0.08	0.09	0.10	0.10	0.10
Oil	3.70	1.31	1.28	1.81	1.45	1.42	1.38
Gas	0.05	0.59	0.93	0.73	1.13	1.14	1.14
Comb. Renewables & Wastes[2]	–	0.16	0.36	0.41	0.46	0.49	0.50
Geothermal	–	–	–	0.01	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	0.95	1.48	1.43	1.46	1.57	1.63	1.69
Heat	–	0.05	0.08	0.14	0.09	0.08	0.07
Shares (%)							
Coal	*1.6*	*8.4*	*1.9*	*1.8*	*2.1*	*2.0*	*2.0*
Oil	*77.4*	*33.4*	*30.8*	*39.0*	*30.3*	*29.3*	*28.4*
Gas	*1.1*	*15.1*	*22.3*	*15.8*	*23.5*	*23.4*	*23.4*
Comb. Renewables & Wastes	–	*4.1*	*8.6*	*8.7*	*9.6*	*10.2*	*10.2*
Geothermal	–	–	–	*0.2*	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	*19.9*	*37.7*	*34.4*	*31.5*	*32.7*	*33.5*	*34.6*
Heat	–	*1.2*	*1.9*	*3.0*	*1.8*	*1.6*	*1.4*
TRANSPORT[7]	**4.29**	**6.29**	**6.85**	**6.91**	**6.86**	**7.10**	**7.43**
TOTAL OTHER SECTORS[8]	**8.49**	**9.44**	**10.02**	**9.85**	**9.77**	**9.81**	**9.32**
Coal[1]	0.21	0.02	0.01	0.01	0.00	0.00	0.00
Oil	6.48	5.47	5.36	4.90	4.61	4.43	4.06
Gas	0.19	0.92	1.24	1.52	1.44	1.54	1.63
Comb. Renewables & Wastes[2]	0.24	0.44	0.43	0.32	0.78	0.82	0.61
Geothermal	–	0.06	0.09	0.09	–	–	–
Solar / Wind / Other	–	–	0.02	0.02	–	–	–
Electricity	1.37	2.34	2.62	2.80	2.75	2.83	2.83
Heat	–	0.20	0.27	0.20	0.19	0.19	0.19
Shares (%)							
Coal	*2.5*	*0.2*	*0.1*	*0.1*	–	–	–
Oil	*76.3*	*57.9*	*53.4*	*49.8*	*47.2*	*45.1*	*43.6*
Gas	*2.2*	*9.8*	*12.3*	*15.4*	*14.8*	*15.7*	*17.5*
Comb. Renewables & Wastes	*2.8*	*4.6*	*4.3*	*3.3*	*8.0*	*8.4*	*6.6*
Geothermal	–	*0.6*	*0.9*	*0.9*	–	–	–
Solar / Wind / Other	–	–	*0.2*	*0.2*	–	–	–
Electricity	*16.1*	*24.7*	*26.2*	*28.4*	*28.1*	*28.8*	*30.3*
Heat	–	*2.1*	*2.6*	*2.0*	*1.9*	*1.9*	*2.0*

Unit:Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	1998	1999	2005	2010	2020
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**4.48**	**9.35**	**10.66**	**11.20**	**10.08**	**10.07**	**9.30**
OUTPUT (Mtoe)	**3.17**	**4.70**	**5.31**	**5.89**	**5.22**	**5.22**	**5.00**
(TWh gross)	36.82	54.62	61.71	68.53	60.65	60.69	58.18
Output Shares (%)							
Coal	–	*0.1*	–	–	–	–	–
Oil	*7.1*	*0.5*	*0.6*	*0.2*	*0.1*	*0.1*	*0.1*
Gas	–	*0.6*	*1.4*	*1.5*	*1.6*	*1.7*	*2.2*
Comb. Renewables & Wastes	–	*1.0*	*1.9*	*2.2*	*3.1*	*3.2*	*3.6*
Nuclear	*17.1*	*43.3*	*41.9*	*37.7*	*39.9*	*39.8*	*36.4*
Hydro	*75.8*	*54.6*	*54.2*	*58.4*	*55.2*	*55.2*	*57.6*
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	*0.0*	*0.0*	*0.0*	*0.1*	*0.1*
TOTAL LOSSES	**2.17**	**5.05**	**5.78**	**5.75**	**5.32**	**5.31**	**4.76**
of which:							
Electricity and Heat Generation[10]	1.32	4.38	4.97	4.94	4.39	4.37	3.83
Other Transformation	0.14	0.01	–0.04	–0.04	0.10	0.10	0.10
Own Use and Losses[11]	0.72	0.66	0.84	0.86	0.83	0.84	0.83
Statistical Differences	–0.02	0.36	–0.12	–0.48	–	–	–

INDICATORS

	1973	1990	1998	1999	2005	2010	2020
GDP (billion 1995 US$)	246.18	308.43	320.87	325.80	347.90	360.25	386.27
Population (millions)	6.44	6.71	7.11	7.14	7.39	7.44	7.49
TPES/GDP[12]	0.08	0.08	0.08	0.08	0.08	0.08	0.07
Energy Production/TPES	0.22	0.39	0.42	0.44	0.42	0.41	0.39
Per Capita TPES[13]	3.06	3.73	3.75	3.74	3.62	3.64	3.52
Oil Supply/GDP[12]	0.06	0.04	0.04	0.04	0.04	0.04	0.03
TFC/GDP[12]	0.07	0.06	0.07	0.07	0.06	0.06	0.06
Per Capita TFC[13]	2.73	2.93	2.96	3.00	2.90	2.93	2.89
Energy-related CO_2 Emissions (Mt CO_2)[14]	43.9	41.1	40.8	39.9	40.1	40.3	40.3
CO_2 Emissions from Bunkers (Mt CO_2)	2.1	3.2	4.3	4.5	4.5	4.5	4.5

GROWTH RATES (% per year)

	73–79	79–90	90–98	98–99	99–05	05–10	10–20
TPES	0.2	2.1	0.8	–0.0	0.0	0.2	–0.3
Coal	–6.3	4.5	–15.8	4.4	1.2	–0.8	–
Oil	–2.2	0.1	0.0	–2.1	–0.2	–0.0	–0.1
Gas	31.0	7.2	4.7	3.6	1.9	0.8	0.5
Comb. Renewables & Wastes	11.2	7.3	5.5	–1.1	4.5	0.8	–1.3
Nuclear	11.0	6.5	1.1	0.0	–1.1	–0.1	–1.3
Hydro	2.1	–0.5	1.5	19.5	–2.9	–	–
Geothermal	–	–	4.7	3.4	–	–	–
Solar/Wind/Other	–	–	–	9.5	–33.4	8.4	5.2
TFC	–0.6	1.4	0.9	1.8	0.0	0.3	–0.1
Electricity Consumption	2.6	3.0	0.7	4.9	0.4	0.8	0.1
Energy Production	6.5	4.2	1.8	4.9	–0.9	0.1	–1.0
Net Oil Imports	–1.6	–0.3	0.3	–7.6	0.6	–0.0	–0.1
GDP	–0.4	2.3	0.5	1.5	1.1	0.7	0.7
Growth in the TPES/GDP Ratio	0.6	–0.2	0.3	–1.5	–1.1	–0.4	–1.0
Growth in the TFC/GDP Ratio	–0.3	–0.9	0.4	0.3	–1.1	–0.4	–0.8

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

TURKEY

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit:Mtoe

SUPPLY

		1973	1990	1998	1999	2005	2010	2020
TOTAL PRODUCTION		**15.48**	**25.50**	**28.54**	**26.90**	**34.12**	**47.33**	**70.24**
Coal[1]		5.21	12.41	13.95	13.29	20.69	28.11	31.64
Oil		3.59	3.61	3.19	2.91	1.66	1.14	0.64
Gas		–	0.18	0.47	0.60	0.16	0.14	0.11
Comb. Renewables & Wastes[2]		6.45	7.21	6.99	6.81	5.33	4.42	3.93
Nuclear		–	–	–	–	–	3.66	16.46
Hydro		0.22	1.99	3.63	2.98	4.16	5.62	8.38
Geothermal		–	0.09	0.23	0.20	1.89	3.81	8.25
Solar / Wind / Other[3]		–	0.02	0.10	0.11	0.22	0.43	0.83
TOTAL NET IMPORTS[4]		**8.74**	**27.98**	**43.22**	**43.04**	**95.51**	**124.01**	**228.21**
Coal[1]	Exports	–	–	–	–	–	–	–
	Imports	0.01	4.21	7.85	6.69	14.78	28.69	86.76
	Net Imports	0.01	4.21	7.85	6.69	14.78	28.69	86.76
Oil	Exports	0.86	1.90	2.12	2.47	–	–	–
	Imports	9.68	23.18	28.93	28.87	38.34	45.26	66.26
	Bunkers	0.09	0.12	0.16	0.28	–	–	–
	Net Imports	8.73	21.16	26.65	26.11	38.34	45.26	66.26
Gas	Exports	–	–	–	–	–	–	–
	Imports	–	2.68	8.46	10.06	42.05	50.06	75.19
	Net Imports	–	2.68	8.46	10.06	42.05	50.06	75.19
Electricity	Exports	–	0.08	0.03	0.03	..	..	..
	Imports	–	0.02	0.28	0.20	0.34	..	..
	Net Imports	–	–0.06	0.26	0.18	0.34	..	..
TOTAL STOCK CHANGES		**0.11**	**–0.83**	**–0.07**	**0.39**	**–**	**–**	**–**
TOTAL SUPPLY (TPES)		**24.32**	**52.65**	**71.69**	**70.33**	**129.63**	**171.34**	**298.45**
Coal[1]		5.15	16.94	21.99	20.07	35.46	56.80	118.41
Oil		12.50	23.61	29.55	29.38	40.01	46.40	66.89
Gas		–	2.86	8.94	10.59	42.21	50.19	75.30
Comb. Renewables & Wastes[2]		6.45	7.21	6.99	6.81	5.33	4.42	3.93
Nuclear		–	–	–	–	–	3.66	16.46
Hydro		0.22	1.99	3.63	2.98	4.16	5.62	8.38
Geothermal		–	0.09	0.23	0.20	1.89	3.81	8.25
Solar / Wind / Other[3]		–	0.02	0.10	0.11	0.22	0.43	0.83
Electricity Trade[5]		–	–0.06	0.26	0.18	0.34	–	–
Shares (%)								
Coal		*21.2*	*32.2*	*30.7*	*28.5*	*27.4*	*33.2*	*39.7*
Oil		*51.4*	*44.8*	*41.2*	*41.8*	*30.9*	*27.1*	*22.4*
Gas		–	*5.4*	*12.5*	*15.1*	*32.6*	*29.3*	*25.2*
Comb. Renewables & Wastes		*26.5*	*13.7*	*9.7*	*9.7*	*4.1*	*2.6*	*1.3*
Nuclear		–	–	–	–	–	*2.1*	*5.5*
Hydro		*0.9*	*3.8*	*5.1*	*4.2*	*3.2*	*3.3*	*2.8*
Geothermal		–	*0.2*	*0.3*	*0.3*	*1.5*	*2.2*	*2.8*
Solar / Wind / Other		–	–	*0.1*	*0.2*	*0.2*	*0.3*	*0.3*
Electricity Trade		–	*–0.1*	*0.4*	*0.3*	*0.3*	–	–

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

Unit:Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	1998	1999	2005	2010	2020
TFC	**19.99**	**40.20**	**53.74**	**52.00**	**90.79**	**120.32**	**214.13**
Coal[1]	2.94	7.57	9.05	7.36	18.65	29.62	75.99
Oil	9.70	20.80	26.05	25.92	36.59	42.74	60.70
Gas	0.04	0.72	4.11	4.04	14.47	18.03	23.12
Comb. Renewables & Wastes[2]	6.45	7.21	6.90	6.71	5.33	4.42	3.93
Geothermal	–	0.02	0.15	0.13	1.82	3.74	8.17
Solar / Wind / Other	–	0.02	0.10	0.11	0.22	0.43	0.83
Electricity	0.85	3.87	7.38	7.72	13.71	21.35	41.39
Heat	–	–	–	–	–	–	–
Shares (%)							
Coal	*14.7*	*18.8*	*16.8*	*14.2*	*20.5*	*24.6*	*35.5*
Oil	*48.5*	*51.7*	*48.5*	*49.8*	*40.3*	*35.5*	*28.3*
Gas	*0.2*	*1.8*	*7.7*	*7.8*	*15.9*	*15.0*	*10.8*
Comb. Renewables & Wastes	*32.3*	*17.9*	*12.8*	*12.9*	*5.9*	*3.7*	*1.8*
Geothermal	–	–	*0.3*	*0.3*	*2.0*	*3.1*	*3.8*
Solar / Wind / Other	–	*0.1*	*0.2*	*0.2*	*0.2*	*0.4*	*0.4*
Electricity	*4.3*	*9.6*	*13.7*	*14.9*	*15.1*	*17.7*	*19.3*
Heat	–	–	–	–	–	–	–
TOTAL INDUSTRY[6]	**4.30**	**13.71**	**21.45**	**19.03**	**40.81**	**60.53**	**128.04**
Coal[1]	1.14	4.52	7.06	5.71	14.38	24.99	67.42
Oil	2.60	6.16	8.65	7.84	10.15	12.06	19.24
Gas	0.00	0.67	1.92	1.64	8.45	10.40	14.20
Comb. Renewables & Wastes[2]	–	–	–	–	–	–	–
Geothermal	–	–	–	–	0.40	0.64	1.47
Solar / Wind / Other	–	0.01	0.02	0.02	0.14	0.25	0.52
Electricity	0.55	2.35	3.80	3.82	7.29	12.19	25.20
Heat	–	–	–	–	–	–	–
Shares (%)							
Coal	*26.5*	*33.0*	*32.9*	*30.0*	*35.2*	*41.3*	*52.7*
Oil	*60.5*	*44.9*	*40.3*	*41.2*	*24.9*	*19.9*	*15.0*
Gas	*0.1*	*4.9*	*8.9*	*8.6*	*20.7*	*17.2*	*11.1*
Comb. Renewables & Wastes	–	–	–	–	–	–	–
Geothermal	–	–	–	–	*1.0*	*1.1*	*1.1*
Solar / Wind / Other	–	*0.1*	*0.1*	*0.1*	*0.3*	*0.4*	*0.4*
Electricity	*12.9*	*17.2*	*17.7*	*20.1*	*17.9*	*20.1*	*19.7*
Heat	–	–	–	–	–	–	–
TRANSPORT[7]	**4.49**	**9.58**	**11.37**	**11.87**	**19.58**	**23.26**	**32.47**
TOTAL OTHER SECTORS[8]	**11.21**	**16.91**	**20.92**	**21.10**	**30.40**	**36.54**	**53.61**
Coal[1]	1.28	3.03	1.99	1.65	4.27	4.63	8.58
Oil	3.15	5.11	6.10	6.29	7.01	7.67	9.46
Gas	0.04	0.05	2.16	2.37	6.02	7.62	8.91
Comb. Renewables & Wastes[2]	6.45	7.21	6.90	6.71	5.33	4.42	3.93
Geothermal	–	0.02	0.15	0.13	1.42	3.10	6.70
Solar / Wind / Other	–	0.01	0.08	0.09	0.08	0.18	0.31
Electricity	0.29	1.49	3.55	3.87	6.27	8.92	15.73
Heat	–	–	–	–	–	–	–
Shares (%)							
Coal	*11.4*	*17.9*	*9.5*	*7.8*	*14.0*	*12.7*	*16.0*
Oil	*28.1*	*30.2*	*29.2*	*29.8*	*23.1*	*21.0*	*17.7*
Gas	*0.3*	*0.3*	*10.3*	*11.2*	*19.8*	*20.9*	*16.6*
Comb. Renewables & Wastes	*57.5*	*42.6*	*33.0*	*31.8*	*17.5*	*12.1*	*7.3*
Geothermal	–	*0.1*	*0.7*	*0.6*	*4.7*	*8.5*	*12.5*
Solar / Wind / Other	–	*0.1*	*0.4*	*0.4*	*0.3*	*0.5*	*0.6*
Electricity	*2.6*	*8.8*	*16.9*	*18.3*	*20.6*	*24.4*	*29.3*
Heat	–	–	–	–	–	–	–

Unit:Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	1998	1999	2005	2010	2020
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**2.77**	**11.08**	**20.93**	**22.24**	**47.58**	**67.36**	**118.82**
OUTPUT (Mtoe)	**1.07**	**4.95**	**9.55**	**10.01**	**16.56**	**25.33**	**47.79**
(TWh gross)	12.43	57.54	111.02	116.44	192.61	294.53	555.69
Output Shares (%)							
Coal	*26.1*	*35.1*	*32.1*	*31.8*	*38.7*	*41.2*	*32.8*
Oil	*51.4*	*6.9*	*7.1*	*6.9*	*0.9*	*0.3*	*1.2*
Gas	–	*17.7*	*22.4*	*31.2*	*35.2*	*31.5*	*37.1*
Comb. Renewables & Wastes	*1.6*	–	*0.2*	*0.2*	..	..	..
Nuclear	–	–	–	–	–	*4.8*	*11.4*
Hydro	*20.9*	*40.2*	*38.0*	*29.8*	*25.1*	*22.2*	*17.5*
Geothermal	–	*0.1*	*0.1*	*0.1*	*0.0*	*0.0*	*0.0*
Solar/Wind/Other	–	–	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
TOTAL LOSSES	**4.03**	**11.58**	**17.50**	**18.13**	**38.84**	**51.02**	**84.32**
of which:							
Electricity and Heat Generation[10]	1.70	6.13	11.39	12.22	31.02	42.03	71.03
Other Transformation	1.32	2.89	1.59	1.53	2.86	3.03	4.22
Own Use and Losses[11]	1.00	2.56	4.53	4.38	4.96	5.96	9.07
Statistical Differences	0.30	0.88	0.45	0.19	–	–	–

INDICATORS

	1973	1990	1998	1999	2005	2010	2020
GDP (billion 1995 US$)	68.39	144.57	200.84	190.76	275.23	398.81	769.99
Population (millions)	38.45	56.20	64.79	65.82	69.83	74.12	81.79
TPES/GDP[12]	0.36	0.36	0.36	0.37	0.47	0.43	0.39
Energy Production/TPES	0.64	0.48	0.40	0.38	0.26	0.28	0.24
Per Capita TPES[13]	0.63	0.94	1.11	1.07	1.86	2.31	3.65
Oil Supply/GDP[12]	0.18	0.16	0.15	0.15	0.15	0.12	0.09
TFC/GDP[12]	0.29	0.28	0.27	0.27	0.33	0.30	0.28
Per Capita TFC[13]	0.52	0.72	0.83	0.79	1.30	1.62	2.62
Energy-related CO_2 Emissions (Mt CO_2)[14]	56.8	138.3	185.0	182.8	346.8	467.0	818.2
CO_2 Emissions from Bunkers (Mt CO_2)	0.4	0.9	2.0	2.4	..	..	..

GROWTH RATES (% per year)

	73–79	79–90	90–98	98–99	99–05	05–10	10–20
TPES	3.7	5.2	3.9	–1.9	10.7	5.7	5.7
Coal	4.1	9.0	3.3	–8.7	9.9	9.9	7.6
Oil	3.1	4.2	2.8	–0.6	5.3	3.0	3.7
Gas	–	–	15.3	18.4	25.9	3.5	4.1
Comb. Renewables & Wastes	3.1	–0.7	–0.4	–2.5	–4.0	–3.7	–1.2
Nuclear	–	–	–	–	–	–	16.2
Hydro	25.7	7.6	7.8	–17.9	5.7	6.2	4.1
Geothermal	–	–	13.0	–10.6	45.2	15.0	8.0
Solar/Wind/Other	–	–	21.5	14.0	11.9	14.1	6.7
TFC	4.1	4.2	3.7	–3.2	9.7	5.8	5.9
Electricity Consumption	11.3	8.2	8.4	4.7	10.0	9.3	6.8
Energy Production	1.9	3.6	1.4	–5.7	4.0	6.8	4.0
Net Oil Imports	5.1	5.5	2.9	–2.0	6.6	3.4	3.9
GDP	4.5	4.5	4.2	–5.0	6.3	7.7	6.8
Growth in the TPES/GDP Ratio	–0.8	0.6	–0.3	3.3	4.2	–1.8	–1.0
Growth in the TFC/GDP Ratio	–0.4	–0.3	–0.5	1.9	3.2	–1.8	–0.8

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

UNITED KINGDOM

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit:Mtoe

SUPPLY		1973	1990	1998	1999	2005	2010	2020
TOTAL PRODUCTION		**108.5**	**208.9**	**272.2**	**282.2**	**..**	**..**	**..**
Coal[1]		75.9	54.6	24.5	22.3	9.0	2.6	–
Oil		0.5	95.2	138.0	143.0	..	..	..
Gas		24.4	40.9	81.1	89.1	..	..	..
Comb. Renewables & Wastes[2]		–	0.6	1.9	2.2	5.0	10.4	10.5
Nuclear		7.3	17.1	26.1	25.1	24.7	18.9	7.7
Hydro		0.3	0.4	0.5	0.5	0.4	0.4	0.4
Geothermal		–	0.0	0.0	0.0	–	–	–
Solar / Wind / Other[3]		–	0.0	0.1	0.1	–	–	–
TOTAL NET IMPORTS[4]		**110.4**	**2.1**	**–41.6**	**–51.5**	**..**	**..**	**..**
Coal[1]	Exports	2.0	1.8	0.9	0.8	0.2	–	–
	Imports	1.1	10.3	14.6	14.0	16.5	18.8	15.6
	Net Imports	–0.9	8.5	13.7	13.2	16.4	18.8	15.6
Oil	Exports	20.9	76.5	112.8	117.5	..	..	..
	Imports	136.9	65.4	61.2	59.4	..	..	..
	Bunkers	5.4	2.5	3.1	2.3	..	..	..
	Net Imports	110.6	–13.6	–54.7	–60.4	..	..	..
Gas	Exports	–	–	2.4	6.5	..	..	..
	Imports	0.7	6.2	0.8	1.0	..	..	..
	Net Imports	0.7	6.2	–1.6	–5.5	..	..	..
Electricity	Exports	0.0	0.0	0.0	0.0	–	–	–
	Imports	0.0	1.0	1.1	1.2	0.9	0.4	0.3
	Net Imports	0.0	1.0	1.1	1.2	0.9	0.4	0.3
TOTAL STOCK CHANGES		**1.8**	**2.0**	**–0.3**	**–0.4**	**..**	**..**	**..**
TOTAL SUPPLY (TPES)		**220.7**	**213.1**	**230.3**	**230.3**	**238.3**	**244.1**	**251.5**
Coal[1]		76.4	64.0	38.8	35.3	25.3	21.3	15.6
Oil		111.6	82.6	82.6	83.0	86.9	92.6	103.0
Gas		25.1	47.2	79.3	83.1	95.1	100.1	114.1
Comb. Renewables & Wastes[2]		–	0.6	1.9	2.2	5.0	10.4	10.5
Nuclear		7.3	17.1	26.1	25.1	24.7	18.9	7.7
Hydro		0.3	0.4	0.5	0.5	0.4	0.4	0.4
Geothermal		–	0.0	0.0	0.0	–	–	–
Solar / Wind / Other[3]		–	0.0	0.1	0.1	–	–	–
Electricity Trade[5]		0.0	1.0	1.1	1.2	0.9	0.4	0.3
Shares (%)								
Coal		*34.6*	*30.0*	*16.8*	*15.3*	*10.6*	*8.7*	*6.2*
Oil		*50.5*	*38.8*	*35.9*	*36.0*	*36.4*	*37.9*	*40.9*
Gas		*11.4*	*22.1*	*34.4*	*36.1*	*39.9*	*41.0*	*45.3*
Comb. Renewables & Wastes		–	*0.3*	*0.8*	*0.9*	*2.1*	*4.3*	*4.2*
Nuclear		*3.3*	*8.0*	*11.3*	*10.9*	*10.4*	*7.8*	*3.1*
Hydro		*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*
Geothermal		–	–	–	–	–	–	–
Solar / Wind / Other		–	–	–	–	–	–	–
Electricity Trade		–	*0.5*	*0.5*	*0.5*	*0.4*	*0.2*	*0.1*

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

Unit:Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	1998	1999	2005	2010	2020
TFC	**147.1**	**145.2**	**157.9**	**159.8**	**172.4**	**180.0**	**195.6**
Coal[1]	26.5	10.6	5.3	5.7	4.1	3.6	3.3
Oil	77.0	68.8	73.7	73.4	79.5	84.9	95.2
Gas	23.6	42.0	51.0	52.2	56.8	57.9	61.3
Comb. Renewables & Wastes[2]	–	0.2	0.8	0.9	0.8	0.7	0.8
Geothermal	–	0.0	0.0	0.0	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
Electricity	20.0	23.6	27.1	27.6	31.2	32.9	35.1
Heat	–	0.0	–	–	–	–	–
Shares (%)							
Coal	*18.0*	*7.3*	*3.4*	*3.6*	*2.3*	*2.0*	*1.7*
Oil	*52.3*	*47.4*	*46.7*	*45.9*	*46.1*	*47.2*	*48.7*
Gas	*16.1*	*28.9*	*32.3*	*32.7*	*33.0*	*32.2*	*31.3*
Comb. Renewables & Wastes	–	*0.1*	*0.5*	*0.6*	*0.5*	*0.4*	*0.4*
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
Electricity	*13.6*	*16.3*	*17.2*	*17.2*	*18.1*	*18.3*	*17.9*
Heat	–	–	–	–	–	–	–
TOTAL INDUSTRY[6]	**65.0**	**42.6**	**43.8**	**45.6**	**47.5**	**48.1**	**50.0**
Coal[1]	13.3	6.2	3.2	3.4	3.1	2.9	2.9
Oil	33.7	15.7	16.8	17.0	16.7	17.0	17.1
Gas	10.1	12.0	14.3	15.3	16.8	17.0	17.8
Comb. Renewables & Wastes[2]	–	0.0	0.4	0.5	0.7	0.6	0.6
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
Electricity	7.8	8.7	9.1	9.3	10.2	10.6	11.6
Heat	–	0.0	–	–	–	–	–
Shares (%)							
Coal	*20.5*	*14.6*	*7.2*	*7.5*	*6.4*	*6.0*	*5.7*
Oil	*51.8*	*36.9*	*38.4*	*37.2*	*35.2*	*35.3*	*34.2*
Gas	*15.6*	*28.1*	*32.7*	*33.7*	*35.4*	*35.3*	*35.6*
Comb. Renewables & Wastes	–	–	*1.0*	*1.2*	*1.5*	*1.2*	*1.2*
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
Electricity	*12.1*	*20.3*	*20.7*	*20.5*	*21.5*	*22.0*	*23.2*
Heat	–	–	–	–	–	–	–
TRANSPORT[7]	**31.0**	**46.5**	**51.2**	**51.6**	**57.7**	**62.8**	**73.0**
TOTAL OTHER SECTORS[8]	**51.2**	**56.2**	**62.8**	**62.7**	**67.2**	**69.1**	**72.7**
Coal[1]	13.1	4.4	2.1	2.3	1.0	0.7	0.4
Oil	12.6	7.0	6.3	5.6	5.8	5.8	5.9
Gas	13.5	30.0	36.7	36.9	40.0	40.9	43.5
Comb. Renewables & Wastes[2]	–	0.2	0.3	0.4	0.1	0.1	0.2
Geothermal	–	0.0	0.0	0.0	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
Electricity	12.0	14.5	17.3	17.5	20.3	21.6	22.7
Heat	–	–	–	–	–	–	–
Shares (%)							
Coal	*25.5*	*7.8*	*3.4*	*3.6*	*1.5*	*1.0*	*0.6*
Oil	*24.7*	*12.5*	*10.1*	*8.9*	*8.6*	*8.4*	*8.1*
Gas	*26.4*	*53.5*	*58.4*	*58.9*	*59.5*	*59.2*	*59.9*
Comb. Renewables & Wastes	–	*0.4*	*0.5*	*0.6*	*0.1*	*0.2*	*0.2*
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
Electricity	*23.4*	*25.8*	*27.6*	*27.9*	*30.2*	*31.3*	*31.2*
Heat	–	–	–	–	–	–	–

Unit:Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	1998	1999	2005	2010	2020
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**72.5**	**74.6**	**79.3**	**77.5**	**78.0**	**79.4**	**74.9**
OUTPUT (Mtoe)	**24.2**	**27.3**	**31.0**	**31.3**	**33.9**	**36.2**	**38.2**
(TWh gross)	281.4	317.0	360.4	363.9	394.7	420.9	443.7
Output Shares (%)							
Coal	*62.1*	*65.3*	*34.2*	*29.3*	*20.7*	*15.8*	*9.4*
Oil	*25.6*	*10.8*	*1.8*	*1.5*	*0.5*	*0.4*	*0.3*
Gas	*1.0*	*1.1*	*32.5*	*38.8*	*49.0*	*56.0*	*73.6*
Comb. Renewables & Wastes	–	*0.4*	*2.0*	*2.1*	*4.5*	*9.3*	*8.9*
Nuclear	*10.0*	*20.7*	*27.8*	*26.5*	*24.0*	*17.3*	*6.7*
Hydro	*1.4*	*1.6*	*1.5*	*1.5*	*1.3*	*1.2*	*1.1*
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	*0.0*	*0.2*	*0.2*	–	–	–
TOTAL LOSSES	**72.7**	**68.7**	**71.2**	**68.5**	**66.0**	**64.1**	**55.9**
of which:							
Electricity and Heat Generation[10]	48.3	47.3	48.3	46.2	44.1	43.2	36.7
Other Transformation	7.1	5.1	3.6	3.8	2.7	2.6	2.5
Own Use and Losses[11]	17.3	16.3	19.3	18.6	19.2	18.3	16.7
Statistical Differences	**0.9**	**–0.8**	**1.3**	**2.0**	**–**	**–**	**–**

INDICATORS

	1973	1990	1998	1999	2005	2010	2020
GDP (billion 1995 US$)	747.20	1040.74	1227.67	1255.78	1456.32	1627.69	2033.32
Population (millions)	56.22	57.56	59.24	59.50	60.35	61.00	61.65
TPES/GDP[12]	0.30	0.20	0.19	0.18	0.16	0.15	0.12
Energy Production/TPES	0.49	0.98	1.18	1.23	..	..	..
Per Capita TPES[13]	3.93	3.70	3.89	3.87	3.95	4.00	4.08
Oil Supply/GDP[12]	0.15	0.08	0.07	0.07	0.06	0.06	0.05
TFC/GDP[12]	0.20	0.14	0.13	0.13	0.12	0.11	0.10
Per Capita TFC[13]	2.62	2.52	2.67	2.69	2.86	2.95	3.17
Energy–related CO_2 Emissions (Mt CO_2)[14]	657.1	572.3	540.4	535.3	573.7	585.1	623.8
CO_2 Emissions from Bunkers (Mt CO_2)	25.4	20.9	26.9	26.1	..	..	..

GROWTH RATES (% per year)

	73–79	79–90	90–98	98–99	99–05	05–10	10–20
TPES	–0.1	–0.3	1.0	–0.0	0.6	0.5	0.3
Coal	–0.5	–1.3	–6.1	–9.1	–5.4	–3.4	–3.1
Oil	–2.6	–1.3	–0.0	0.4	0.8	1.3	1.1
Gas	8.3	1.4	6.7	4.7	2.3	1.0	1.3
Comb. Renewables & Wastes	–	–	14.8	13.1	15.0	15.8	0.0
Nuclear	5.4	5.0	5.4	–3.9	–0.3	–5.2	–8.6
Hydro	1.6	1.8	0.1	2.2	–1.1	–	–
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	71.5	2.7	–	–	–
TFC	0.1	–0.2	1.1	1.2	1.3	0.9	0.8
Electricity Consumption	0.9	1.0	1.8	1.5	2.1	1.1	0.6
Energy Production	10.1	0.7	3.4	3.7	..	..	..
Net Oil Imports	–27.1	–	19.0	10.4	..	..	..
GDP	1.5	2.2	2.1	2.3	2.5	2.3	2.3
Growth in the TPES/GDP Ratio	–1.5	–2.5	–1.1	–2.2	–1.9	–1.7	–1.9
Growth in the TFC/GDP Ratio	–1.4	–2.4	–1.0	–1.1	–1.2	–1.3	–1.4

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

UNITED STATES

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit:Mtoe

SUPPLY		1973	1990	1998	1999	2005	2010	2020
TOTAL PRODUCTION		**1455**	**1650**	**1700**	**1688**	**1821**	**1890**	**2038**
Coal[1]		333	539	573	559	635	657	679
Oil		534	433	383	367	357	339	352
Gas		503	419	444	438	496	550	690
Comb. Renewables & Wastes[2]		37	62	76	82	87	94	107
Nuclear		23	159	186	203	204	199	159
Hydro		23	23	25	25	26	26	26
Geothermal		2	14	13	15	14	23	24
Solar / Wind / Other[3]		–	0	0	0	1	1	1
TOTAL NET IMPORTS[4]		**289**	**315**	**521**	**546**	**683**	**786**	**935**
Coal1	Exports	31	67	50	38	38	37	35
	Imports	1	2	7	7	10	11	13
	Net Imports	–30	–65	–42	–31	–28	–26	–23
Oil	Exports	11	39	46	46	43	43	46
	Imports	316	413	560	567	663	752	884
	Bunkers	9	29	23	26	19	19	19
	Net Imports	296	346	491	496	600	690	818
Gas	Exports	2	2	4	4	8	10	15
	Imports	24	35	73	83	113	130	152
	Net Imports	22	33	69	79	106	120	137
Electricity	Exports	0	2	1	1	1	1	1
	Imports	1	2	3	4	6	4	2
	Net Imports	1	0	2	2	4	3	2
TOTAL STOCK CHANGES		**–8**	**–39**	**–15**	**36**	**0**	**1**	**1**
TOTAL SUPPLY (TPES)		**1736**	**1926**	**2206**	**2270**	**2504**	**2677**	**2974**
Coal[1]		311	457	538	539	608	632	657
Oil		824	770	865	881	958	1029	1171
Gas		515	439	500	522	602	669	827
Comb. Renewables & Wastes[2]		37	62	76	82	87	94	107
Nuclear		23	159	186	203	204	199	159
Hydro		23	23	25	25	26	26	26
Geothermal		2	14	13	15	14	23	24
Solar / Wind / Other[3]		–	0	0	0	1	1	1
Electricity Trade[5]		1	0	2	2	4	3	2
Shares (%)								
Coal		*17.9*	*23.7*	*24.4*	*23.8*	*24.3*	*23.6*	*22.1*
Oil		*47.5*	*40.0*	*39.2*	*38.8*	*38.2*	*38.4*	*39.4*
Gas		*29.6*	*22.8*	*22.7*	*23.0*	*24.0*	*25.0*	*27.8*
Comb. Renewables & Wastes		*2.2*	*3.2*	*3.4*	*3.6*	*3.5*	*3.5*	*3.6*
Nuclear		*1.3*	*8.3*	*8.4*	*8.9*	*8.2*	*7.4*	*5.3*
Hydro		*1.3*	*1.2*	*1.1*	*1.1*	*1.1*	*1.0*	*0.9*
Geothermal		*0.1*	*0.7*	*0.6*	*0.7*	*0.6*	*0.9*	*0.8*
Solar / Wind / Other		–	–	–	–	–	–	–
Electricity Trade		*0.1*	–	*0.1*	*0.1*	*0.2*	*0.1*	*0.1*

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

Unit:Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	1998	1999	2005	2010	2020
TFC	**1246**	**1283**	**1432**	**1476**	**1735**	**1863**	**2102**
Coal[1]	44	31	28	27	65	64	64
Oil	701	698	777	802	893	966	1103
Gas	341	303	308	318	386	404	440
Comb. Renewables & Wastes[2]	16	23	29	34	66	70	80
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	143	226	282	287	320	352	409
Heat	–	2	7	7	6	6	6
Shares (%)							
Coal	*3.5*	*2.4*	*2.0*	*1.9*	*3.7*	*3.4*	*3.0*
Oil	*56.3*	*54.4*	*54.3*	*54.3*	*51.5*	*51.9*	*52.5*
Gas	*27.4*	*23.6*	*21.5*	*21.6*	*22.2*	*21.7*	*20.9*
Comb. Renewables & Wastes	*1.3*	*1.8*	*2.0*	*2.3*	*3.8*	*3.8*	*3.8*
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	*11.5*	*17.7*	*19.7*	*19.5*	*18.4*	*18.9*	*19.5*
Heat	–	*0.1*	*0.5*	*0.5*	*0.3*	*0.3*	*0.3*
TOTAL INDUSTRY[6]	**406**	**378**	**411**	**424**	**557**	**586**	**643**
Coal[1]	31	22	25	25	63	63	63
Oil	161	149	155	162	180	192	213
Gas	151	124	117	120	166	172	184
Comb. Renewables & Wastes[2]	7	9	15	17	48	52	60
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	56	75	93	95	95	101	117
Heat	–	–	5	5	5	5	5
Shares (%)							
Coal	*7.5*	*5.9*	*6.2*	*5.8*	*11.4*	*10.8*	*9.8*
Oil	*39.7*	*39.3*	*37.8*	*38.1*	*32.2*	*32.8*	*33.1*
Gas	*37.3*	*32.7*	*28.5*	*28.3*	*29.9*	*29.4*	*28.7*
Comb. Renewables & Wastes	*1.8*	*2.4*	*3.5*	*4.0*	*8.6*	*8.9*	*9.4*
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	*13.7*	*19.7*	*22.7*	*22.4*	*17.0*	*17.3*	*18.2*
Heat	–	–	*1.3*	*1.3*	*0.9*	*0.8*	*0.8*
TRANSPORT[7]	**420**	**502**	**582**	**601**	**691**	**759**	**884**
TOTAL OTHER SECTORS[8]	**420**	**402**	**439**	**450**	**487**	**519**	**575**
Coal[1]	14	9	3	3	1	1	1
Oil	137	63	57	58	49	46	44
Gas	173	164	176	181	200	209	227
Comb. Renewables & Wastes[2]	9	14	13	15	13	13	13
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	87	152	189	192	223	248	288
Heat	–	2	2	2	1	1	1
Shares (%)							
Coal	*3.2*	*2.2*	*0.6*	*0.6*	*0.3*	*0.3*	*0.2*
Oil	*32.6*	*15.6*	*12.9*	*12.9*	*10.1*	*8.9*	*7.7*
Gas	*41.2*	*40.7*	*40.1*	*40.2*	*41.1*	*40.3*	*39.5*
Comb. Renewables & Wastes	*2.1*	*3.4*	*2.9*	*3.3*	*2.6*	*2.5*	*2.3*
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	*20.8*	*37.7*	*43.0*	*42.5*	*45.7*	*47.9*	*50.1*
Heat	–	*0.4*	*0.4*	*0.4*	*0.2*	*0.2*	*0.2*

Unit:Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	1998	1999	2005	2010	2020
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**507**	**765**	**944**	**963**	**983**	**1054**	**1159**
OUTPUT (Mtoe)	**169**	**274**	**327**	**336**	**379**	**419**	**483**
(TWh gross)	1966	3182	3802	3910	4403	4867	5620
Output Shares (%)							
Coal	*46.2*	*53.4*	*52.8*	*51.8*	*51.9*	*49.4*	*44.7*
Oil	*17.1*	*4.1*	*3.9*	*3.1*	*1.2*	*0.7*	*0.7*
Gas	*18.6*	*12.0*	*14.7*	*15.7*	*19.6*	*25.0*	*35.6*
Comb. Renewables & Wastes	*0.0*	*2.1*	*1.7*	*1.6*	*1.9*	*2.0*	*1.9*
Nuclear	*4.5*	*19.2*	*18.8*	*19.9*	*17.8*	*15.7*	*10.8*
Hydro	*13.5*	*8.6*	*7.7*	*7.4*	*7.0*	*6.3*	*5.4*
Geothermal	*0.1*	*0.5*	*0.4*	*0.4*	*0.4*	*0.6*	*0.5*
Solar / Wind / Other	–	*0.1*	*0.1*	*0.1*	*0.2*	*0.3*	*0.3*
TOTAL LOSSES	**498**	**651**	**764**	**776**	**769**	**814**	**871**
of which:							
Electricity and Heat Generation[10]	338	489	608	617	597	629	668
Other Transformation	–1	15	5	5	26	30	27
Own Use and Losses[11]	160	147	151	153	146	155	176
Statistical Differences	**–7**	**–9**	**10**	**19**	**–**	**–**	**–**

INDICATORS

	1973	1990	1998	1999	2005	2010	2020
GDP (billion 1995 US$)	3990.10	6520.50	8292.80	8587.70	10603.69	12255.03	15977.59
Population (millions)	211.94	249.98	270.56	273.00	288.02	300.17	325.24
TPES / GDP[12]	0.44	0.30	0.27	0.26	0.24	0.22	0.19
Energy Production / TPES	0.84	0.86	0.77	0.74	0.73	0.71	0.69
Per Capita TPES[13]	8.19	7.70	8.15	8.32	8.69	8.92	9.14
Oil Supply / GDP[12]	0.21	0.12	0.10	0.10	0.09	0.08	0.07
TFC / GDP[12]	0.31	0.20	0.17	0.17	0.16	0.15	0.13
Per Capita TFC[13]	5.88	5.13	5.29	5.40	6.02	6.21	6.46
Energy-related CO_2 Emissions (Mt CO_2)[14]	4680.6	4845.9	5505.9	5584.8	6185.2	6624.1	7459.2
CO_2 Emissions from Bunkers (Mt CO_2)	45.2	129.8	125.5	139.4	116.9	117.4	118.5

GROWTH RATES (% per year)

	73–79	79–90	90–98	98–99	99–05	05–10	10–20
TPES	1.3	0.2	1.7	2.9	1.7	1.3	1.1
Coal	2.8	2.0	2.1	0.3	2.0	0.8	0.4
Oil	1.2	–1.2	1.5	1.9	1.4	1.4	1.3
Gas	–1.3	–0.7	1.6	4.4	2.4	2.2	2.1
Comb. Renewables & Wastes	5.9	1.5	2.5	7.8	1.0	1.7	1.3
Nuclear	20.3	7.7	2.0	8.9	0.1	–0.5	–2.2
Hydro	1.1	–0.3	0.9	–1.6	1.0	–0.0	–0.0
Geothermal	9.0	13.2	–0.5	13.1	–0.6	9.8	0.2
Solar / Wind / Other	–	–	3.5	38.4	12.3	6.0	1.2
TFC	0.8	–0.2	1.4	3.1	2.7	1.4	1.2
Electricity Consumption	3.1	2.5	2.8	1.7	1.8	2.0	1.5
Energy Production	0.8	0.7	0.4	–0.7	1.3	0.7	0.8
Net Oil Imports	5.1	–1.3	4.5	0.9	3.2	2.8	1.7
GDP	3.0	2.9	3.1	3.6	3.6	2.9	2.7
Growth in the TPES / GDP Ratio	–1.7	–2.6	–1.3	–0.6	–1.9	–1.5	–1.6
Growth in the TFC / GDP Ratio	–2.2	–3.0	–1.6	–0.5	–0.8	–1.5	–1.4

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

A

ANNEX

ENERGY BALANCES AND KEY STATISTICAL DATA TABLES

Table A1

GDP Growth Rates for IEA Countries[1]

(annual average percentage change)

	1973-79	1995	1996	1997	1998	1999	2000
Canada	3.9	2.7	1.5	4.4	3.3	4.6	4.8
United States	3.0	2.7	3.6	4.5	4.4	3.6	5.2
North America	**3.1**	**2.7**	**3.5**	**4.5**	**4.3**	**3.6**	**5.2**
Australia	2.7	4.5	3.8	4.7	4.5	4.4	4.2
Japan	3.5	1.5	5.0	1.6	–2.5	0.2	1.9
Korea	8.5	8.9	6.8	5.0	–6.7	10.7	8.9
New Zealand	0.0	3.8	2.6	1.9	0.0	4.4	3.6
Pacific	**3.6**	**2.2**	**5.1**	**2.1**	**–2.4**	**1.4**	**2.7**
Austria	3.0	1.6	2.0	1.3	3.3	2.8	3.6
Belgium	2.4	2.6	1.2	3.4	2.4	2.7	4.0
Czech Republic	2.5	5.9	4.8	–1.0	–2.2	–0.8	2.5
Denmark	1.5	2.8	2.5	3.0	2.8	2.1	2.9
Finland	2.4	3.8	4.0	6.3	5.3	4.2	5.7
France	2.8	1.7	1.1	1.9	3.1	2.9	3.3
Germany	2.4	1.7	0.8	1.4	2.1	1.6	3.0
Greece	3.3	2.1	2.4	3.5	3.1	3.4	4.0
Hungary	4.3	1.5	1.3	4.6	4.9	4.4	5.5
Ireland	4.9	9.7	7.7	10.7	8.6	9.8	11.0
Italy	3.5	2.9	1.1	2.0	1.8	1.6	2.9
Luxembourg	1.3	3.8	2.9	7.3	5.0	7.5	8.1
Netherlands	2.6	2.3	3.0	3.8	3.7	3.6	4.5
Norway	4.6	3.8	4.9	4.7	2.0	0.9	3.1
Portugal	2.9	2.6	3.7	3.8	3.8	3.0	3.2
Spain	2.3	2.7	2.4	3.9	4.3	4.0	4.1
Sweden	1.8	3.7	1.1	2.1	3.6	4.1	3.5
Switzerland	–0.4	0.5	0.3	1.7	2.3	1.5	3.3
Turkey	4.5	7.2	7.0	7.5	3.1	–5.0	7.0
United Kingdom	1.5	2.8	2.6	3.5	2.6	2.3	3.0
IEA Europe	**2.4**	**2.4**	**1.7**	**2.6**	**2.7**	**2.3**	**3.5**
IEA Total	**2.9**	**2.5**	**3.2**	**3.1**	**1.9**	**2.5**	**3.9**

1. Data are in 1995 dollars at 1995 prices

Sources: *National Accounts, Volume 1*, OECD Paris, 2001, and *Main Economic Indicators*, OECD Paris, May 2001.

Table A2

TPES/GDP Ratios for IEA Countries[1]

	1973	1979	1998	1999	2000[2]	Average Annual Growth Rates (%) 1988-93	1994-99
Canada	0.51	0.48	0.37	0.36	0.36	0.04	–2.1
United States	0.44	0.39	0.27	0.26	0.26	–1.2	–1.7
North America	**0.44**	**0.40**	**0.27**	**0.27**	**0.26**	**–1.1**	**–1.7**
Australia	0.30	0.30	0.24	0.24	0.24	0.7	–1.3
Japan	0.13	0.11	0.10	0.10	0.10	–0.2	0.2
Korea	0.23	0.26	0.32	0.32	0.31	3.8	1.2
New Zealand	0.19	0.21	0.28	0.28	0.27	2.6	0.56
Pacific	**0.14**	**0.13**	**0.13**	**0.13**	**0.13**	**0.9**	**0.83**
Austria	0.16	0.14	0.11	0.11	0.10	–1.7	–0.2
Belgium	0.27	0.24	0.20	0.19	0.19	–0.5	–0.0
Czech Republic	1.12	1.04	0.78	0.74	0.74	–1.9	–2.2
Denmark	0.15	0.15	0.11	0.10	0.09	–0.1	–3.1
Finland	0.26	0.26	0.22	0.21	0.20	1.6	–3.0
France	0.18	0.16	0.15	0.15	0.15	1.2	–0.1
Germany	0.21	0.20	0.13	0.13	0.12	–3.6	–1.5
Greece	0.15	0.16	0.21	0.20	0.20	1.2	0.3
Hungary	0.63	0.66	0.51	0.49	0.45	0.2	–2.8
Ireland	0.27	0.25	0.15	0.15	0.14	–1.9	–4.5
Italy	0.20	0.18	0.14	0.14	0.14	–0.0	0.3
Luxembourg	0.54	0.43	0.16	0.15	0.15	–2.0	–6.6
Netherlands	0.25	0.23	0.16	0.16	0.15	–1.2	–2.2
Norway	0.22	0.20	0.15	0.16	0.14	0.5	–0.6
Portugal	0.12	0.14	0.18	0.19	0.19	2.0	2.1
Spain	0.15	0.17	0.17	0.18	0.17	0.8	0.3
Sweden	0.23	0.23	0.20	0.19	0.17	–1.0	–2.1
Switzerland	0.08	0.08	0.08	0.08	0.08	–0.2	–0.4
Turkey	0.36	0.34	0.36	0.37	0.38	–1.0	0.8
United Kingdom	0.30	0.27	0.19	0.18	0.18	0.2	–2.4
IEA Europe	**0.22**	**0.21**	**0.16**	**0.16**	**0.16**	**–0.9**	**–0.9**
IEA Total	**0.28**	**0.25**	**0.19**	**0.19**	**0.19**	**–0.8**	**–0.8**

1. Measured in toe per $1 000 of GDP at 1995 prices and exchange rates; changes in energy intensity reflect the combined effects of efficiency improvements, structural changes, fuel substitution and exchange rates.
2. Preliminary data.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001, *National Accounts, Volume 1*, OECD Paris, 2000, and *Main Economic Indicators*, OECD Paris, May 2001.

Table A3

TPES per Inhabitant for IEA Countries

(toe per capita)

	1973	1979	1998	1999	2000[1]	Average Annual Growth Rates (%) 1988-93	1994-99
Canada	7.16	7.88	7.85	7.93	8.13	–0.5	0.1
United States	8.19	8.36	8.15	8.32	8.38	–0.1	1.1
North America	**8.09**	**8.31**	**8.12**	**8.28**	**8.36**	**–0.2**	**1.0**
Australia	4.27	4.73	5.57	5.69	5.73	1.72	1.7
Japan	2.98	3.06	4.04	4.07	4.10	2.5	1.0
Korea	0.62	1.06	3.55	3.87	3.99	10.0	5.0
New Zealand	2.78	2.88	4.57	4.77	4.81	2.46	2.0
Pacific	**2.58**	**2.76**	**4.08**	**4.19**	**4.24**	**3.49**	**1.9**
Austria	2.86	3.17	3.51	3.51	3.42	0.2	1.8
Belgium	4.76	4.93	5.72	5.74	5.95	0.8	2.2
Czech Republic	4.58	4.73	4.00	3.75	3.87	–3.7	–0.8
Denmark	3.94	4.15	3.93	3.77	3.62	0.3	–1.0
Finland	4.57	5.12	6.49	6.46	6.41	–0.1	1.3
France	3.31	3.40	4.24	4.23	4.30	2.4	1.7
Germany	4.28	4.73	4.20	4.11	4.09	–2.3	–0.1
Greece	1.38	1.68	2.51	2.55	2.61	1.7	3.0
Hungary	2.06	2.68	2.49	2.51	2.45	–3.2	0.8
Ireland	2.34	2.63	3.58	3.73	3.76	2.2	3.5
Italy	2.35	2.50	2.88	2.93	2.95	1.0	2.0
Luxembourg	12.76	10.64	7.73	8.01	8.41	2.8	–3.0
Netherlands	4.65	4.91	4.73	4.69	4.74	0.9	0.5
Norway	3.82	4.62	5.73	5.96	5.49	2.4	2.0
Portugal	0.84	1.03	2.20	2.37	2.40	4.9	5.4
Spain	1.50	1.80	2.86	3.01	3.10	2.7	3.7
Sweden	4.83	5.17	5.74	5.77	5.32	–1.9	0.5
Switzerland	3.06	3.15	3.75	3.74	3.63	0.3	0.4
Turkey	0.63	0.70	1.11	1.07	1.16	1.7	2.9
United Kingdom	3.93	3.91	3.89	3.87	3.91	0.5	–0.1
IEA Europe	**3.08**	**3.25**	**3.45**	**3.44**	**3.46**	**0.05**	**1.0**
IEA Total	**4.43**	**4.64**	**5.03**	**5.10**	**5.15**	**0.52**	**1.2**

1. Preliminary data.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001, *National Accounts, Volume 1*, OECD Paris, 2000, and *Main Economic Indicators*, OECD Paris, May 2001.

Table A4

TFC/GDP Ratios for IEA Countries[1]

	1973	1979	1997	1998	1999	Average Annual Growth Rates (%) 1988-93	1994-99
Canada	0.42	0.39	0.30	0.28	0.28	–0.1	–1.7
United States	0.31	0.27	0.18	0.17	0.17	–1.5	–2.1
North America	**0.32**	**0.28**	**0.19**	**0.18**	**0.18**	**–1.4**	**–2.1**
Australia	0.21	0.20	0.17	0.16	0.16	–0.0	–1.9
Japan	0.09	0.08	0.06	0.06	0.06	–0.5	0.3
Korea	0.19	0.21	0.22	0.22	0.22	4.4	–0.1
New Zealand	0.14	0.16	0.20	0.20	0.20	1.6	0.49
Pacific	**0.10**	**0.09**	**0.08**	**0.08**	**0.09**	**0.7**	**0.60**
Austria	0.12	0.12	0.10	0.10	0.09	–1.3	–0.3
Belgium	0.20	0.18	0.14	0.14	0.14	–0.1	0.1
Czech Republic	0.82	0.83	0.48	0.48	0.47	–4.9	–3.1
Denmark	0.13	0.12	0.08	0.08	0.08	1.3	–1.9
Finland	0.24	0.21	0.17	0.17	0.16	1.8	–3.2
France	0.14	0.13	0.10	0.10	0.10	0.7	–0.1
Germany	0.16	0.15	0.10	0.10	0.09	–3.5	–1.1
Greece	0.11	0.11	0.14	0.15	0.14	0.5	1.2
Hungary	0.51	0.52	0.36	0.35	0.33	–1.8	–3.3
Ireland	0.20	0.19	0.12	0.12	0.11	–2.1	–4.2
Italy	0.15	0.13	0.11	0.11	0.11	0.1	0.3
Luxembourg	0.35	0.33	0.16	0.15	0.15	–1.3	–4.1
Netherlands	0.19	0.18	0.13	0.13	0.12	–1.1	–2.0
Norway	0.20	0.18	0.12	0.12	0.12	–2.5	–1.4
Portugal	0.11	0.12	0.14	0.14	0.14	0.4	1.4
Spain	0.11	0.13	0.12	0.12	0.12	0.7	0.6
Sweden	0.21	0.19	0.14	0.14	0.13	0.1	–2.3
Switzerland	0.07	0.07	0.06	0.07	0.07	–0.1	0.4
Turkey	0.29	0.29	0.28	0.27	0.27	–1.2	0.1
United Kingdom	0.20	0.18	0.13	0.13	0.13	0.1	–1.8
IEA Europe	**0.16**	**0.15**	**0.12**	**0.12**	**0.11**	**–1.1**	**–0.7**
IEA Total	**0.20**	**0.18**	**0.13**	**0.13**	**0.13**	**–1.1**	**–0.9**

1. Measured in toe per $1 000 of GDP at 1995 prices and exchange rates.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001, *National Accounts, Volume 1*, OECD Paris, 2000, and *Main Economic Indicators*, OECD Paris, May 2001.

Table A5

Total Energy Demand in IEA Countries

(Mtoe and %)

	1973						1979					
	TPES	Shares of TPES					TPES	Shares of TPES				
	Mtoe	Coal %	Oil %	Natural Gas %	Nuclear %	Other[1] %	Mtoe	Coal %	Oil %	Natural Gas %	Nuclear %	Other[1] %
Canada	161.0	9.5	50.3	23.2	2.5	14.5	190.8	10.4	48.2	22.9	5.1	13.4
United States	1736.4	17.9	47.5	29.6	1.3	3.7	1881.2	19.5	47.0	25.4	3.7	4.4
North America	**1897.4**	**17.2**	**47.7**	**29.1**	**1.4**	**4.6**	**2072.0**	**18.7**	**47.1**	**25.1**	**3.9**	**5.2**
Australia	57.6	39.2	47.1	5.9	–	7.8	68.7	36.0	46.8	10.1	–	7.1
Japan	323.6	17.9	77.9	1.6	0.8	1.8	354.6	14.4	73.0	5.2	5.2	2.2
Korea	21.1	35.9	63.6	–	–	0.5	39.9	30.0	67.5	–	2.1	0.5
New Zealand	8.3	15.3	53.5	3.4	–	27.8	9.0	10.6	46.5	9.4	–	33.5
Pacific	**410.6**	**21.7**	**72.4**	**2.1**	**0.6**	**3.1**	**472.3**	**18.8**	**68.2**	**5.6**	**4.1**	**3.4**
Austria	21.7	17.9	56.7	15.3	–	10.1	23.9	15.2	53.6	18.3	–	12.9
Belgium	46.3	24.1	60.5	15.4	0.0	–0.1	48.4	21.7	52.9	19.2	6.1	–0.0
Czech Republic	45.4	78.4	19.6	2.2	–	–0.2	48.7	71.9	23.5	4.6	–	0.0
Denmark	19.8	9.7	88.7	–	–	1.6	21.2	20.4	76.1	–	–	3.5
Finland	21.3	12.0	63.6	–	–	24.4	24.4	17.4	54.0	3.3	7.2	18.0
France	176.6	16.6	70.4	7.7	2.2	3.2	187.1	17.3	61.2	11.1	5.6	4.8
Germany	337.9	41.2	47.9	8.5	0.9	1.4	369.6	37.4	43.6	13.9	3.7	1.4
Greece	12.4	17.0	77.7	–	–	5.2	16.0	21.6	73.6	–	–	4.8
Hungary	21.5	36.8	38.2	19.4	–	5.5	28.7	29.7	39.8	25.8	–	4.8
Ireland	7.2	22.0	77.1	–	–	0.8	8.9	22.5	71.5	5.2	–	0.8
Italy	128.6	6.3	77.9	11.1	0.6	4.1	140.7	7.4	71.0	16.1	0.5	5.0
Luxembourg	4.5	54.1	37.1	4.9	–	4.0	3.9	47.4	33.8	12.1	–	6.6
Netherlands	62.4	4.6	49.5	45.6	0.5	–0.2	68.9	4.8	45.9	47.6	1.3	0.4
Norway	15.1	6.0	55.5	–	–	38.5	18.8	5.3	49.5	3.8	–	41.4
Portugal	7.2	7.0	75.4	–	–	17.5	10.0	4.4	78.3	–	–	17.3
Spain	52.4	17.2	73.3	1.8	3.3	4.4	66.8	16.1	73.3	2.1	2.6	5.9
Sweden	39.3	4.1	72.2	–	1.4	22.3	42.9	4.2	61.3	–	12.8	21.7
Switzerland	19.7	1.7	77.4	0.8	8.3	11.9	20.0	1.1	66.9	3.8	15.4	12.8
Turkey	24.3	21.2	51.4	–	–	27.4	30.3	21.6	49.6	–	–	28.8
United Kingdom	220.7	34.6	50.5	11.4	3.3	0.2	220.0	33.7	43.2	18.4	4.5	0.2
IEA Europe	**1284.4**	**26.7**	**57.8**	**9.9**	**1.5**	**4.1**	**1399.1**	**25.2**	**52.4**	**14.0**	**3.6**	**4.8**
IEA Total	**3592.4**	**21.1**	**54.1**	**19.1**	**1.4**	**4.3**	**3943.3**	**21.0**	**51.5**	**18.8**	**3.8**	**4.8**

1. Includes hydro, geothermal, combustible renewables, wastes, solar, wind, tide, wave, ambient heat used in heat pumps, and electricity and heat trade.

Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001.

Table A5 (continued)

Total Energy Demand in IEA Countries

(Mtoe and %)

	1999						2000[1]						1999-2000
	TPES	Shares of TPES					TPES	Shares of TPES					Change in TPES
	Mtoe	Coal %	Oil %	Natural Gas %	Nuclear %	Other[2] %	Mtoe	Coal %	Oil %	Natural Gas %	Nuclear %	Other[2] %	%
Canada	241.8	11.5	35.7	29.1	7.9	15.8	250.7	11.8	35.9	29.4	7.6	15.3	3.7
United States	2270.0	23.8	38.8	23.0	8.9	5.5	2309.2	23.2	38.7	23.9	9.0	5.1	1.7
North America	**2511.8**	**22.6**	**38.5**	**23.6**	**8.8**	**6.5**	**2560.0**	**22.1**	**38.4**	**24.4**	**8.9**	**6.1**	**1.9**
Australia	107.9	43.9	33.0	16.9	–	6.3	109.9	44.4	32.7	16.7	–	6.2	1.8
Japan	515.4	17.0	51.7	12.0	16.0	3.3	520.7	18.1	50.8	12.4	15.5	3.2	1.0
Korea	181.4	20.4	55.0	8.4	14.8	1.5	188.6	20.0	54.5	9.0	15.1	1.5	4.0
New Zealand	18.2	5.9	35.5	26.5	–	32.1	18.4	5.6	36.9	27.8	–	29.7	1.0
Pacific	**822.9**	**21.0**	**49.6**	**12.2**	**13.3**	**3.9**	**837.6**	**21.7**	**49.0**	**12.6**	**13.0**	**3.8**	**1.8**
Austria	28.4	10.7	41.9	24.0	–	23.3	27.7	12.0	41.9	23.0	–	23.0	–2.5
Belgium	58.6	12.8	41.2	22.7	21.8	1.5	60.6	13.8	39.9	23.7	20.7	2.0	3.3
Czech Republic	38.6	48.1	21.4	20.0	9.0	1.4	39.8	52.4	19.8	18.9	8.9	0.1	3.1
Denmark	20.1	23.1	46.5	22.0	–	8.4	19.3	20.9	45.8	22.7	–	10.7	–3.8
Finland	33.4	15.8	31.2	10.0	17.9	25.0	33.2	15.3	31.0	10.3	17.6	25.8	–0.5
France	255.0	6.0	35.4	13.5	40.3	4.8	259.3	5.9	34.2	13.7	41.7	4.4	1.7
Germany	337.2	23.5	40.1	21.3	13.1	1.9	333.9	23.8	39.4	21.5	13.2	2.1	–1.0
Greece	26.9	32.8	57.1	4.5	–	5.7	27.7	32.0	56.5	6.2	–	5.4	2.8
Hungary	25.3	16.7	27.7	39.2	14.5	2.0	24.6	16.4	27.4	39.2	15.0	2.0	–2.9
Ireland	14.0	17.8	58.8	21.4	–	2.0	14.2	18.5	55.5	24.1	–	1.9	1.8
Italy	169.0	7.0	52.9	32.9	–	7.3	169.9	7.4	51.3	33.9	–	7.4	0.5
Luxembourg	3.5	3.2	63.0	18.8	–	15.0	3.7	3.4	63.5	18.2	–	14.9	5.4
Netherlands	74.1	10.1	38.0	46.7	1.3	3.9	75.1	10.6	37.9	46.0	1.4	4.0	1.4
Norway	26.6	4.0	34.0	17.9	–	44.1	24.6	4.0	33.4	13.7	–	48.9	–7.4
Portugal	23.6	16.0	67.9	8.2	–	7.9	24.0	15.7	64.8	8.8	–	10.7	1.5
Spain	118.5	16.3	53.8	11.2	12.9	5.8	122.3	16.2	53.0	11.7	13.2	5.8	3.2
Sweden	51.1	5.0	27.9	1.4	37.3	28.4	47.2	5.4	28.6	1.5	31.4	33.1	–7.6
Switzerland	26.7	0.4	49.5	9.2	25.3	15.6	26.1	0.5	48.8	9.3	25.0	16.3	–2.3
Turkey	70.3	28.5	41.8	15.1	–	14.6	77.0	30.9	40.4	16.0	–	12.7	9.5
United Kingdom	230.3	15.3	36.0	36.1	10.9	1.7	232.9	16.0	35.0	37.6	9.6	1.8	1.1
IEA Europe	**1631.2**	**15.4**	**41.0**	**22.3**	**14.7**	**6.6**	**1643.1**	**15.9**	**40.1**	**22.8**	**14.5**	**6.7**	**0.7**
IEA Total	**4965.9**	**20.0**	**41.2**	**21.3**	**11.5**	**6.1**	**5040.7**	**20.0**	**40.7**	**21.9**	**11.4**	**5.9**	**1.5**

1. Preliminary data.
2. Includes hydro, geothermal, combustible renewables, wastes, solar, wind, tide, wave, ambient heat used in heat pumps, and electricity and heat trade.

Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001.

Table A5 (continued)

Total Energy Demand in IEA Countries

(Mtoe and %)

	2005						2010						2005-10
	TPES	Shares of TPES					TPES	Shares of TPES					Change in TPES
	Mtoe	Coal %	Oil %	Natural Gas %	Nuclear %	Other[1] %	Mtoe	Solid Fuels %	Oil %	Natural Gas %	Nuclear %	Other[1] %	%
Canada	272.1	10.1	33.3	31.3	8.6	16.8	284.4	9.0	33.9	32.5	7.1	17.5	4.5
United States	2504.3	24.3	38.2	24.0	8.2	5.3	2676.9	23.6	38.4	25.0	7.4	5.5	6.9
North America	**2776.4**	**22.9**	**37.8**	**24.7**	**8.2**	**6.4**	**2961.2**	**22.2**	**38.0**	**25.7**	**7.4**	**6.7**	**6.7**
Australia	119.6	37.0	33.6	23.4	–	6.0	127.7	34.7	33.7	25.8	..	5.9	6.8
Japan	..	..	..	..	..	..	537.6	14.7	43.9	12.4	23.3	5.7	..
Korea	..	..	..	..	..	..	..	..	..	..	..	..	..
New Zealand	19.7	9.5	39.0	15.8	..	35.7	20.6	9.7	38.1	14.4	..	37.7	4.6
Pacific	**..**	**..**	**..**	**..**	**..**	**..**	**685.9**	**18.2**	**41.9**	**15.0**	**18.2**	**6.7**	**..**
Austria	30.76	6.8	36.2	32.3	–	24.6	32.8	5.6	34.2	34.9	–	25.3	6.7
Belgium	54.36	14.2	40.1	22.8	22.6	0.3	57.3	13.4	39.3	24.7	21.4	1.1	5.4
Czech Republic	39.2	35.7	18.1	27.6	17.1	1.5	41.1	34.8	18.5	27.5	16.3	2.9	4.8
Denmark	20.945	21.5	44.1	26.0	–	8.5	21.8	25.1	43.6	24.6	–	6.7	3.9
Finland	34.519	18.7	24.5	15.6	16.4	24.9	35.8	19.2	23.5	16.9	15.8	24.6	3.7
France	..	..	..	..	..	..	307.8	3.5	36.5	19.4	36.2	4.4	..
Germany	350.84	21.7	40.1	22.2	12.6	3.4	350.4	21.1	39.9	24.0	11.2	3.7	–0.1
Greece	36.519	24.9	62.4	8.1	–	4.5	44.5	25.6	62.9	7.9	–	3.7	21.9
Hungary	26.314	13.8	27.5	38.8	14.3	5.6	27.4	12.1	27.7	40.4	13.8	6.0	4.0
Ireland	16.447	16.3	51.2	29.8	–	2.7	17.7	10.2	50.3	36.5	–	3.0	7.7
Italy	173.93	6.8	51.0	35.5	–	6.8	185.8	6.7	46.4	38.8	–	8.2	6.8
Luxembourg	3.792	2.6	51.4	37.3	–	8.6	3.7	2.7	48.4	39.5	–	9.5	–1.9
Netherlands	83.045	8.9	35.0	52.0	0.5	3.6	87.9	8.2	35.0	53.2	–	3.6	5.8
Norway	..	..	..	..	..	..	..	..	..	..	..	..	..
Portugal	23.1	15.5	58.5	15.8	–	10.2	25.2	14.4	53.0	22.7	–	10.0	9.1
Spain	128.3	10.3	52.0	16.0	12.8	8.9	135.0	8.4	49.8	17.0	12.2	12.6	5.2
Sweden	52.6	4.9	33.3	1.9	33.0	26.9	52.8	4.8	30.4	1.8	33.7	29.2	0.3
Switzerland	26.7	0.4	48.8	10.2	23.6	17.0	27.1	0.4	48.2	10.5	23.2	17.7	1.2
Turkey	129.6	27.4	30.9	32.6	–	9.2	171.3	33.2	27.1	29.3	2.1	8.3	32.2
United Kingdom	238.3	10.6	36.4	39.9	10.4	2.7	244.1	8.7	37.9	41.0	7.8	4.6	2.4
IEA Europe	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**
IEA Total	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**

1. Includes hydro, geothermal, combustible renewables, wastes, solar, wind, tide, wave, ambient heat used in heat pumps, and electricity and heat trade.

Note: The IEA Secretariat has estimated data for certain countries. Please see Energy Balances and Key Statistical Data for details.

Source: Country submissions.

Table A6

Development of IEA Energy Self–Sufficiency by Product
(Mtoe and %)

	1973			1979			1998			1999			2000[1]		
	TPES	Production	%	TPES	Production	%	TPES	Production	%	TPES	Production	%	TPES	Production	%
North America															
Coal	15.3	11.7	76.7	19.8	18.7	94.3	28.8	40.7	141.1	27.8	39.2	140.6	566.5	580.5	102.5
Oil	81.0	96.3	118.9	92.0	86.6	94.1	85.2	128.3	150.5	86.4	123.0	142.3	984.2	497.0	50.5
Natural Gas	37.3	61.4	164.6	43.6	67.0	153.5	68.3	142.1	208.1	70.3	144.7	205.8	625.1	598.7	95.8
Total	**161.0**	**198.0**	**123.0**	**190.8**	**210.1**	**110.2**	**237.4**	**368.5**	**155.2**	**241.8**	**366.6**	**151.6**	**2560.0**	**2060.5**	**80.5**
Pacific															
Coal	89.3	66.1	74.0	88.8	70.8	79.7	165.4	155.2	93.8	173.0	159.5	92.2	181.7	168.0	92.5
Oil	297.2	20.8	7.0	322.0	23.8	7.4	396.3	34.9	8.8	408.1	28.5	7.0	410.1	37.3	9.1
Natural Gas	8.7	6.0	68.1	26.4	9.9	37.6	93.9	32.8	34.9	100.3	33.9	33.8	105.2	34.8	33.1
Total	**410.6**	**108.3**	**26.4**	**472.3**	**139.5**	**29.5**	**797.6**	**364.7**	**45.7**	**822.9**	**363.4**	**44.2**	**837.6**	**380.7**	**45.4**
IEA Europe															
Coal	342.7	303.2	88.5	352.8	296.6	84.1	267.3	155.1	58.0	250.6	148.5	59.2	260.8	142.6	54.7
Oil	742.5	22.9	3.1	733.1	118.8	16.2	672.4	324.9	48.3	668.4	330.8	49.5	658.8	331.4	50.3
Natural Gas	127.0	119.9	94.4	196.0	167.2	85.3	348.5	226.4	65.0	363.8	233.1	64.1	373.9	238.5	63.8
Total	**1284.4**	**517.6**	**40.3**	**1399.1**	**699.0**	**50.0**	**1629.6**	**1046.3**	**64.2**	**1631.2**	**1059.4**	**64.9**	**1643.1**	**1060.8**	**64.6**
IEA Total															
Coal	447.2	381.0	85.2	461.4	386.1	83.7	461.5	351.0	76.0	451.5	347.2	76.9	1009.0	891.1	88.3
Oil	1120.7	140.0	12.5	1147.1	229.1	20.0	1154.0	488.1	42.3	1163.0	482.3	41.5	2053.0	865.6	42.2
Natural Gas	173.0	187.2	108.2	266.0	244.1	91.8	510.7	401.2	78.6	534.4	411.7	77.0	1104.2	872.0	79.0
Total	**1855.9**	**823.9**	**44.4**	**2062.1**	**1048.6**	**50.9**	**2664.5**	**1779.4**	**66.8**	**2695.9**	**1789.3**	**66.4**	**5040.7**	**3501.9**	**69.5**

1. Preliminary data.

Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001.

Table A7

Indigenous Production/Primary Energy Supply in IEA Countries, 1999

	Total Energy[1]	Coal[1]	Oil[1]	Gas[1]	Electricity[2]
Canada	1.516	1.406	1.423	2.058	1.053
United States	0.744	1.036	0.416	0.838	0.993
North America	**0.818**	**1.054**	**0.506**	**0.983**	**1.000**
Australia	1.966	3.236	0.705	1.486	1.000
Japan	0.202	0.025	0.003	0.032	1.000
Korea	0.176	0.051	0.004	–	1.000
New Zealand	0.833	2.044	0.355	1.000	1.000
Pacific	**0.442**	**0.922**	**0.070**	**0.338**	**1.000**
Austria	0.335	0.098	0.083	0.216	1.033
Belgium	0.235	0.026	–	–	0.990
Czech Republic	0.724	1.244	0.046	0.023	1.054
Denmark	1.178	–	1.592	1.569	1.063
Finland	0.462	0.372	0.006	–	0.862
France	0.500	0.229	0.021	0.048	1.138
Germany	0.394	0.783	0.025	0.232	0.998
Greece	0.365	0.941	0.001	0.002	0.997
Hungary	0.454	0.712	0.255	0.265	0.972
Ireland	0.180	0.463	–	0.368	0.989
Italy	0.164	0.001	0.058	0.258	0.861
Luxembourg	0.013	–	–	–	0.061
Netherlands	0.797	–	0.093	1.565	0.825
Norway	7.884	0.310	16.958	9.278	1.015
Portugal	0.082	–	–	–	1.020
Spain	0.259	0.447	0.005	0.010	0.973
Sweden	0.675	0.101	–	–	1.053
Switzerland	0.442	–	–	–	1.176
Turkey	0.383	0.662	0.099	0.057	0.983
United Kingdom	1.225	0.633	1.723	1.073	0.962
IEA Europe	**0.649**	**0.592**	**0.495**	**0.641**	**0.996**
IEA Total	**0.700**	**0.914**	**0.415**	**0.804**	**0.999**

1. Calculated as production divided by primary energy supply.
2. Calculated as the ratio between domestic generation and total apparent consumption, or TFC plus own-use in the energy sector and distribution losses. Includes CHP units.

Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001.

Table A8

Recent Energy and Oil Supply Trends for IEA Countries

(Mtoe and %)

	TPES					Oil Supply					Net Oil Imports[1]				
	1998	1999	% Chg.	2000[2]	% Chg.	1998	1999	% Chg.	2000[2]	% Chg.	1998	1999	% Chg.	2000[2]	% Chg.
New Zealand	17.4	17.2	–1.2	17.6	2.5	6.4	6.6	2.5	6.5	–1.0	3.7	4.4	18.7	4.7	7.2
Canada	237.4	241.8	1.9	250.7	3.7	85.2	86.4	1.4	90.0	4.2	–42.5	–36.2	–14.7	–38.5	6.3
United States	2205.6	2270.0	2.9	2309.2	1.7	864.9	881.4	1.9	894.2	1.5	514.4	521.8	1.4	549.3	5.3
North America	**2443.0**	**2511.8**	**2.8**	**2560.0**	**1.9**	**950.1**	**967.8**	**1.9**	**984.2**	**1.7**	**471.9**	**485.6**	**2.9**	**510.8**	**5.2**
Australia	104.4	107.9	3.4	109.9	1.8	35.1	35.6	1.3	36.0	1.1	5.3	10.9	106.4	3.0	–72.4
Japan	511.0	515.4	0.9	520.7	1.0	262.8	266.4	1.4	264.6	–0.7	262.7	268.1	2.1	269.3	0.5
Korea	164.8	181.4	10.0	188.6	4.0	91.9	99.7	8.4	102.8	3.1	97.1	105.6	8.8	108.8	3.0
New Zealand	17.3	18.2	4.8	18.4	1.0	6.5	6.5	0.0	6.8	4.9	4.3	4.8	11.8	4.8	0.4
Pacific	**797.6**	**822.9**	**3.2**	**837.6**	**1.8**	**396.3**	**408.1**	**3.0**	**410.1**	**0.5**	**369.3**	**389.4**	**5.4**	**385.9**	**–0.9**
Austria	28.3	28.4	0.3	27.7	–2.5	12.0	11.9	–0.5	11.6	–2.5	11.3	11.0	–2.4	10.5	–4.5
Belgium	58.3	58.6	0.5	60.6	3.3	24.6	24.2	–1.6	24.2	–0.1	30.6	27.6	–9.8	29.1	5.4
Czech Republic	41.2	38.6	–6.4	39.8	3.1	8.3	8.3	–0.3	7.9	–4.8	8.3	7.9	–5.2	7.5	–4.4
Denmark	20.9	20.1	–3.8	19.3	–3.8	9.6	9.3	–2.3	8.8	–5.2	–0.3	–4.8	1316.0	–8.2	72.0
Finland	33.5	33.4	–0.3	33.2	–0.5	10.7	10.4	–3.0	10.3	–1.2	11.0	10.4	–4.7	11.1	6.6
France	254.4	255.0	0.2	259.3	1.7	90.7	90.2	–0.5	88.8	–1.6	92.6	90.0	–2.8	91.4	1.6
Germany	344.8	337.2	–2.2	333.9	–1.0	139.9	135.1	–3.4	131.4	–2.8	141.4	129.4	–8.5	127.3	–1.7
Greece	26.4	26.9	1.8	27.7	2.8	15.2	15.3	0.8	15.6	1.8	19.2	17.6	–8.4	19.3	9.6
Hungary	25.3	25.3	0.0	24.6	–2.9	7.2	7.0	–3.5	6.7	–3.8	5.9	5.3	–10.8	5.0	–4.7
Ireland	13.3	14.0	5.4	14.2	1.8	7.3	8.2	13.1	7.9	–3.9	7.5	8.4	11.8	7.8	–8.0
Italy	166.0	169.0	1.8	169.9	0.5	91.7	89.5	–2.4	87.1	–2.6	89.1	86.8	–2.6	86.9	0.1
Luxembourg	3.3	3.5	5.3	3.7	5.4	2.1	2.2	6.7	2.3	6.2	2.1	2.2	2.6	2.4	11.1
Netherlands	74.3	74.1	–0.3	75.1	1.4	27.3	28.1	2.9	28.5	1.3	36.7	36.8	0.1	41.8	13.7
Norway	25.4	26.6	4.7	24.6	–7.4	8.5	9.0	6.1	8.2	–9.1	–144.9	–143.5	–0.9	–153.3	6.8
Portugal	21.9	23.6	7.8	24.0	1.5	15.8	16.0	1.7	15.5	–3.0	16.1	16.9	4.9	16.2	–4.0
Spain	112.8	118.5	5.0	122.3	3.2	61.5	63.8	3.7	64.9	1.7	68.1	69.8	2.5	71.6	2.6
Sweden	50.8	51.1	0.6	47.2	–7.6	14.5	14.3	–1.3	13.5	–5.5	16.7	14.8	–11.1	14.7	–1.0
Switzerland	26.7	26.7	0.0	26.1	–2.3	13.5	13.2	–2.1	12.7	–3.7	13.7	12.6	–7.6	12.3	–2.9
Turkey	71.7	70.3	–1.9	77.0	9.5	29.6	29.4	–0.6	31.1	5.9	26.8	26.4	–1.6	29.5	11.7
United Kingdom	230.3	230.3	0.0	232.9	1.1	82.6	83.0	0.4	81.6	–1.6	–51.6	–58.1	12.5	–48.7	–16.2
IEA Europe	**1629.6**	**1631.2**	**0.1**	**1643.1**	**0.7**	**672.4**	**668.4**	**–0.6**	**658.8**	**–1.4**	**400.1**	**367.5**	**–8.2**	**374.0**	**1.8**
IEA Total	**4870.1**	**4965.9**	**2.0**	**5040.7**	**1.5**	**2018.9**	**2044.3**	**1.3**	**2053.0**	**0.4**	**1241.4**	**1242.4**	**0.1**	**1270.8**	**2.3**

1. Imports minus exports.
2. IEA Preliminary data.

Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001.

Table A9

Share of Oil Use by Sector in IEA Countries

(%)

	TFC				Industry[1]				Residential/Commercial[2]				Transport			
	1973	**1979**	**1998**	**1999**	**1973**	**1979**	**1998**	**1999**	**1973**	**1979**	**1998**	**1999**	**1973**	**1979**	**1998**	**1999**
Canada	58.3	53.3	43.3	43.4	40.4	37.3	29.0	29.3	47.4	35.4	18.6	18.5	98.9	95.2	89.1	89.4
United States	56.3	57.7	54.3	54.3	39.7	48.3	37.8	38.1	32.6	25.0	12.9	12.9	95.9	96.9	97.1	96.8
North America	**56.5**	**57.2**	**53.0**	**53.1**	**39.8**	**47.0**	**36.5**	**36.8**	**34.0**	**26.1**	**13.6**	**13.5**	**96.1**	**96.7**	**96.4**	**96.2**
Australia	61.7	59.7	51.5	51.5	43.8	40.6	26.6	26.4	39.7	26.7	13.1	13.0	99.4	99.6	98.1	98.0
Japan	73.2	70.3	63.1	63.0	67.7	62.2	54.2	55.0	68.5	63.6	43.8	42.4	96.9	97.6	98.0	98.0
Korea	54.6	59.7	70.2	68.2	82.2	74.2	67.0	65.8	13.0	24.0	52.6	50.0	99.1	99.4	99.5	99.5
New Zealand	60.6	55.2	44.3	44.0	43.9	35.1	10.5	10.2	32.8	22.8	14.4	13.7	99.9	99.9	99.1	99.2
Pacific	**70.2**	**67.5**	**62.6**	**62.3**	**65.5**	**60.3**	**52.9**	**53.3**	**57.8**	**52.8**	**42.1**	**41.1**	**97.6**	**98.2**	**98.3**	**98.3**
Austria	60.4	54.8	45.3	44.9	52.3	41.0	28.1	28.3	47.8	43.6	27.6	25.6	93.4	95.0	93.2	94.2
Belgium	60.7	56.9	54.4	53.2	46.8	38.6	37.9	36.4	64.2	58.3	43.5	42.0	98.4	98.6	98.8	98.8
Czech Republic	24.4	24.8	30.7	31.1	27.3	26.0	28.0	30.1	5.4	8.8	5.9	3.9	88.0	88.6	94.2	94.7
Denmark	88.3	81.2	50.6	51.1	84.5	72.0	33.5	34.0	85.4	77.2	26.1	25.9	99.7	99.7	99.4	99.4
Finland	59.2	54.8	34.8	34.3	66.2	54.3	16.5	16.4	42.3	41.1	27.9	25.8	99.3	99.5	98.6	98.6
France	72.0	66.8	53.0	52.8	63.4	59.2	38.9	38.6	68.0	56.1	29.5	28.8	97.7	98.1	97.7	97.7
Germany	56.0	53.2	52.8	52.3	44.3	39.5	37.2	36.4	53.6	47.8	35.2	32.1	93.5	97.1	97.9	98.0
Greece	77.6	77.4	70.0	70.2	68.7	69.4	49.5	49.7	68.6	61.6	52.0	50.8	99.2	99.7	99.8	99.8
Hungary	38.8	41.7	32.1	31.6	29.6	32.7	32.7	29.7	34.9	35.4	8.9	8.7	81.2	90.6	97.4	97.3
Ireland	71.2	64.3	61.6	64.3	86.6	73.8	38.4	40.9	37.7	30.5	44.6	47.2	100.0	100.0	99.9	99.9
Italy	73.0	65.1	51.0	50.6	62.3	52.1	33.9	32.5	73.5	58.5	23.1	23.8	97.1	97.3	97.6	97.6
Luxembourg	52.1	43.8	63.2	64.0	38.6	19.9	11.3	10.6	78.4	67.8	48.1	47.5	99.0	99.2	99.5	99.5
Netherlands	50.5	42.6	39.1	40.2	48.8	46.7	34.6	35.4	34.2	16.8	6.4	7.3	99.0	99.0	99.0	99.0
Norway	55.9	52.6	42.0	42.2	43.2	43.3	30.2	28.4	50.6	37.3	18.1	18.3	98.3	98.3	96.7	96.9
Portugal	75.1	73.7	72.9	71.4	66.9	66.9	67.4	64.4	59.7	52.9	43.3	41.2	98.0	99.0	99.5	99.5
Spain	75.6	78.6	65.6	64.2	64.7	70.0	49.2	45.4	68.2	64.4	36.9	36.0	98.8	99.1	98.9	99.0
Sweden	70.4	62.8	41.0	40.8	53.4	48.1	26.7	26.7	78.7	62.6	22.7	21.3	96.8	96.9	97.0	97.1
Switzerland	81.4	75.3	63.1	62.6	77.4	64.0	30.8	39.0	76.3	70.7	53.4	49.8	95.9	95.8	96.9	96.8
Turkey	48.5	49.5	48.5	49.8	60.5	56.6	40.3	41.2	28.1	23.8	29.2	29.8	88.1	96.3	99.4	99.4
United Kingdom	52.3	48.5	46.7	45.9	51.8	45.6	38.4	37.2	24.7	21.6	10.1	8.9	99.1	99.1	98.6	98.6
IEA Europe	**60.7**	**56.7**	**50.8**	**50.6**	**52.6**	**47.6**	**37.0**	**36.3**	**52.3**	**44.2**	**26.7**	**25.5**	**96.5**	**97.8**	**98.1**	**98.2**
IEA Total	**59.6**	**58.2**	**53.8**	**53.7**	**49.1**	**49.3**	**40.0**	**40.1**	**43.3**	**36.1**	**22.9**	**22.3**	**96.4**	**97.2**	**97.2**	**97.0**

1. Includes non-energy use.
2. Includes public and agricultural use.

Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001.

Table A10

Historical and Projected Oil Production in IEA Countries

(Mtoe)

	1973	1979	1999	2000[1]	2005	2010	2020
Canada	96.3	86.6	123.0	129.9	163.1	170.9	193.5
United States	533.8	495.1	366.8	367.1	357.3	339.0	352.4
North America	**630.2**	**581.7**	**489.8**	**497.0**	**520.4**	**509.9**	**545.9**
Australia	19.8	22.7	25.1	33.8	30.4	29.4	..
Japan	0.8	0.6	0.7	0.7	..	0.7	..
Korea	–	–	0.4	0.6	..	..	..
New Zealand	0.2	0.4	2.3	2.1	2.2	2.2	2.2
Pacific	**20.8**	**23.8**	**28.5**	**37.3**	**..**	**32.3**	**..**
Austria	2.7	1.8	1.0	1.0	0.7	0.6	..
Belgium	–	–	–	–	–	–	..
Czech Republic	0.0	0.3	0.4	0.4	0.2	0.2	0.2
Denmark	0.1	0.4	14.9	18.0	11.7	5.5	..
Finland	–	–	0.1	0.1	–	–	–
France	2.1	2.1	1.9	1.9	..	–	–
Germany	6.8	4.9	3.4	3.9	2.0	1.6	..
Greece	–	–	0.0	0.3	–	–	..
Hungary	2.0	2.4	1.8	1.8	1.2	0.9	0.7
Ireland	–	–	–	–	–	–	..
Italy	1.1	1.8	5.2	4.7	5.8	5.5	..
Luxembourg	–	–	–	–	–	–	..
Netherlands	1.6	1.6	2.6	2.4	1.7	1.1	0.6
Norway	1.6	19.3	153.4	161.8	..	..	..
Portugal	–	–	–	–	–	–	..
Spain	0.7	1.4	0.3	0.2	..	..	..
Sweden	–	0.0	–	–	–	–	..
Switzerland	–	–	–	–	–	–	–
Turkey	3.6	2.9	2.9	2.7	1.7	1.1	0.6
United Kingdom	0.5	79.9	143.0	132.2	..	..	..
IEA Europe	**22.9**	**118.8**	**330.8**	**331.4**	**..**	**..**	**..**
IEA Total	**673.8**	**724.2**	**849.1**	**865.6**	**..**	**..**	**..**

1. Preliminary data.

Note: The IEA Secretariat has estimated forecast data for certain countries. Please see Energy Balances and Key Statistical Data for details.

Sources: *Energy Balances of OECD Countries*, Paris IEA/OECD, 2001 for 1973, 1979 and 1999; and country submissions for 2005, 2010 and 2020.

Table A11

Historical and Projected Net Oil Imports of IEA Countries[1]
(Mtoe)

	1979	1998	1999	2000[2]	2005	2010	2020
Canada	7.8	–42.5	–36.2	–38.5	–71.9	–73.9	–83.9
United States	423.7	514.4	521.8	549.3	619.2	708.6	837.6
North America	**431.5**	**471.9**	**485.6**	**510.8**	**547.4**	**634.8**	**753.7**
Australia	10.8	5.3	10.9	3.0	10.6	14.5	..
Japan	277.0	262.7	268.1	269.3	..	240.5	..
Korea	27.0	97.1	105.6	108.8	..	..	..
New Zealand	4.2	4.3	4.8	4.8	5.9	6.1	7.6
Pacific	**318.9**	**369.3**	**389.4**	**385.9**	**..**	**..**	**..**
Austria	11.4	11.3	11.0	10.5	10.5	10.7	..
Belgium	29.4	30.6	27.6	29.1	25.8	26.5	..
Czech Republic	11.2	8.3	7.9	7.5	7.3	7.6	8.2
Denmark	15.8	–0.3	–4.8	–8.2	–1.0	5.5	..
Finland	15.3	11.0	10.4	11.1	8.5	8.4	8.2
France	120.7	92.6	90.0	91.4	..	115.0	129.5
Germany	162.7	141.4	129.4	127.3	140.6	140.2	..
Greece	13.3	19.2	17.6	19.3	26.3	31.5	..
Hungary	9.8	5.9	5.3	5.0	6.0	6.7	7.5
Ireland	6.4	7.5	8.4	7.8	8.6	9.1	..
Italy	102.6	89.1	86.8	86.9	85.3	83.0	..
Luxembourg	1.4	2.1	2.2	2.4	2.0	1.8	..
Netherlands	41.4	36.7	36.8	41.8	45.7	50.8	61.6
Norway	–9.7	–144.9	–143.5	–153.3	..	..	..
Portugal	9.2	16.1	16.9	16.2	14.6	14.7	..
Spain	49.6	68.1	69.8	71.6	..	..	..
Sweden	28.4	16.7	14.8	14.7	18.7	17.5	..
Switzerland	13.8	13.7	12.6	12.3	13.1	13.0	12.9
Turkey	11.8	26.8	26.4	29.5	38.3	45.3	66.3
United Kingdom	19.2	–51.6	–58.1	–48.7	..	..	..
IEA Europe	**663.8**	**400.1**	**367.5**	**374.0**	**..**	**..**	**..**
IEA Total	**1414.2**	**1241.4**	**1242.4**	**1270.8**	**..**	**..**	**..**

1. Includes requirements for marine bunkers.
2. Preliminary data.

Note: The IEA Secretariat has estimated data for certain countries. Please see Energy Balances and Key Statistical Data for details.

Sources: *Energy Balances of OECD Countries*, IEA / OECD Paris, 2001 for 1979, 1998 and 1999; and country submissions for 2005, 2010 and 2020.

Table A12

Total IEA Electricity Generation by Fuel

(TWh and %)

	1973		1979		1999		2000[1]		2005[2]		2010[3]	
	Output TWh	Share %	Output TWh	Share %	Output TWh	Share %	Output TWh	Share %	Output TWh	Share %	Output TWh	Share %
Coal	1606.5	37.2	2019.6	37.8	3379.8	37.7	3466.8	38.0	3255.9	41.4	3605.5	34.5
Oil	1105.7	25.6	1052.3	19.7	528.7	5.9	498.4	5.5	233.3	3.0	337.6	3.2
Natural Gas	512.9	11.9	598.5	11.2	1408.1	15.7	1480.0	16.2	1659.6	21.1	2590.0	24.8
Comb. Renewables & Wastes	6.9	0.2	11.8	0.2	141.3	1.6	150.4	1.7	187.9	2.4	272.6	2.6
Nuclear	188.3	4.4	573.4	10.7	2192.7	24.5	2207.2	24.2	1402.7	17.8	2250.4	21.5
Hydro	891.2	20.6	1073.7	20.1	1265.8	14.1	1255.5	13.8	1042.9	13.3	1268.8	12.1
Geothermal	6.4	0.1	8.6	0.2	27.9	0.3	24.7	0.3	24.8	0.3	47.4	0.5
Solar / Wind	0.6	0.0	0.5	0.0	21.6	0.2	28.7	0.3	56.5	0.7	86.5	0.8
Total	**4318.4**	**100.0**	**5338.4**	**100.0**	**8965.9**	**100.0**	**9111.7**	**100.0**	**7863.6**	**100.0**	**10458.8**	**100.0**

1. Preliminary data.
2. Excluding Japan, Korea and Norway.
3. Excluding France, Korea and Norway.

Note: The IEA Secretariat has estimated forecast data for certain countries. Please see Energy Balances and Key Statistical Data for details.

Sources: *Energy Balances of OECD Countries*, IEA / OECD Paris, 2001 for 1973, 1979 and 1999; and country submissions for 2005 and 2010.

Table A13

Electricity Generation in IEA Countries, 1999

	Energy Inputs[1] (Mtoe)	Output in TWh	Shares of Fuel in Electricity Generation (%)					
			Coal	Oil	Gas	Nuclear	Hydro	Other[2]
Canada	82.0	577.0	19.0	2.6	4.5	12.7	59.9	1.3
United States	963.2	3910.2	51.8	3.1	15.7	19.9	7.4	2.2
North America	**1045.2**	**4487.1**	**47.5**	**3.0**	**14.2**	**19.0**	**14.1**	**2.1**
Australia	47.3	203.0	78.1	1.3	10.6	–	8.2	1.9
Japan	215.5	1057.0	21.2	16.6	22.1	30.0	8.2	1.9
Korea	62.7	265.0	41.1	7.0	11.4	38.9	1.6	0.0
New Zealand	6.9	38.1	4.8	–	25.1	–	61.7	8.4
Pacific	**332.3**	**1563.1**	**31.6**	**12.6**	**18.9**	**26.8**	**8.4**	**1.7**
Austria	8.4	59.2	9.1	4.7	14.7	–	68.4	3.0
Belgium	20.1	83.4	15.0	1.2	23.1	58.8	0.4	1.5
Czech Republic	19.5	64.2	69.9	0.7	4.7	20.8	2.6	1.3
Denmark	9.0	38.9	51.6	12.5	23.5	–	0.1	12.3
Finland	14.6	69.4	20.9	1.3	13.7	33.1	18.4	12.6
France	121.3	519.8	6.2	2.0	1.4	75.8	13.9	0.7
Germany	131.8	551.3	51.9	1.1	10.0	30.8	3.5	2.7
Greece	11.4	49.4	65.6	16.5	7.9	–	9.3	0.7
Hungary	11.5	37.2	25.9	14.3	21.1	37.9	0.5	0
Ireland	4.9	21.8	34.5	28.3	31.9	–	3.9	1.5
Italy	49.1	259.2	10.9	35.2	33.6	–	17.5	2.8
Luxembourg	0.1	0.4	..	..	57.0	–	23.7	19.3
Netherlands	19.2	86.7	25.5	7.6	56.9	4.4	0.1	5.5
Norway	10.7	121.7	0.2	0.0	0.2	–	99.3	0.3
Portugal	8.0	42.9	35.2	25.6	18.8	–	16.9	3.4
Spain	42.9	206.3	36.6	11.8	9.2	28.5	11.1	2.7
Sweden	30.6	155.2	2.1	1.9	0.3	47.2	46.1	2.5
Switzerland	11.2	68.5	–	0.2	1.5	37.7	58.4	2.2
Turkey	22.2	116.4	31.8	6.9	31.2	–	29.8	0.3
United Kingdom	77.5	363.9	29.3	1.5	38.8	26.5	1.5	2.4
IEA Europe	**623.8**	**2915.7**	**25.8**	**6.7**	**16.3**	**31.6**	**17.2**	**2.4**
IEA Total	**2001.3**	**8965.9**	**37.7**	**5.9**	**15.7**	**24.5**	**14.1**	**2.1**

1. Includes CHP units.
2. Includes combustible renewables, wastes, geothermal, solar, wind, tide and wave.
Source: *Energy Balances of OECD Countries*, IEA / OECD Paris, 2001.

Table A14

Electricity Intensity of IEA Countries[1]

	1973	1979	1997	1998	1999	Average Annual Growth Rates (%) 1988-93	1994-99
Canada	0.81	0.83	0.88	0.84	0.83	0.30	–1.9
United States	0.50	0.50	0.47	0.46	0.46	1.31	–1.3
North America	**0.52**	**0.53**	**0.50**	**0.49**	**0.49**	**1.10**	**–1.4**
Australia	0.33	0.40	0.45	0.46	0.45	1.04	–0.4
Japan	0.18	0.19	0.19	0.19	0.20	0.68	0.88
Korea	0.16	0.23	0.44	0.47	0.47	3.51	2.96
New Zealand	0.43	0.52	0.59	0.60	0.58	1.12	–0.8
Pacific	**0.19**	**0.21**	**0.23**	**0.24**	**0.24**	**1.07**	**1.46**
Austria	0.21	0.22	0.23	0.22	0.22	–0.9	0.03
Belgium	0.23	0.25	0.28	0.28	0.28	1.31	–0.2
Czech Republic	0.96	1.05	1.17	1.18	1.16	0.23	–0.3
Denmark	0.15	0.18	0.19	0.19	0.18	1.09	–1.8
Finland	0.37	0.43	0.54	0.53	0.51	3.53	–2.4
France	0.19	0.22	0.27	0.27	0.27	1.27	0.05
Germany	0.25	0.26	0.22	0.22	0.21	–3.0	–0.5
Greece	0.18	0.22	0.37	0.37	0.37	1.88	1.07
Hungary	0.66	0.70	0.79	0.76	0.74	1.02	–1.8
Ireland	0.27	0.30	0.25	0.24	0.23	0.19	–3.4
Italy	0.22	0.23	0.25	0.26	0.26	1.02	0.59
Luxembourg	0.41	0.42	0.28	0.27	0.26	–4.5	–2.0
Netherlands	0.20	0.22	0.22	0.22	0.22	0.19	–0.2
Norway	0.97	0.92	0.71	0.73	0.72	–0.9	–1.8
Portugal	0.17	0.23	0.32	0.33	0.34	2.00	2.03
Spain	0.21	0.26	0.30	0.30	0.31	0.64	1.89
Sweden	0.47	0.51	0.57	0.56	0.54	–0.6	–2.0
Switzerland	0.14	0.16	0.17	0.17	0.18	–0.1	0.36
Turkey	0.18	0.26	0.54	0.57	0.62	3.68	4.75
United Kingdom	0.38	0.37	0.30	0.30	0.30	0.46	–0.6
IEA Europe	**0.26**	**0.28**	**0.29**	**0.29**	**0.29**	**–0.3**	**0.03**
IEA Total	**0.33**	**0.34**	**0.34**	**0.35**	**0.35**	**0.53**	**–0.2**

1. Calculated as production plus net imports divided by GDP and measured in kWh per dollar of GDP at 1995 prices and exchange rates; includes CHP units.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2001, *National Accounts, Volume 1*, OECD Paris, 2000, and *Main Economic Indicators*, OECD Paris, May 2001.

Table A15

Electricity Generation in IEA Countries

(GW net)

	1999							1999						
	Total Capacity							Under Construction*						
	Coal	Oil	Natural Gas	Nuclear	Hydro	Other	Total	Coal	Oil	Natural Gas	Nuclear	Hydro	Other	Total
Canada	17.41	8.59	6.00	10.62	67.12	1.24	110.97	0	0	0	0	0	0	0
United States[1]	314.42	44.42	235.98	96.57	99.06	16.23	806.68	0	0	0	0	0	0	0
North America	**331.83**	**53.00**	**241.98**	**107.19**	**166.18**	**17.46**	**917.65**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Australia	28.01	2.18	5.81	–	7.61	0.51	44.12	..	..	..	..	..	..	..
Japan[2,3]	24.76	51.63	57.92	45.08	44.40	0.50	224.29	..	..	..	..	..	..	..
Korea	13.39	14.52	6.39	13.72	3.15	0.42	51.59	..	..	..	..	..	..	..
New Zealand	0.18	0.12	2.10	–	5.18	0.64	8.21	–	–	–	–	0.58	–	0.58
Pacific	**66.34**	**68.44**	**72.22**	**58.80**	**60.33**	**2.07**	**328.21**	**..**	**..**	**..**	**..**	**–**	**..**	**–**
Austria	1.78	0.32	3.65	–	11.53	0.45	17.73	–	–	0.15	–	0.01	0.00	0.17
Belgium	3.14	0.90	4.26	5.71	1.40	0.16	15.57	–	–	0.39	–	–	0.01	0.40
Czech Republic	10.62	0.03	0.66	1.76	2.15	0.01	15.22	–	–	0.32	1.96	–	–	2.28
Denmark	5.85	2.39	2.37	–	0.01	2.12	12.73	–	–	0.40	–	–	0.14	0.54
Finland	5.17	1.40	2.52	2.64	2.88	1.57	16.16	–	–	0.15	–	0.01	0.35	0.52
France	12.50	11.65	1.60	63.18	25.12	0.73	114.77	–	–	0.50	–	–	–	0.50
Germany	48.34	7.47	21.60	22.33	8.85	6.10	114.69	..	..	..	..	..	..	..
Greece	4.55	1.98	1.11	–	2.96	0.13	10.73	0.30	0.20	0.47	–	0.34	0.26	1.57
Hungary	1.84	0.41	3.68	1.84	0.05	0.02	7.84	0.04	0.17	0.55	–	–	–	0.76
Ireland[2]	1.14	0.83	1.77	–	0.53	0.08	4.35	0.23	–	0.16	–	–	–	0.39
Italy	10.93	15.39	25.62	–	20.44	1.47	73.85	0.56	0.71	1.66	–	0.34	0.39	3.66
Luxembourg	–	–	0.08	–	1.14	0.02	1.23	–	–	0.32	–	–	–	0.32
Netherlands	–	3.78	15.34	0.45	0.04	1.07	20.68	..	..	..	–	0.01	–	..
Norway	0.09	0.01	0.04	–	27.65	0.13	27.91	..	..	..	..	..	..	..
Portugal	1.78	2.55	1.55	–	4.53	0.34	10.75	–	–	1.06	–	0.31	–	1.37
Spain	11.29	9.40	4.83	7.35	16.90	1.59	51.36	..	..	..	..	..	..	..
Sweden	0.97	4.35	0.35	10.08	16.44	1.41	33.59	..	..	..	..	..	..	..
Switzerland	–	0.53	0.04	3.13	11.98	0.30	15.98	..	..	..	..	..	..	..
Turkey	6.70	1.94	6.89	–	10.54	0.05	26.12	1.56	–	4.55	–	2.88	–	8.99
United Kingdom	38.60	–	18.50	13.00	4.27	0.80	75.16	..	..	..	..	..	..	..
IEA Europe	**165.28**	**65.31**	**116.44**	**131.47**	**169.39**	**18.52**	**666.42**	**..**	**..**	**..**	**..**	**..**	**..**	**..**
IEA Total	**563.45**	**186.75**	**430.65**	**297.46**	**395.91**	**38.06**	**1912.28**	**..**	**..**	**..**	**..**	**..**	**..**	**..**

* These figures reflect capacity under construction (as of December 1999) that will come on line by 2005, as reported in the country submissions (fiscal years for Australia, Japan and New Zealand).

Source: Country submissions.

1. Capacity is net summer capacity.
2. Only gross capacity data are available.
3. Does not include autoproducer capacity.

Table A15 (continued)

Electricity Generation in IEA Countries
(GW net)

	2005							2010						
	Total Capacity							Total Capacity						
	Coal	Oil	Natural Gas	Nuclear	Hydro	Other	Total	Coal	Oil	Natural Gas	Nuclear	Hydro	Other	Total
Canada	17.90	6.36	23.31	12.07	69.29	1.25	130.18	14.64	6.61	33.88	10.50	72.84	1.25	139.72
United States[1]	309.80	42.89	311.27	97.48	99.09	20.35	880.88	323.90	42.06	421.21	93.73	99.21	24.70	1004.82
North America	**327.70**	**49.25**	**334.58**	**109.55**	**168.38**	**21.60**	**1011.06**	**338.54**	**48.67**	**455.09**	**104.23**	**172.05**	**25.95**	**1144.54**
Australia	28.01	2.18	5.81	–	7.61	0.51	44.12	28.01	2.18	5.81	–	7.61	0.51	44.12
Japan[2, 3]	..	..	..	..	..	..	..	36.00	35.90	64.50	70.00	48.00	1.50	255.90
Korea	..	..	..	..	..	..	..	..	..	..	..	..	..	..
New Zealand	1.50	0.12	1.74	–	5.76	0.80	9.92	1.50	0.12	2.04	–	5.76	0.98	10.39
Pacific	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**
Austria	1.54	0.32	3.89	–	11.75	0.44	17.94	1.54	0.32	4.67	–	11.75	0.47	18.75
Belgium	1.21	0.69	4.48	5.71	1.40	0.16	13.65	1.21	0.25	4.48	5.71	1.40	1.12	14.17
Czech Republic	10.02	0.03	1.31	3.72	2.22	0.01	17.29	10.18	0.03	1.78	3.72	2.26	0.01	17.97
Denmark	3.83	1.49	2.69	–	0.01	3.21	11.23	3.15	1.42	2.53	–	0.01	4.05	11.17
Finland	..	..	..	..	..	..	..	..	..	..	..	..	..	..
France	12.50	11.65	2.09	63.18	25.12	1.03	115.57	12.5	11.7	2.1	63.2	25.1	1.1	115.7
Germany	58.05	7.76	23.22	22.40	10.44	4.86	126.72	58.65	6.86	24.14	22.40	10.64	5.94	128.64
Greece	4.85	2.28	1.58	–	3.46	0.39	12.57	5.69	2.74	2.07	–	3.73	0.51	14.74
Hungary	1.08	0.41	4.29	1.89	0.05	0.03	7.75	1.08	0.41	4.64	1.89	0.05	0.02	8.09
Ireland[2]	1.27	0.84	2.75	–	0.54	0.41	5.81	1.14	0.84	3.55	–	0.54	0.58	6.66
Italy	10.25	13.86	27.22	–	20.78	1.77	73.88	8.29	12.40	32.41	–	21.30	3.00	77.40
Luxembourg	–	–	0.40	–	1.14	0.03	1.57	–	–	0.40	–	1.14	0.03	1.57
Netherlands	..	..	..	..	0.05	1.88	..	..	..	..	..	0.05	2.47	..
Norway	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Portugal	1.78	2.32	2.61	–	4.84	0.64	12.18	1.78	2.10	4.13	–	5.03	0.73	13.76
Spain	..	..	..	..	..	..	..	..	..	..	..	18.80	11.56	..
Sweden	0.97	3.05	0.27	9.46	16.30	1.56	31.61	0.97	3.05	0.27	8.86	16.20	2.16	31.51
Switzerland	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Turkey	10.87	1.61	13.15	–	14.12	0.15	39.90	17.87	1.61	19.45	2.00	19.41	0.15	60.49
United Kingdom	59.80	3.00	51.50	25.00	8.27	3.80	151.36	53.80	1.00	61.50	23.00	8.27	7.80	155.36
IEA Europe	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**
IEA Total	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**

1. Capacity is net summer capacity.
2. Only gross capacity data are available.
3. Does not include autoproducer capacity.

Source: Country submissions.

Table A16

Percentage Change in Real Energy Prices for End–Users in IEA Countries, 1999–2000

	Total Energy		Oil Products		Electricity		Gas		Coal	
	Industry	Residential/ Commercial	Industry	Residential/ Commercial	Industry	Residential/ Commercial	Industry	Residential/ Commercial	Industry	Residential/ Commercial
Canada	16.0	–8.6	56.3	..	..	..	7.7	–8.6	..	..
United States	22.3	7.8	65.5	38.0	–2.0	–2.2	37.9	10.8	–5.6	..
Australia	–6.7	–4.3	..	..	..	..	..	..	..	..
Japan	–2.0	4.1	16.0	12.1	..	..	..	..	–12.8	..
Korea	14.2	4.9	23.8	11.4	3.4	–3.1	..	..	9.6	..
New Zealand	–10.6	–1.7	33.5	..	–16.1	–1.4	–11.8	–3.4	..	..
Austria	–3.9	28.2	–3.9	50.3	..	2.0	..	..	..	–2.9
Belgium	0.5	29.8	46.6	70.8	..	..	..	..	0.8	–2.0
Czech Republic	5.8	19.7	44.8	..	–5.9	14.2	9.3	24.4	–3.3	3.8
Denmark	16.1	15.6	38.7	15.9	–2.6	7.3	..	26.4	..	–1.2
Finland	0.8	17.8	33.1	44.1	–11.3	–4.7	7.6	14.2	–1.6	..
France	24.5	13.9	59.2	42.1	..	..	40.4	2.9	4.9	–1.6
Germany	4.4	21.6	54.8	55.5	..	..	..	..	..	..
Greece	21.5	28.2	42.1	44.6	..	..	..	..	..	..
Hungary	1.7	–2.5	38.7	..	–5.8	–2.8	–1.6	–2.6	..	2.8
Ireland	15.9	0.1	47.3	34.5	–5.4	–5.3	–3.8	–13.0	..	..
Italy	6.8	1.0	27.6	14.1	13.0	3.6	..	..	..	..
Luxembourg	61.8	53.8	61.8	64.2	..	–5.7	..	..	..	..
Netherlands	31.6	10.3	28.7	39.6	–3.0	11.6	47.7	9.7	..	..
Norway	–0.3	–1.4	23.5	22.4	..	–2.9	..	..	..	..
Portugal	14.0	–4.5	37.1	..	–17.5	–4.5	..	..	–4.4	..
Spain	27.9	14.9	41.5	44.5	..	..	46.3	14.2	..	..
Sweden	1.9	4.7	47.5	26.8	..	..	..	..	..	..
Switzerland	29.7	39.6	71.8	62.7	–3.3	–5.7	15.6	10.3	..	..
Turkey	10.0	2.3	19.3	16.2	1.3	–0.7	4.0	9.8	11.9	–9.5
United Kingdom	5.6	–4.6	42.1	50.5	–9.4	–4.8	2.6	–5.2	..	–0.9

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

Table A17

Tax as a Percentage of Oil Product Prices in IEA Countries, 1997–2000

	Heavy Fuel Oil Industry				Heating Oil Residential				Diesel Transport				Premium Unleaded Gasoline (95 RON)[1] Transport			
	1997	1998	1999	2000	1997	1998	1999	2000	1997	1998	1999	2000	1997	1998	1999	2000
Canada	..	..	..	..	..	..	..	..	38.4	39.4	39.3	32.7	48.0	53.0	49.1	41.2
United States	..	..	..	..	..	..	..	..	..	..	..	..	27.0	30.6	28.1	22.8
Australia	..	..	..	..	..	..	..	..	..	..	..	..	57.8	62.9	60.9	51.1
Japan	4.3	4.8	4.8	4.8	4.3	4.8	4.8	4.8	55.2	57.1	58.2	54.9	55.8	59.9	59.5	55.3
Korea	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
New Zealand	..	..	..	..	..	..	..	..	0.8	0.9	0.9	0.6	45.5	49.4	49.9	42.5
Austria	44.7	48.0	..	..	40.5	44.7	42.5	33.6	50.6	55.0	54.6	44.6	64.9	67.8	67.6	60.7
Belgium	14.6	17.5	14.4	9.5	23.4	25.0	24.1	21.2	53.2	58.2	55.9	44.4	72.6	75.8	73.7	65.7
Czech Republic	..	..	..	..	31.7	32.0	30.5	27.3	45.7	49.6	49.7	40.2	58.0	63.0	62.8	55.8
Denmark	..	..	..	..	59.9	64.2	62.1	55.8	41.9	39.5	36.3	45.3	69.8	72.4	72.3	66.3
Finland	..	..	..	..	35.8	42.0	41.3	33.6	53.2	58.1	54.4	43.6	74.8	78.0	74.3	67.3
France	20.9	26.0	21.5	10.9	39.4	43.4	41.9	31.2	63.9	69.5	67.3	54.5	78.4	81.2	79.1	69.7
Germany	..	..	..	..	29.3	33.3	35.6	28.8	57.5	63.1	61.9	54.8	71.7	75.2	73.8	69.2
Greece	..	..	..	..	61.5	59.8	52.4	38.6	55.3	59.1	57.1	43.1	65.3	66.7	62.9	52.6
Hungary	..	..	..	..	..	..	..	..	64.8	68.7	65.1	57.3	66.2	69.7	66.8	60.0
Ireland	11.5	13.1	9.4	5.5	26.9	27.9	25.7	21.4	46.7	56.7	56.4	46.3	66.7	68.0	67.7	58.9
Italy	31.1	34.6	36.4	26.6	69.4	72.0	71.5	60.6	61.9	65.2	63.7	51.6	72.0	74.7	73.2	64.8
Luxembourg	..	..	..	..	13.0	13.5	13.2	12.2	52.6	56.9	54.2	41.9	62.3	65.5	64.1	55.8
Netherlands	..	..	..	..	40.1	45.3	46.0	40.5	56.6	61.1	58.3	48.7	71.9	74.9	73.3	66.2
Norway	..	..	..	..	30.0	31.5	30.0	27.8	61.3	61.0	59.2	55.4	74.3	76.0	74.7	68.7
Portugal	18.7	21.2	18.9	11.4	..	..	..	..	57.2	61.1	59.8	48.4	70.1	72.9	67.7	49.4
Spain	8.6	11.6	9.9	6.6	39.8	44.1	41.5	32.3	53.8	58.0	55.6	45.1	65.0	68.7	66.9	59.1
Sweden	..	..	..	..	60.0	64.7	62.3	53.2	49.4	53.0	49.8	43.3	73.2	75.5	73.1	67.0
Switzerland	..	..	..	..	10.7	11.1	11.4	9.7	73.3	78.4	75.6	63.2	66.4	70.1	69.0	60.3
Turkey	43.8	36.1	28.2	22.3	64.8	63.7	65.4	61.2	63.7	64.0	64.3	60.7	69.0	70.5	71.2	63.0
United Kingdom	21.3	26.9	27.9	21.7	23.0	26.9	26.3	19.2	72.6	78.6	77.5	69.9	77.3	81.5	81.5	75.5

1. Regular unleaded gasoline for Australia, Canada and Japan 1997 to 2000.
Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2001.

Table A18

Energy Balances and Key Indicators for IEA and Regions

		IEA Total				North America				Pacific				IEA Europe			
		1973	1979	1998	1999	1973	1979	1998	1999	1973	1979	1998	1999	1973	1979	1998	1999
SUPPLY																	**Unit: Mtoe**
TOTAL PRODUCTION		**2279.4**	**2574.6**	**3479.7**	**3477.2**	**1653.5**	**1736.1**	**2068.7**	**2054.4**	**108.3**	**139.5**	**364.7**	**363.4**	**517.6**	**699.0**	**1046.3**	**1059.4**
Coal[1]		714.4	811.0	923.8	905.9	345.1	443.6	613.5	597.9	66.1	70.8	155.2	159.5	303.2	296.6	155.1	148.5
Oil		673.8	724.2	871.2	849.1	630.2	581.7	511.4	489.8	20.8	23.8	34.9	28.5	22.9	118.8	324.9	330.8
Gas		689.9	698.9	844.8	849.3	564.0	521.8	585.7	582.3	6.0	9.9	32.8	33.9	119.9	167.2	226.4	233.1
Comb. Renewables & Wastes[2]		70.3	91.0	155.0	164.9	45.3	59.9	86.1	92.6	3.5	4.0	13.3	14.0	21.5	27.1	55.7	58.2
Nuclear		49.2	150.0	551.2	571.5	27.3	80.3	204.7	221.9	2.5	19.2	110.0	109.4	19.3	50.6	236.4	240.2
Hydro		76.6	92.3	108.3	108.9	39.6	45.3	53.8	54.5	8.1	10.1	11.8	11.2	29.0	37.0	42.8	43.1
Geothermal		5.2	7.0	22.2	24.0	2.1	3.5	13.2	14.9	1.3	1.7	5.9	5.8	1.8	1.8	3.2	3.3
Solar/Wind/Other[3]		0.0	0.1	3.2	3.7	–	–	0.3	0.5	–	0.0	1.0	1.0	0.0	0.0	1.9	2.2
TOTAL NET IMPORTS[4]		**1333.0**	**1426.0**	**1402.2**	**1433.1**	**253.8**	**374.4**	**390.9**	**418.4**	**307.7**	**339.9**	**428.1**	**451.1**	**771.5**	**711.8**	**583.2**	**563.6**
Coal[1]	Exports	84.1	113.4	196.2	188.7	38.7	51.5	73.5	61.7	18.2	26.7	107.1	112.4	27.2	35.2	15.6	14.6
	Imports	114.4	145.8	257.1	255.1	11.2	15.5	19.6	19.5	41.7	45.5	117.2	120.3	61.4	84.9	120.3	115.3
	Net Imports	30.3	32.4	61.0	66.4	–27.5	–36.1	–53.9	–42.2	23.6	18.8	10.1	7.9	34.2	49.7	104.7	100.7
Oil	Exports	233.2	252.5	661.2	658.2	74.1	40.4	136.5	132.1	7.3	4.2	66.8	63.9	151.7	207.9	457.8	462.2
	Imports	1596.8	1666.6	1902.5	1900.6	365.3	471.9	608.5	617.7	308.1	323.1	436.1	453.3	923.4	871.7	857.9	829.7
	Bunkers	71.0	74.0	79.6	81.0	9.2	26.0	24.1	27.1	19.4	14.5	12.5	12.8	42.3	33.6	43.0	41.1
	Net Imports	1292.6	1340.1	1161.7	1161.4	281.9	405.5	447.8	458.4	281.3	304.4	356.8	376.6	729.3	630.2	357.1	326.3
Gas	Exports	50.3	82.5	159.5	171.2	24.9	24.0	76.8	81.6	–	–	8.9	8.9	25.5	58.5	73.9	80.7
	Imports	60.0	135.3	337.6	375.1	24.2	29.0	73.8	83.7	2.8	16.7	70.0	75.4	33.0	89.6	193.8	215.9
	Net Imports	9.7	52.8	178.1	203.9	–0.7	5.0	–3.0	2.2	2.8	16.7	61.2	66.6	7.5	31.2	119.9	135.2
Electricity	Exports	6.7	10.3	22.4	24.5	1.6	2.9	4.9	5.1	–	–	–	–	5.0	7.4	17.5	19.5
	Imports	7.1	10.9	23.4	25.5	1.6	2.9	4.9	5.1	–	–	–	–	5.4	8.1	18.5	20.4
	Net Imports	0.4	0.6	1.0	1.0	0.0	–0.0	–0.0	0.0	–	–	–	–	0.4	0.7	1.0	1.0
TOTAL STOCK CHANGES		**–20.0**	**–57.3**	**–11.7**	**55.6**	**–9.8**	**–38.5**	**–16.6**	**38.9**	**–5.4**	**–7.1**	**4.8**	**8.4**	**–4.8**	**–11.7**	**0.1**	**8.3**
TOTAL SUPPLY (TPES)		**3592.4**	**3943.3**	**4870.1**	**4965.9**	**1897.4**	**2072.0**	**2443.0**	**2511.8**	**410.6**	**472.3**	**797.6**	**822.9**	**1284.4**	**1399.1**	**1629.6**	**1631.2**
Coal[1]		758.3	828.4	999.4	990.9	326.3	386.8	566.7	567.3	89.3	88.8	165.4	173.0	342.7	352.8	267.3	250.6
Oil		1944.7	2030.8	2018.9	2044.3	905.0	975.6	950.1	967.8	297.2	322.0	396.3	408.1	742.5	733.1	672.4	668.4
Gas		687.5	743.0	1010.5	1056.4	551.8	520.6	568.1	592.3	8.7	26.4	93.9	100.3	127.0	196.0	348.5	363.8
Comb. Renewables & Wastes[2]		70.4	91.1	155.4	165.3	45.3	59.9	86.0	92.6	3.5	4.0	13.3	14.0	21.6	27.2	56.1	58.7
Nuclear		49.2	150.0	551.2	571.5	27.3	80.3	204.7	221.9	2.5	19.2	110.0	109.4	19.3	50.6	236.4	240.2
Hydro		76.6	92.3	108.3	108.9	39.6	45.3	53.8	54.5	8.1	10.1	11.8	11.2	29.0	37.0	42.8	43.1
Geothermal		5.2	7.0	22.2	24.0	2.1	3.5	13.2	14.9	1.3	1.7	5.9	5.8	1.8	1.8	3.2	3.3
Solar/Wind/Other[3]		0.0	0.1	3.2	3.7	–	–	0.3	0.5	–	0.0	1.0	1.0	0.0	0.0	1.9	2.2
Electricity Trade[5]		0.4	0.7	1.0	1.0	0.0	–0.0	–0.0	0.0	–	–	–	–	0.4	0.7	1.0	1.0

Table A18 (continued)

Energy Balances and Key Indicators for IEA and Regions

	IEA Total				North America				Pacific				IEA Europe			
	1973	1979	1998	1999	1973	1979	1998	1999	1973	1979	1998	1999	1973	1979	1998	1999
SUPPLY																**Unit: Mtoe**
Fuel Shares (%)																
Coal	*21.1*	*21.0*	*20.5*	*20.0*	*17.2*	*18.7*	*23.2*	*22.6*	*21.7*	*18.8*	*20.7*	*21.0*	*26.7*	*25.2*	*16.4*	*15.4*
Oil	*54.1*	*51.5*	*41.5*	*41.2*	*47.7*	*47.1*	*38.9*	*38.5*	*72.4*	*68.2*	*49.7*	*49.6*	*57.8*	*52.4*	*41.3*	*41.0*
Gas	*19.1*	*18.8*	*20.7*	*21.3*	*29.1*	*25.1*	*23.3*	*23.6*	*2.1*	*5.6*	*11.8*	*12.2*	*9.9*	*14.0*	*21.4*	*22.3*
Comb. Renewables & Wastes	*2.0*	*2.3*	*3.2*	*3.3*	*2.4*	*2.9*	*3.5*	*3.7*	*0.9*	*0.9*	*1.7*	*1.7*	*1.7*	*1.9*	*3.4*	*3.6*
Nuclear	*1.4*	*3.8*	*11.3*	*11.5*	*1.4*	*3.9*	*8.4*	*8.8*	*0.6*	*4.1*	*13.8*	*13.3*	*1.5*	*3.6*	*14.5*	*14.7*
Hydro	*2.1*	*2.3*	*2.2*	*2.2*	*2.1*	*2.2*	*2.2*	*2.2*	*2.0*	*2.1*	*1.5*	*1.4*	*2.3*	*2.6*	*2.6*	*2.6*
Geothermal	*0.1*	*0.2*	*0.5*	*0.5*	*0.1*	*0.2*	*0.5*	*0.6*	*0.3*	*0.4*	*0.7*	*0.7*	*0.1*	*0.1*	*0.2*	*0.2*
Solar/Wind/Other	–	–	*0.1*	*0.1*	–	–	–	–	–	–	*0.1*	*0.1*	–	–	*0.1*	*0.1*
Electricity Trade	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*0.1*	*0.1*
DEMAND																**Unit: Mtoe**
FINAL CONSUMPTION BY SECTOR																
TFC	**2644.4**	**2841.5**	**3305.8**	**3381.9**	**1379.1**	**1460.6**	**1612.2**	**1661.6**	**298.4**	**333.3**	**528.1**	**549.9**	**966.9**	**1047.6**	**1165.4**	**1170.4**
Coal[1]	224.9	202.6	112.0	108.0	49.4	45.8	31.4	30.8	33.0	34.2	30.1	30.7	142.5	122.6	50.5	46.5
Oil	1575.1	1654.6	1778.5	1816.4	778.7	835.7	855.2	882.3	209.6	225.1	330.8	342.4	586.8	593.9	592.5	591.8
Gas	475.4	519.3	644.6	664.0	365.0	347.5	357.6	369.4	9.5	14.3	41.7	44.5	100.9	157.5	245.2	250.1
Comb. Renewables & Wastes[2]	47.2	61.4	86.5	92.8	23.6	33.8	38.6	43.9	3.5	3.8	7.1	7.4	20.1	23.8	40.8	41.5
Geothermal	–	–	0.8	0.8	–	–	–	–	–	–	0.6	0.6	–	–	0.3	0.3
Solar/Wind/Other	–	0.0	1.4	1.4	–	–	–	–	–	0.0	1.0	1.0	–	0.0	0.4	0.5
Electricity	314.2	389.3	645.5	659.4	162.3	196.8	321.4	327.0	42.7	55.7	114.8	119.1	109.2	136.9	209.2	213.2
Heat	7.6	14.2	36.4	39.1	0.1	1.0	8.0	8.2	0.0	0.1	2.0	4.4	7.5	13.0	26.4	26.6
Fuel Shares (%)																
Coal	*8.5*	*7.1*	*3.4*	*3.2*	*3.6*	*3.1*	*1.9*	*1.9*	*11.1*	*10.3*	*5.7*	*5.6*	*14.7*	*11.7*	*4.3*	*4.0*
Oil	*59.6*	*58.2*	*53.8*	*53.7*	*56.5*	*57.2*	*53.0*	*53.1*	*70.2*	*67.5*	*62.6*	*62.3*	*60.7*	*56.7*	*50.8*	*50.6*
Gas	*18.0*	*18.3*	*19.5*	*19.6*	*26.5*	*23.8*	*22.2*	*22.2*	*3.2*	*4.3*	*7.9*	*8.1*	*10.4*	*15.0*	*21.0*	*21.4*
Comb. Renewables & Wastes	*1.8*	*2.2*	*2.6*	*2.7*	*1.7*	*2.3*	*2.4*	*2.6*	*1.2*	*1.1*	*1.4*	*1.3*	*2.1*	*2.3*	*3.5*	*3.5*
Geothermal	–	–	–	–	–	–	–	–	–	–	*0.1*	*0.1*	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–	–	–	–	*0.2*	*0.2*	–	–	–	–
Electricity	*11.9*	*13.7*	*19.5*	*19.5*	*11.8*	*13.5*	*19.9*	*19.7*	*14.3*	*16.7*	*21.7*	*21.7*	*11.3*	*13.1*	*18.0*	*18.2*
Heat	*0.3*	*0.5*	*1.1*	*1.2*	–	*0.1*	*0.5*	*0.5*	–	–	*0.4*	*0.8*	*0.8*	*1.2*	*2.3*	*2.3*

Table A18 (continued)

Energy Balances and Key Indicators for IEA and Regions

	IEA Total				North America				Pacific				IEA Europe			
	1973	1979	1998	1999	1973	1979	1998	1999	1973	1979	1998	1999	1973	1979	1998	1999
DEMAND																**Unit: Mtoe**
TOTAL INDUSTRY[6]	**1046.0**	**1085.3**	**1099.7**	**1121.8**	**458.4**	**488.8**	**482.1**	**497.2**	**167.5**	**168.6**	**225.0**	**234.7**	**420.1**	**427.9**	**392.7**	**390.0**
Coal[1]	139.4	126.7	97.9	94.9	35.2	31.3	28.6	28.0	24.1	24.6	28.1	28.8	80.1	70.7	41.2	38.1
Oil	513.1	535.1	440.4	449.8	182.4	229.7	175.9	183.0	109.8	101.6	119.1	125.1	221.0	203.7	145.4	141.7
Gas	220.8	218.3	258.0	264.3	163.2	135.9	139.7	142.7	3.9	6.0	19.2	20.0	53.8	76.3	99.2	101.6
Comb. Renewables & Wastes[2]	17.9	20.7	41.0	45.1	12.9	13.7	22.3	25.4	1.5	2.1	5.1	5.2	3.5	4.8	13.6	14.5
Geothermal	–	–	0.4	0.4	–	–	–	–	–	–	0.4	0.4	–	–	–	0.0
Solar / Wind / Other	–	–	0.0	0.0	–	–	–	–	–	–	–	0.0	–	–	0.0	0.0
Electricity	152.2	180.2	250.5	255.9	64.6	77.2	109.5	111.8	28.3	34.2	53.2	55.3	59.3	68.9	87.8	88.8
Heat	2.5	4.4	11.5	11.4	0.1	1.0	6.1	6.2	–	–	–	–	2.5	3.4	5.4	5.2
Fuel Shares (%)																
Coal	*13.3*	*11.7*	*8.9*	*8.5*	*7.7*	*6.4*	*5.9*	*5.6*	*14.4*	*14.6*	*12.5*	*12.3*	*19.1*	*16.5*	*10.5*	*9.8*
Oil	*49.1*	*49.3*	*40.0*	*40.1*	*39.8*	*47.0*	*36.5*	*36.8*	*65.5*	*60.3*	*52.9*	*53.3*	*52.6*	*47.6*	*37.0*	*36.3*
Gas	*21.1*	*20.1*	*23.5*	*23.6*	*35.6*	*27.8*	*29.0*	*28.7*	*2.3*	*3.6*	*8.5*	*8.5*	*12.8*	*17.8*	*25.3*	*26.1*
Comb. Renewables & Wastes	*1.7*	*1.9*	*3.7*	*4.0*	*2.8*	*2.8*	*4.6*	*5.1*	*0.9*	*1.3*	*2.3*	*2.2*	*0.8*	*1.1*	*3.5*	*3.7*
Geothermal	–	–	–	–	–	–	–	–	–	–	*0.2*	*0.2*	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Electricity	*14.6*	*16.6*	*22.8*	*22.8*	*14.1*	*15.8*	*22.7*	*22.5*	*16.9*	*20.3*	*23.6*	*23.5*	*14.1*	*16.1*	*22.4*	*22.8*
Heat	*0.2*	*0.4*	*1.0*	*1.0*	–	*0.2*	*1.3*	*1.2*	–	–	–	–	*0.6*	*0.8*	*1.4*	*1.3*
TRANSPORT[7]	**697.5**	**796.0**	**1121.5**	**1154.5**	**455.8**	**498.7**	**634.9**	**655.4**	**60.9**	**80.3**	**149.6**	**153.5**	**180.9**	**217.0**	**337.0**	**345.6**
TOTAL OTHER SECTORS[8]	**900.9**	**960.2**	**1084.6**	**1105.6**	**464.9**	**473.1**	**495.3**	**509.1**	**70.0**	**84.4**	**153.5**	**161.7**	**365.9**	**402.7**	**435.8**	**434.8**
Coal[1]	81.9	75.0	14.0	13.0	14.0	14.5	2.8	2.8	8.7	9.6	1.9	1.7	59.2	50.9	9.3	8.4
Oil	390.0	346.2	248.5	246.2	158.1	123.6	67.3	68.9	40.5	44.6	64.7	66.4	191.4	178.0	116.6	110.9
Gas	237.6	284.8	365.6	376.3	185.0	195.7	197.7	204.2	5.7	8.3	22.3	24.3	46.9	80.8	145.6	147.9
Comb. Renewables & Wastes[2]	29.3	40.7	43.6	45.8	10.8	20.1	14.6	16.8	2.0	1.7	2.0	2.2	16.5	18.9	26.9	26.8
Geothermal	–	–	0.5	0.4	–	–	–	–	–	–	0.2	0.2	–	–	0.3	0.3
Solar / Wind / Other	–	0.0	1.4	1.4	–	–	–	–	–	0.0	1.0	1.0	–	0.0	0.4	0.5
Electricity	157.1	203.7	386.3	394.8	97.0	119.2	211.1	214.4	13.2	20.1	59.4	61.6	46.8	64.5	115.8	118.9
Heat	5.0	9.8	24.9	27.7	–	0.0	1.9	2.0	0.0	0.1	2.0	4.4	5.0	9.7	21.0	21.3

Table A18 (continued)

Energy Balances and Key Indicators for IEA and Regions

	IEA Total				North America				Pacific				IEA Europe			
	1973	**1979**	**1998**	**1999**	**1973**	**1979**	**1998**	**1999**	**1973**	**1979**	**1998**	**1999**	**1973**	**1979**	**1998**	**1999**
DEMAND																**Unit: Mtoe**
Fuel Shares (%)																
Coal	*9.1*	*7.8*	*1.3*	*1.2*	*3.0*	*3.1*	*0.6*	*0.5*	*12.4*	*11.4*	*1.2*	*1.1*	*16.2*	*12.6*	*2.1*	*1.9*
Oil	*43.3*	*36.1*	*22.9*	*22.3*	*34.0*	*26.1*	*13.6*	*13.5*	*57.8*	*52.8*	*42.1*	*41.1*	*52.3*	*44.2*	*26.7*	*25.5*
Gas	*26.4*	*29.7*	*33.7*	*34.0*	*39.8*	*41.4*	*39.9*	*40.1*	*8.1*	*9.8*	*14.5*	*15.0*	*12.8*	*20.1*	*33.4*	*34.0*
Comb. Renewables & Wastes	*3.3*	*4.2*	*4.0*	*4.1*	*2.3*	*4.3*	*2.9*	*3.3*	*2.9*	*2.0*	*1.3*	*1.3*	*4.5*	*4.7*	*6.2*	*6.2*
Geothermal	–	–	–	–	–	–	–	–	–	–	*0.1*	*0.1*	–	–	*0.1*	*0.1*
Solar/Wind/Other	–	–	*0.1*	*0.1*	–	–	–	–	–	–	*0.6*	*0.6*	–	–	*0.1*	*0.1*
Electricity	*17.4*	*21.2*	*35.6*	*35.7*	*20.9*	*25.2*	*42.6*	*42.1*	*18.8*	*23.8*	*38.7*	*38.1*	*12.8*	*16.0*	*26.6*	*27.3*
Heat	*0.6*	*1.0*	*2.3*	*2.5*	–	–	*0.4*	*0.4*	–	*0.1*	*1.3*	*2.7*	*1.4*	*2.4*	*4.8*	*4.9*
ENERGY TRANSFORMATION AND LOSSES																
ELECTRICITY GENERATION [9]																
INPUT (Mtoe)	**983.3**	**1207.5**	**1963.3**	**2001.3**	**543.3**	**649.8**	**1025.7**	**1045.2**	**113.0**	**152.5**	**323.0**	**332.3**	**326.9**	**405.2**	**614.6**	**623.8**
OUTPUT (Mtoe)	**371.4**	**459.1**	**751.2**	**771.1**	**192.3**	**233.8**	**375.2**	**385.9**	**48.4**	**63.1**	**129.7**	**134.4**	**130.7**	**162.2**	**246.2**	**250.8**
(TWh gross)	4318.4	5338.4	8734.4	8965.9	2235.6	2718.8	4363.1	4487.1	563.2	733.7	1508.4	1563.1	1519.7	1885.9	2862.9	2915.7
Output Shares (%)																
Coal	*37.2*	*37.8*	*38.5*	*37.7*	*42.1*	*43.3*	*48.4*	*47.5*	*15.7*	*15.7*	*30.5*	*31.6*	*37.9*	*38.5*	*27.4*	*25.8*
Oil	*25.6*	*19.7*	*6.4*	*5.9*	*15.4*	*12.5*	*3.8*	*3.0*	*63.2*	*46.9*	*12.7*	*12.6*	*26.6*	*19.5*	*7.2*	*6.7*
Gas	*11.9*	*11.2*	*14.4*	*15.7*	*17.0*	*13.4*	*13.4*	*14.2*	*2.4*	*11.0*	*18.0*	*18.9*	*7.8*	*8.2*	*14.1*	*16.3*
Comb. Renewables & Wastes	*0.2*	*0.2*	*1.6*	*1.6*	*0.0*	*0.1*	*1.6*	*1.6*	*0.1*	*0.1*	*1.3*	*1.3*	*0.4*	*0.5*	*1.6*	*1.7*
Nuclear	*4.4*	*10.7*	*24.2*	*24.5*	*4.7*	*11.2*	*18.0*	*19.0*	*1.7*	*10.0*	*28.0*	*26.8*	*4.9*	*10.3*	*31.7*	*31.6*
Hydro	*20.6*	*20.1*	*14.4*	*14.1*	*20.6*	*19.4*	*14.3*	*14.1*	*16.7*	*16.0*	*9.1*	*8.4*	*22.2*	*22.8*	*17.4*	*17.2*
Geothermal	*0.1*	*0.2*	*0.3*	*0.3*	*0.1*	*0.2*	*0.4*	*0.4*	*0.3*	*0.3*	*0.4*	*0.4*	*0.2*	*0.1*	*0.2*	*0.2*
Solar/Wind/Other	*0.0*	*0.0*	*0.2*	*0.2*	–	–	*0.1*	*0.1*	–	–	*0.0*	*0.0*	*0.0*	*0.0*	*0.4*	*0.5*
TOTAL LOSSES (Mtoe)	**963.2**	**1101.9**	**1551.5**	**1569.8**	**529.2**	**605.8**	**819.0**	**831.5**	**117.7**	**141.3**	**268.6**	**272.1**	**316.3**	**354.9**	**463.9**	**466.2**
of which:																
Electricity and Heat Generation [10]	603.2	732.8	1170.6	1186.0	351.0	415.0	640.3	648.8	64.6	89.2	191.3	193.4	187.7	228.7	339.1	343.8
Other Transformation	79.5	96.3	56.6	56.7	1.3	33.4	2.1	1.9	31.0	24.9	35.9	36.8	47.1	38.0	18.7	18.0
Own Use and Losses [11]	280.5	272.8	324.3	327.1	176.9	157.4	176.6	180.8	22.1	27.2	41.5	41.9	81.5	88.2	106.2	104.5
Statistical Differences	**–15.3**	**–0.0**	**12.8**	**14.2**	**–10.9**	**5.6**	**11.8**	**18.6**	**–5.5**	**–2.3**	**0.8**	**0.9**	**1.2**	**–3.3**	**0.2**	**–5.4**

Table A18 (continued)

Energy Balances and Key Indicators for IEA and Regions

	IEA Total				North America				Pacific				IEA Europe			
	1973	1979	1998	1999	1973	1979	1998	1999	1973	1979	1998	1999	1973	1979	1998	1999
INDICATORS																
GDP (billion 1995 US$)	13061	15515	25269	25910	4307	5176	8927	9251	2890	3565	6348	6435	5864	6774	9994	10224
Population (millions)	811	851	969	975	234	249	301	303	159	171	195	196	417	430	473	475
TPES/GDP[12]	0.28	0.25	0.19	0.19	0.44	0.40	0.27	0.27	0.14	0.13	0.13	0.13	0.22	0.21	0.16	0.16
Energy Production/TPES	0.63	0.65	0.71	0.70	0.87	0.84	0.85	0.82	0.26	0.30	0.46	0.44	0.40	0.50	0.64	0.65
Per Capita TPES[13]	4.43	4.64	5.03	5.10	8.09	8.31	8.12	8.28	2.58	2.76	4.08	4.19	3.08	3.25	3.45	3.44
Oil Supply/GDP[12]	0.15	0.13	0.08	0.08	0.21	0.19	0.11	0.10	0.10	0.09	0.06	0.06	0.13	0.11	0.07	0.07
TFC/GDP[12]	0.20	0.18	0.13	0.13	0.32	0.28	0.18	0.18	0.10	0.09	0.08	0.09	0.16	0.15	0.12	0.11
Per Capita TFC[13]	3.26	3.34	3.41	3.47	5.88	5.86	5.36	5.48	1.87	1.95	2.70	2.80	2.32	2.44	2.46	2.46
Energy-Related CO_2 Emissions (Mt CO_2)[14]	9901.08	10497.28	11427.67	11529.28	5053.03	5384.74	5993.84	6073.96	1163.42	1267.73	1848.47	1921.00	3684.63	3844.81	3585.36	3534.32
CO_2 Emissions from Bunkers (Mt CO_2)	294.62	312.97	439.54	455.91	46.73	105.19	132.14	145.92	69.58	53.32	69.76	70.18	178.31	154.46	237.64	239.81
GROWTH RATES (% per year)																
	73–79	79–99	91–99	98–99	73–79	79–99	91–99	98–99	73–79	79–99	91–99	98–99	73–79	79–99	91–99	98–99
TPES	**1.6**	**1.3**	**2.0**	**2.0**	**1.5**	**1.1**	**2.3**	**2.8**	**2.4**	**3.1**	**3.4**	**3.2**	**1.4**	**0.9**	**1.0**	**0.1**
Coal	1.5	1.0	0.5	–0.8	2.9	2.2	2.6	0.1	–0.1	3.8	3.2	4.6	0.5	–1.9	–4.3	–6.2
Oil	0.7	0.0	1.8	1.3	1.3	–0.0	2.3	1.9	1.3	1.3	2.4	3.0	–0.2	–0.5	0.9	–0.6
Gas	1.3	2.0	3.3	4.5	–1.0	0.7	2.0	4.3	20.2	7.7	5.8	6.8	7.5	3.5	4.8	4.4
Comb. Renewables & Wastes	4.4	3.4	3.6	6.3	4.8	2.4	3.6	7.6	2.3	7.2	2.9	5.9	3.9	4.4	3.7	4.5
Nuclear	20.4	7.7	2.8	3.7	19.7	5.8	2.1	8.4	40.1	10.2	6.5	–0.6	17.4	9.0	2.1	1.6
Hydro	3.2	0.9	1.1	0.5	2.3	1.0	0.9	1.4	3.8	0.6	–1.0	–4.5	4.1	0.9	2.1	0.7
Geothermal	5.2	7.1	2.5	8.1	9.0	8.4	1.0	13.1	4.7	7.0	6.1	–0.6	0.1	3.4	4.8	3.2
Solar/Wind/Other	3.2	25.2	25.2	16.3	–	–	7.2	41.0	–	26.5	41.8	–1.3	–1.4	23.1	29.4	22.2
TFC	**1.2**	**1.0**	**1.9**	**2.3**	**1.0**	**0.7**	**2.0**	**3.1**	**1.9**	**2.8**	**3.0**	**4.1**	**1.3**	**0.6**	**1.1**	**0.4**
Electricity Consumption	3.6	3.0	2.7	2.2	3.3	2.9	2.5	1.7	4.5	4.3	4.1	3.7	3.8	2.5	2.2	1.9
Energy Production	2.1	1.7	1.5	–0.1	0.8	0.9	0.9	–0.7	4.3	5.5	3.9	–0.4	5.1	2.3	1.9	1.3
Net Oil Imports	0.6	–0.8	2.0	–0.0	6.2	0.7	6.4	2.4	1.3	1.2	2.6	5.6	–2.4	–3.6	–2.9	–8.6
GDP	2.9	2.9	2.7	2.5	3.1	3.3	4.0	3.6	3.6	3.3	1.7	1.4	2.4	2.3	2.2	2.3
Growth in the TPES/GDP Ratio	–1.3	–1.6	–0.7	–0.6	–1.6	–2.1	–1.7	–0.8	–1.2	–0.2	1.7	1.8	–1.0	–1.4	–1.2	–2.1
Growth in the TFC/GDP Ratio	–1.7	–1.9	–0.8	–0.2	–2.1	–2.5	–1.9	–0.5	–1.6	–0.5	1.3	2.7	–1.1	–1.7	–1.1	–1.8

Table A18 (Footnotes)

1. Includes lignite and peat.
2. Comprises solid biomass and animal products, gas/liquids from biomass, industrial waste and municipal waste. Data are often based on partial surveys and may not be comparable between countries.
3. Other includes tide, wave and ambient heat used in heat pumps.
4. Total net imports include combustible renewables and wastes.
5. Total supply of electricity represents net trade. A negative number indicates that exports are greater than imports.
6. Includes non-energy use.
7. Includes less than 1% non-oil fuels.
8. Includes residential, commercial, public service and agricultural sectors.
9. Inputs to electricity generation include inputs to electricity, CHP and heat plants. Output refers only to electricity generation.
10. Losses arising in the production of electricity and heat at public utilities and autoproducers. For non-fossil-fuel electricity generation, theoretical losses are shown based on plant efficiencies of 33% for nuclear, 10% for geothermal and 100% for hydro.
11. Data on "losses" for forecast years often include large statistical differences covering differences between expected supply and demand and mostly do not reflect real expectations on transformation gains and losses.
12. Toe per thousand US dollars at 1995 prices and exchange rates.
13. Toe per person.
14. "Energy-related CO_2 emissions" specifically means CO_2 from the combustion of the fossil fuel components of TPES (i.e. coal and coal products, peat, crude oil and derived products and natural gas), while CO_2 emissions from the remaining components of TPES (i.e. electricity from hydro, other renewables and nuclear) are zero. Emissions from the combustion of biomass-derived fuels are not included, in accordance with the IPCC greenhouse gas inventory methodology. 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

GOVERNMENT ENERGY R&D BUDGETS

Table B1

IEA Government R&D Budgets in National Currencies*

(millions except for Italian, Japanese and Turkish currencies, which are in billions)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Canada	369.4	378.5	362.4	367.6	315.7	322.0	322.0	300.6	265.9	249.6	248.6	244.2
United States	2 164.8	2 497.0	2 598.4	2 261.7	2 264.0	2 441.6	2 409.1	2 149.9	1 965.7	2 024.6	2 293.8	2 266.7
Australia	91.7	..	..	..	110.4	..	116.3	..	157.6	..	..	..
Japan	375.6	367.7	383.0	392.9	404.7	433.9	445.7	459.1	437.7	441.8	433.2	436.3
New Zealand	..	2.0	2.0	..	4.7	3.8	4.4	5.3	5.1	6.4	6.1	6.4
Austria	187.6	137.6	245.0	210.7	286.9	324.6	332.1	334.3	354.1	376.8	365.0	..
Belgium[1]	1 825.0	..	358.4	387.6	671.3	702.5	1 765.8	2 277.1	2 200.5	2 839.3	2 006.7	..
Czech Republic	..	..	..	..	..	..	..	..	..	..	..	..
Denmark	154.5	215.0	262.0	310.0	302.0	259.0	245.1	217.6	258.3	316.2	312.6	327.1
Finland	..	193.3	214.4	227.4	236.4	286.3	346.0	333.6	471.9	486.8	336.5	..
France	3 115.3	3 018.9	3 058.4	2 914.4	2 944.9	2 783.0	3 292.4	3 169.3	3 202.3	3 457.3	4 048.0	..
Germany[2]	799.1	856.0	863.0	710.1	715.9	586.8	512.8	557.4	507.0	547.8	226.7	210.4
Greece	1 546.2	1 487.0	1 577.1	1 208.0	1 125.0	1 138.9	2 091.9	2 560.3	4 863.4	..	..	..
Hungary	..	..	..	..	..	..	44.6	10.5	..	122.0	75.1	..
Ireland	..	0.7	..	..	..	..	..	..	..	..	..	..
Italy	844.8	798.6	788.7	..	444.7	436.5	472.1	460.5	429.6	430.0	..	..
Luxembourg[3]	–	–	–	–	–	–	–	–	–	–	–	–
Netherlands	279.9	304.1	304.1	299.6	338.4	310.8	303.8	263.8	293.0	270.2	309.2	..
Norway	313.7	323.7	368.5	391.9	366.5	355.7	304.4	288.3	281.8	277.4	371.6	370.0
Portugal	1 105.6	1 427.4	1 024.8	943.9	646.6	547.8	273.3	350.3	235.4	322.7	399.6	296.0
Spain	7 095.0	5 409.1	12 975.8	10 985.9	9 658.3	10 657.0	9 988.0	9 867.0	10 037.0	7 883.1	8 314.8	8 268.5
Sweden	585.1	591.0	567.0	714.1	553.1	598.0	452.9	413.1	467.0	440.0	590.0	630.0
Switzerland	165.4	187.2	199.0	220.6	223.3	220.8	215.1	206.7	196.9	182.6	179.9	187.0
Turkey[4]	8.9	5.2	9.7	23.6	41.2	42.1	189.1	274.8	1 608.9	1 387.8	1 406.3	2 237.6
United Kingdom	190.2	166.7	142.9	133.5	98.8	50.9	52.9	36.4	49.3	43.8	42.8	47.4
European Commission[5]	..	..	..	..	..	..	..	..	..	..	..	..

* Korea is not included throughout this annex.

1. Figures for 1991 refer to Wallonia only. From 1991 to 1994, nuclear data are not available and therefore are not included in the budget.
2. Data do not include the new Länder of Germany prior to 1992.
3. Luxembourg has no energy R&D programme.
4. The strong increase in the budget is due to high inflation rate in Turkey and to new RD&D activities.
5. The European Commission is revising its current RD&D series.

Source: Country submissions.

Table B2

IEA Government R&D Budgets in 2000 National Currencies

(millions except for Italian, Japanese and Turkish currencies, which are in billions)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Canada	445.0	442.7	412.7	413.2	349.6	352.8	345.0	316.6	277.5	262.0	256.9	244.2
United States	2 780.7	3 088.7	3 099.5	2 636.2	2 574.4	2 721.4	2 627.6	2 300.4	2 062.1	2 099.1	2 342.0	2 266.7
Australia	112.6	..	..	..	122.6	..	126.2	..	164.7	..	..	..
Japan	388.7	372.1	377.4	380.4	389.7	417.0	431.2	450.6	428.4	431.2	426.4	436.3
New Zealand	..	2.3	2.3	..	5.1	4.1	4.6	5.5	5.3	6.5	6.3	6.4
Austria	238.5	169.2	290.3	239.4	317.1	348.8	348.7	346.5	361.3	382.3	366.8	..
Belgium[1]	2 302.8	..	427.5	445.9	744.3	764.7	1 889.4	2 407.6	2 297.1	2 915.6	2 041.1	..
Czech Republic	..	..	..	..	..	..	..	..	..	..	..	..
Denmark	199.7	268.0	317.7	365.3	351.1	295.9	275.2	238.4	278.6	334.0	321.5	327.1
Finland	..	230.8	251.6	264.5	268.5	319.1	370.2	357.7	496.0	496.0	340.6	..
France	3 739.8	3 523.2	3 465.1	3 238.9	3 194.9	2 967.0	3 450.4	3 272.3	3 267.8	3 500.7	4 083.1	..
Germany[2]	1 013.8	1 052.5	1 021.2	800.2	778.1	622.1	532.8	573.4	517.0	552.6	226.7	210.4
Greece	4 584.8	3 654.6	3 235.1	2 156.2	1 755.5	1 597.7	2 673.4	3 046.6	5 418.9	..	..	..
Hungary	..	..	..	..	..	..	84.8	16.5	..	143.4	81.0	..
Ireland	..	1.0	..	..	..	..	..	..	..	..	..	..
Italy	1 329.3	1 160.8	1 065.3	..	553.0	524.5	540.1	500.3	455.9	444.4	..	..
Luxembourg[3]	–	–	–	–	–	–	–	–	–	–	–	–
Netherlands	352.1	374.0	364.3	350.9	388.9	348.8	334.8	287.3	312.9	283.0	318.4	..
Norway	458.8	456.0	506.9	541.5	497.5	483.3	401.6	364.3	345.8	343.1	431.4	370.0
Portugal	2 134.1	2 443.3	1 563.4	1 309.5	840.9	670.5	318.1	394.7	257.6	339.3	409.1	296.0
Spain	11 356.0	8 071.4	18 068.3	14 322.9	12 070.2	12 801.8	11 446.2	10 925.2	10 871.8	8 349.4	8 561.3	8 268.5
Sweden	793.2	737.5	657.6	817.4	616.4	651.2	476.5	428.6	478.4	445.1	594.0	630.0
Switzerland	202.3	219.6	220.2	237.6	234.3	227.8	219.6	210.1	200.7	185.6	181.9	187.0
Turkey	3 136.8	1 156.4	1 365.8	2 031.4	2 112.7	1 046.5	2 511.8	2 052.7	6 619.3	3 250.1	2 111.3	2 237.6
United Kingdom	277.8	226.3	181.6	163.3	117.6	59.7	60.6	40.3	53.1	45.8	43.6	47.4
European Commission[4]	..	..	..	..	..	..	..	..	..	..	..	..

1. Figures for 1991 refer to Wallonia only. From 1991 to 1994. nuclear data are not available and therefore are not included in the budget.
2. Data do not include the new Länder of Germany prior to 1992.
3. Luxembourg has no energy R&D programme.
4. The European Commission is revising its current RD&D series.

Sources: *OECD Economic Outlook*, OECD Paris, 2000, and country submissions.

Table B3

IEA Government R&D Budgets

(US$ million at 2000 prices and exchange rates)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2000 exch. rates Unit per $
Canada	299.7	298,1	277.9	278.2	235.4	237.6	232.4	213.2	186.9	176.4	173.0	164.5	1.485
United States	2 780.7	3 088.7	3 099.5	2 636.2	2 574.4	2 721.4	2 627.6	2 300.4	2 062.1	2 099.1	2 342.0	2 266.7	1.000
Australia	65.2	..	..	..	71.0	..	73.1	..	95.4	..	..	..	1.726
Japan	3 605.4	3 452.1	3 501.0	3 529.2	3 614.9	3 868.6	3 999.8	4 180.3	3 973.7	3 999.9	3 955.7	4 047.6	107.8
New Zealand	..	1.1	1.0	..	2.3	1.9	2.1	2.5	2.4	2.9	2.8	2.9	2.205
Austria	16.0	11.3	19.4	16.0	21.2	23.4	23.4	23.2	24.2	25.6	24.6	..	14.930
Belgium[1]	52.6	..	9.8	10.2	17.0	17.5	43.2	55.0	52.5	66.6	46.6	..	43.770
Czech Republic	..	..	..	..	..	..	..	..	..	..	..	..	..
Denmark	24.7	33.1	39.3	45.2	43.4	36.6	34.0	29.5	34.4	41.3	39.7	40.4	8.090
Finland	..	35.8	39.0	41.0	41.6	49.5	57.4	55.4	76.9	76.9	52.8	..	6.452
France	525.4	495.0	486.8	455.0	448.8	416.8	484.7	459.7	459.1	491.8	573.6	..	7.118
Germany[2]	477.7	496.0	481.3	377.1	366.7	293.2	251.1	270.2	243.6	260.4	106.8	99.2	2.122
Greece	12.6	10.0	8.9	5.9	4.8	4.4	7.3	8.4	14.9	..	..	..	364.100
Hungary	..	..	..	..	..	..	0.3	0.1	..	0.5	0.3	..	282.300
Ireland	..	1.1	..	..	..	..	..	..	..	..	..	..	0.855
Italy	632.7	552.5	507.0	..	263.2	249.6	257.1	238.1	217.0	211.5	..	..	2 101
Luxembourg[3]	–	–	–	–	–	–	–	–	–	–	–	–	43.770
Netherlands	147.3	156.4	152.3	146.7	162.7	145.9	140.0	120.1	130.9	118.4	133.2	..	2.391
Norway	52.2	51.8	57.6	61.6	56.5	54.9	45.7	41.4	39.3	39.0	49.0	42.1	8.797
Portugal	9.8	11.2	7.2	6.0	3.9	3.1	1.5	1.8	1.2	1.6	1.9	1.4	217.500
Spain	62.9	44.7	100.1	79.4	66.9	70.9	63.4	60.5	60.2	46.3	47.4	45.8	180.500
Sweden	86.7	80.6	71.9	89.3	67.4	71.2	52.1	46.8	52.3	48.6	64.9	68.9	9.149
Switzerland	119.9	130.1	130.5	140.8	138.8	134.9	130.1	124.5	118.9	109.9	107.8	110.8	1.688
Turkey	5.0	1.9	2.2	3.3	3.4	1.7	4.0	3.3	10.6	5.2	3.4	3.6	624 300
United Kingdom	420.3	342.3	274.8	247.0	177.9	90.4	91.6	60.9	80.3	69.3	66.0	71.7	0.661
Total Reported[4]	**9 396.8**	**9 293.9**	**9 267.5**	**8 168.1**	**8 382.2**	**8 493.3**	**8 621.8**	**8 295.5**	**7 936.7**	**7 891.3**	**..**	**..**	**–**
European Commission[5]	..	..	..	..	..	..	..	..	..	..	..	..	1.085

1. Figures for 1991 refer to Wallonia only. From 1991 to 1994, nuclear data are not available and therefore are not included in the budget.
2. Data do not include the new Länder of Germany prior to 1992.
3. Luxembourg has no energy R&D programme.
4. Yearly totals are not comparable because of missing data.
5. The European Commission is revising its current RD&D series.

Sources: *OECD Economic Outlook*, OECD Paris, 2000, and country submissions.

Table B4

IEA Government Budgets on Energy R&D

(per thousand units of GDP)

	R&D/GDP including nuclear research								
	1992	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
Canada	0.53	0.44	0.42	0.40	0.36	0.30	0.28	0.26	0.24
United States	0.36	0.34	0.35	0.33	0.28	0.24	0.23	0.25	0.23
Australia	..	0.25	..	0.24	..	0.29	..	..	..
Japan	0.83	0.85	0.91	0.92	0.92	0.86	0.89	0.87	0.88
New Zealand	..	0.06	0.04	0.05	0.06	0.05	0.06	0.06	0.06
Austria	0.10	0.13	0.14	0.14	0.14	0.14	0.14	0.14	..
Belgium[1]	0.05	0.09	0.09	0.22	0.27	0.25	0.31	0.21	..
Czech Republic	..	..	..	..	..	..	..	..	..
Denmark	0.35	0.34	0.27	0.24	0.21	0.23	0.27	0.26	0.25
Finland	0.47	0.48	0.55	0.61	0.57	0.74	0.70	0.47	..
France	0.41	0.41	0.37	0.42	0.40	0.39	0.41	0.46	..
Germany[2]	0.23	0.22	0.17	0.15	0.16	0.14	0.14	0.06	0.05
Greece	0.06	0.05	0.05	0.08	0.09	0.15	..	..	..
Hungary	..	..	..	0.01	0.00	..	0.01	0.01	..
Ireland	..	..	..	..	..	..	..	..	..
Italy	..	0.28	0.26	0.26	0.24	0.22	0.21	..	..
Luxembourg[3]	–	–	–	–	–	–	–	–	–
Netherlands	0.51	0.56	0.49	0.46	0.38	0.40	0.35	0.38	..
Norway	0.50	0.44	0.41	0.33	0.28	0.26	0.25	0.31	0.26
Portugal	0.07	0.05	0.04	0.02	0.02	0.01	0.02	0.02	0.01
Spain	0.18	0.15	0.16	0.14	0.13	0.12	0.09	0.09	0.08
Sweden	0.48	0.37	0.37	0.26	0.24	0.26	0.23	0.30	0.31
Switzerland	0.64	0.64	0.62	0.59	0.57	0.53	0.48	0.46	0.46
Turkey	0.02	0.02	0.01	0.02	0.02	0.06	0.03	0.02	0.02
United Kingdom	0.22	0.15	0.08	0.07	0.05	0.06	0.05	0.05	0.05

	R&D/GDP excluding nuclear research								
	1992	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
Canada	0.28	0.21	0.20	0.19	0.20	0.17	0.16	0.18	0.17
United States	0.27	0.27	0.29	0.26	0.24	0.20	0.20	0.22	0.20
Australia	..	0.25	..	0.22	..	0.29	..	..	..
Japan	0.17	0.17	0.23	0.23	0.22	0.21	0.26	0.25	0.26
New Zealand	..	0.06	0.04	0.05	0.06	0.05	0.06	0.06	0.06
Austria	0.09	0.12	0.13	0.13	0.13	0.13	0.13	0.12	..
Belgium[1]	0.05	0.09	0.09	0.10	0.10	0.08	0.09	0.04	..
Czech Republic	..	..	..	..	..	..	..	..	..
Denmark	0.33	0.32	0.26	0.24	0.20	0.23	0.24	0.23	0.23
Finland	0.38	0.39	0.48	0.55	0.49	0.67	0.64	0.40	..
France	0.05	0.04	0.04	0.04	0.04	0.03	0.03	0.04	..
Germany[2]	0.10	0.10	0.07	0.06	0.07	0.06	0.06	0.06	0.05
Greece	0.06	0.05	0.05	0.07	0.08	0.14	..	..	..
Hungary	..	..	..	0.01	0.00	..	0.01	0.00	..
Ireland	..	..	..	..	..	..	..	..	..
Italy	..	0.15	0.15	0.16	0.14	0.12	0.12	..	..
Luxembourg[3]	–	–	–	–	–	–	–	–	–
Netherlands	0.33	0.44	0.37	0.34	0.33	0.35	0.30	0.34	..
Norway	0.43	0.38	0.35	0.27	0.23	0.21	0.20	0.26	0.22
Portugal	0.05	0.03	0.01	0.02	0.02	0.01	0.02	0.02	0.01
Spain	0.11	0.09	0.09	0.07	0.07	0.06	0.05	0.05	0.05
Sweden	0.40	0.29	0.30	0.23	0.21	0.23	0.21	0.28	0.31
Switzerland	0.45	0.44	0.44	0.43	0.40	0.37	0.34	0.34	0.35
Turkey	0.02	0.01	0.00	0.02	0.01	0.05	0.02	0.02	0.02
United Kingdom	0.08	0.07	0.04	0.04	0.03	0.04	0.03	0.03	0.04

1. Nuclear data are not available before 1994 and therefore are not included in the budget.
2. Data do not include the new Länder of Germany prior to 1992.
3. Luxembourg has no energy R&D programme.

Sources: *OECD Economic Outlook*, OECD Paris, 2000, and country submissions.

Table B5

IEA Government R&D Budgets for Conservation
(US$ million at 2000 prices and exchange rates)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Canada	31.1	31.0	28.1	23.8	26.0	38.7	37.8	38.7	37.5	38.3	40.6	40.8
United States	203.6	224.1	258.6	332.1	349.7	476.9	552.1	442.0	406.7	436.8	490.4	538.8
Australia	4.7	..	..	..	4.3	..	8.7	..	6.1	..	..	..
Japan[1]	5.6	3.8	19.7	19.5	30.1	252.5	269.6	309.9	301.6	485.1	587.5	636.9
New Zealand	..	0.5	0.5	..	0.4	0.3	0.5	0.4	0.4	0.2	0.4	0.5
Austria	5.5	5.1	6.1	5.1	7.6	9.4	8.5	8.5	8.0	6.4	7.1	..
Belgium[2]	0.8	..	6.7	2.9	6.2	8.4	7.6	9.8	8.6	12.6	3.8	..
Czech Republic	..	..	..	..	..	..	..	..	..	..	..	..
Denmark	6.9	9.7	7.6	8.6	6.2	5.1	4.3	4.6	6.9	7.9	8.7	11.9
Finland	..	8.4	12.5	12.9	13.4	14.7	20.1	19.8	32.9	39.9	23.5	..
France	14.8	22.1	16.7	16.1	10.5	7.1	6.8	6.2	4.0	5.6	10.8	..
Germany[3]	16.1	15.5	15.6	11.0	10.4	11.9	13.7	19.8	12.9	11.6	16.4	14.1
Greece	1.3	2.8	1.1	0.2	0.2	1.2	1.4	1.8	4.5	..	..	..
Hungary	..	..	..	..	..	..	–	–	..	–	..	..
Ireland	..	0.2	..	..	..	..	..	..	..	..	..	..
Italy	33.9	42.1	49.0	..	47.8	45.1	47.6	48.2	44.7	44.5	..	..
Luxembourg[4]	–	–	–	–	–	–	–	–	–	–	–	–
Netherlands	39.8	50.7	49.3	38.8	55.6	42.8	46.2	45.7	49.5	43.2	49.4	..
Norway	11.0	10.3	12.2	14.5	13.9	8.0	1.9	1.7	1.6	1.5	1.5	1.5
Portugal	1.5	2.3	1.0	0.5	0.9	0.4	0.7	0.6	0.5	0.1	0.2	0.2
Spain	1.7	3.2	37.6	11.0	4.2	6.9	5.3	3.3	3.2	6.1	2.8	3.4
Sweden	27.6	26.2	24.4	27.5	22.0	20.9	18.9	22.0	16.4	13.7	20.6	..
Switzerland	16.4	17.0	19.0	21.3	22.6	25.7	24.5	22.9	18.1	17.2	19.1	19.5
Turkey	1.3	0.3	–	–	1.2	–	0.2	0.2	0.1	0.2	0.2	0.2
United Kingdom	47.3	34.2	26.1	32.2	36.4	4.1	2.5	2.2	1.6	0.8	1.1	1.7
Total Reported[5]	**470.9**	**509.5**	**591.8**	**577.9**	**669.5**	**980.0**	**1 079.1**	**1 008.3**	**965.8**	**1 171.7**	**..**	**..**

1. The items included in Conservation were expanded in 1994. Earlier budgetary data are not comparable.
2. Figures for 1991 refer to Wallonia only.
3. Data do not include the new Länder of Germany prior to 1992.
4. Luxembourg has no energy R&D programme.
5. Yearly totals are not comparable because of missing data.

Sources: *OECD Economic Outlook*, OECD Paris, 2000, and country submissions.

Table B6

IEA Government R&D Budgets for Oil & Gas

(US$ million at 2000 prices and exchange rates)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Canada	90.2	91.1	83.7	70.0	50.1	40.3	37.3	43.9	36.8	37.8	38.1	34.8
United States	63.8	73.6	95.0	100.8	180.2	109.4	120.8	82.9	71.6	75.8	74.6	86.6
Australia	16.7	..	..	..	30.6	..	25.4	..	53.0	..	..	..
Japan	81.0	97.2	111.7	117.4	123.7	130.9	149.4	148.8	144.3	108.2	36.5	28.9
New Zealand	..	–	–	..	1.1	0.4	0.4	0.5	0.5	0.5	0.5	0.5
Austria	0.4	0.1	0.5	0.7	0.3	0.2	0.3	0.5	0.2	0.2	0.1	..
Belgium[1]	–	..	–	–	–	–	–	0.1	0.1	–	0.2	..
Czech Republic	..	..	..	..	..	..	..	..	..	..	..	..
Denmark	–	–	–	2.3	2.7	3.0	3.1	2.5	2.3	1.8	2.2	1.7
Finland	..	–	–	–	–	–	–	–	2.0	2.2	2.1	..
France	37.1	36.1	32.8	31.4	29.1	29.1	27.8	27.4	27.1	26.9	26.8	..
Germany[2]	13.0	13.2	6.6	6.0	3.5	2.5	0.7	–	–	–	–	–
Greece	0.1	–	–	0.1	0.1	0.5	1.0	1.0	1.6	..	..	..
Hungary	..	..	..	..	..	..	–	–	..	–	..	..
Ireland	..	0.1	..	..	..	..	..	..	..	..	..	..
Italy	–	–	–	..	–	–	–	–	–	–	..	..
Luxembourg[3]	–	–	–	–	–	–	–	–	–	–	–	–
Netherlands	0.6	0.6	0.6	6.1	8.7	9.1	11.2	11.1	7.6	7.5	7.2	..
Norway	22.2	20.0	16.7	17.5	15.5	24.4	22.7	20.0	18.9	18.2	29.4	22.7
Portugal	–	–	–	–	–	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Spain	–	–	–	–	–	–	–	–	–	–	0.1	0.1
Sweden	3.3	3.5	1.8	1.1	–	–	–	–	–	–	–	..
Switzerland	6.4	7.7	9.9	10.9	10.9	10.3	9.8	7.6	8.4	7.3	6.9	7.1
Turkey	0.7	0.2	–	0.3	0.1	0.1	2.7	1.9	4.0	0.8	0.1	0.1
United Kingdom	22.3	10.7	1.5	6.7	6.2	4.8	10.4	4.8	7.2	5.7	3.8	4.6
Total Reported[4]	**358.0**	**354.1**	**360.8**	**371.3**	**462.9**	**365.2**	**423.1**	**353.2**	**385.5**	**292.9**	**228.9**	**..**

1. Figures for 1991 refer to Wallonia only.
2. Data do not include the new Länder of Germany prior to 1992.
3. Luxembourg has no energy R&D programme.
4. Yearly totals are not comparable because of missing data.

Sources: *OECD Economic Outlook*, OECD Paris, 2000, and country submissions.

Table B7

IEA Government R&D Budgets for Coal

(US$ million at 2000 prices and exchange rates)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Canada	20.6	25.0	24.3	18.4	11.1	8.0	10.0	7.3	2.4	4.1	5.2	4.1
United States	514.4	992.5	818.3	359.1	269.1	431.8	208.6	285.0	101.2	108.2	129.2	120.9
Australia	14.4	..	..	..	12.9	..	12.5	..	15.8	..	..	..
Japan	300.4	293.2	239.3	245.6	279.8	277.2	256.3	230.3	204.2	184.7	141.6	89.4
New Zealand	..	0.2	0.2	..	0.2	0.3	0.2	0.3	0.3	0.3	0.3	0.3
Austria	0.1	0.1	0.4	0.5	1.0	0.6	0.5	1.1	1.4	0.3	0.5	..
Belgium[1]	4.3	..	0.9	1.2	1.0	1.5	1.2	1.4	1.9	0.4	0.5	..
Czech Republic	..	..	..	..	..	..	..	..	..	..	..	..
Denmark	–	3.9	5.5	5.8	4.7	4.2	2.5	0.7	–	–	–	–
Finland	..	4.7	4.3	4.1	2.7	3.3	2.9	3.1	3.1	2.6	2.0	..
France	5.1	4.9	4.8	4.7	4.9	4.8	4.9	4.5	4.4	0.1	–	..
Germany[2]	75.0	68.7	51.5	37.3	22.1	16.2	11.6	3.2	1.2	1.1	14.4	17.2
Greece	1.8	1.8	1.3	0.5	0.3	0.4	0.7	0.6	1.9	..	..	..
Hungary	..	..	..	..	..	..	–	–	..	–	..	..
Ireland	..	0.1	..	..	..	..	..	..	..	..	..	..
Italy	0.4	–	–	..	–	–	–	–	–	–	..	..
Luxembourg[3]	–	–	–	–	–	–	–	–	–	–	–	–
Netherlands	27.4	11.6	11.3	6.4	6.6	5.7	3.0	3.0	2.7	2.9	1.9	..
Norway	0.1	0.1	0.1	0.1	0.1	–	–	–	–	–	–	–
Portugal	1.5	1.0	0.7	1.4	0.5	–	–	–	–	0.1	0.2	0.2
Spain	1.9	2.5	3.1	2.1	1.4	3.8	4.2	3.7	3.5	2.3	4.5	3.3
Sweden	3.0	2.8	1.3	1.4	0.7	0.6	0.4	0.2	0.1	–	–	..
Switzerland	0.7	1.3	1.0	0.2	0.1	0.3	0.4	–	–	–	–	–
Turkey	1.3	0.8	2.0	0.7	0.4	0.1	0.2	0.1	3.1	1.6	1.3	1.2
United Kingdom	6.0	24.1	8.1	7.4	13.2	5.7	8.5	8.1	4.0	2.1	0.9	2.5
Total Reported[4]	**978.4**	**1 439.4**	**1 178.5**	**696.9**	**633.0**	**764.5**	**528.5**	**552.5**	**351.2**	**311.1**	**302.7**	**..**

1. Figures for 1991 refer to Wallonia only.
2. Data do not include the new Länder of Germany prior to 1992.
3. Luxembourg has no energy R&D programme.
4. Yearly totals are not comparable because of missing data.

Sources: *OECD Economic Outlook*, OECD Paris, 2000, and country submissions.

Table B8

IEA Government R&D Budgets for Conventional Nuclear

(US$ million at 2000 prices and exchange rates)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Canada	119,8	117.4	109.7	119.7	116.6	116.7	114.2	86.7	84.1	70.4	53.6	46.3
United States	751.8	663.5	669.1	254.7	133.0	106.1	91.9	41.9	59.2	20.7	23.0	34.8
Australia	13.3	..	..	..	0.7	..	4.9	..	0.7	..	..	..
Japan	1 888.2	1 852.3	1 934.7	1 980.1	2 044.1	2 100.5	2 304.3	2 450.5	2 351.1	2 301.1	2 323.7	2 204.8
New Zealand	..	–	–	..	–	–	–	–	–	–	–	–
Austria	0.8	0.5	0.3	0.4	0.5	0.5	0.5	0.7	0.5	–	0.4	..
Belgium	30.1	..	..	..	..	..	21.0	30.8	31.5	42.6	32.9	..
Czech Republic	..	..	..	..	..	..	..	..	..	..	..	..
Denmark	–	2.5	0.6	0.7	0.7	0.7	0.5	0.5	0.5	2.6	2.5	2.4
Finland	..	7.3	7.8	7.8	7.3	6.3	5.3	6.8	6.2	6.5	6.8	..
France	400.0	359.7	354.3	333.3	327.5	307.6	394.6	371.9	378.6	408.4	478.8	..
Germany[1]	121.4	143.6	164.7	87.6	77.8	64.1	62.8	49.2	34.8	33.3	–	–
Greece	0.4	0.1	0.1	–	–	0.2	0.2	0.2	0.2	..	..	..
Hungary	..	..	..	..	..	..	–	–	..	0.2	0.3	..
Ireland	..	–	..	..	..	..	..	..	..	..	..	..
Italy	90.6	79.6	52.1	..	46.0	46.3	36.9	33.2	32.8	29.5	..	..
Luxembourg[2]	–	–	–	–	–	–	–	–	–	–	–	–
Netherlands	20.9	20.4	19.9	27.5	22.5	19.5	22.1	11.0	10.4	11.5	6.2	..
Norway	3.1	3.0	8.0	8.2	8.2	7.8	7.9	7.5	7.3	8.2	7.7	6.9
Portugal	2.1	1.8	1.2	1.0	0.3	2.0	0.1	0.1	0.1	–	–	–
Spain	26.2	14.4	16.2	19.5	17.1	16.1	15.1	15.1	14.9	7.0	4.5	3.7
Sweden	1.1	1.1	1.4	1.5	1.4	1.3	1.2	1.1	1.0	1.0	1.0	..
Switzerland	25.8	25.6	23.9	21.4	21.1	21.2	20.4	17.8	18.2	17.0	12.4	11.8
Turkey	0.5	0.3	–	0.9	1.2	0.9	0.6	0.8	1.2	0.8	0.2	0.2
United Kingdom	97.3	42.3	40.5	35.6	19.8	14.2	12.7	6.7	1.6	3.2	–	–
Total Reported[3]	**3 593.3**	**3 335.3**	**3 404.3**	**2 899.9**	**2 846.1**	**2 832.1**	**3 117.3**	**3 132.5**	**3 035.0**	**2 963.9**	**..**	**..**

1. Data do not include the new Länder of Germany prior to 1992.
2. Luxembourg has no energy R&D programme.
3. Yearly totals are not comparable because of missing data.

Sources: *OECD Economic Outlook*, OECD Paris, 2000, and country submissions.

Table B9

IEA Government R&D Budgets for Nuclear Breeders

(US$ million at 2000 prices and exchange rates)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Canada	–	–	–	–	–	–	–	–	–	0.2	0.4	0.4
United States	–	–	–	–	–	–	–	–	–	–	–	–
Australia	–	..	..	..	–	..	–	..	–	..	..	..
Japan	773.3	648.9	590.8	528.0	524.9	472.7	369.6	344.4	296.1	254.7	234.2	398.0
New Zealand	..	–	–	..	–	–	–	–	–	–	–	–
Austria	–	–	–	–	–	–	–	–	–	–	–	..
Belgium	9.9	..	..	..	..	..	–	–	–	–	–	..
Czech Republic	..	..	..	..	..	..	..	..	..	..	..	..
Denmark	–	–	–	–	–	–	–	–	–	..	–	–
Finland	..	–	–	–	0.1	–	0.8	–	–	–	–	..
France	20.7	24.9	35.0	25.0	39.8	31.9	13.5	13.1	10.5	19.2	17.7	..
Germany[1]	50.8	38.3	21.1	3.6	–	–	–	–	–	–	–	–
Greece	–	–	–	–	–	–	–	–	–	..	..	..
Hungary	..	..	..	..	..	..	–	–	..	–	–	..
Ireland	..	–	..	..	..	..	..	..	..	..	..	..
Italy	11.2	–	–	..	–	–	–	–	–	–	..	..
Luxembourg[2]	–	–	–	–	–	–	–	–	–	–	–	–
Netherlands	–	1.5	1.5	0.4	0.4	0.2	0.2	–	–	–	–	..
Norway	–	–	–	–	–	–	–	–	–	–	–	–
Portugal	–	–	–	–	–	–	–	–	–	–	–	–
Spain	–	–	–	–	–	–	–	–	–	–	–	–
Sweden	3.3	3.2	4.1	4.3	4.2	4.0	3.7	3.2	2.9	2.9	2.9	..
Switzerland	0.9	1.2	0.9	1.2	1.1	0.4	0.8	0.8	0.3	0.1	0.1	..
Turkey	–	–	–	–	–	–	–	–	–	–	–	–
United Kingdom	156.5	145.9	116.0	95.5	45.0	1.8	0.2	–	–	–	–	–
Total Reported[3]	**1 026.7**	**863.9**	**769.5**	**658.1**	**615.4**	**511.1**	**388.8**	**361.5**	**309.7**	**277.1**	**255.3**	**..**

1. Data do not include the new Länder of Germany prior to 1992.
2. Luxembourg has no energy R&D programme.
3. Yearly totals are not comparable because of missing data.

Sources: *OECD Economic Outlook*, OECD Paris, 2000, and country submissions.

Table B10

IEA Government R&D Budgets for Nuclear Fusion

(US$ million at 2000 prices and exchange rates)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Canada	6.8	10.2	9.5	9.6	6.3	6.2	6.1	6.7	–	2.5	0.1	0.1
United States	397.0	385.7	335.2	387.2	381.0	366.3	401.8	255.7	230.2	225.3	225.2	238.3
Australia	2.5	..	..	..	–	..	–	..	–	..	..	..
Japan	303.3	297.1	272.5	291.8	314.5	317.7	327.2	365.7	341.1	275.3	269.7	259.3
New Zealand	..	–	–	..	–	–	–	–	–	–	–	–
Austria	1.2	0.5	1.9	1.4	1.6	1.0	1.1	0.6	1.0	2.2	2.4	..
Belgium	5.7	..	..	..	..	..	3.1	4.3	4.5	4.6	5.2	..
Czech Republic	..	..	..	..	..	..	..	..	..	..	..	..
Denmark	3.1	2.8	1.8	1.9	1.1	–	–	–	–	1.6	1.7	1.7
Finland	..	–	–	–	–	–	–	0.9	1.4	0.9	0.5	..
France	40.3	39.7	36.3	37.8	32.2	31.8	32.5	32.3	31.8	28.0	27.9	..
Germany[1]	115.0	114.9	113.9	116.4	118.2	102.0	87.4	93.4	102.0	113.6	–	–
Greece	0.1	0.1	0.1	–	–	–	–	–	–	..	..	..
Hungary	..	..	..	..	..	..	–	–	..	–	–	..
Ireland	..	–	..	..	..	..	..	..	..	..	..	..
Italy	100.9	106.0	86.8	..	75.2	60.9	61.5	66.9	65.7	63.0	..	..
Luxembourg[2]	–	–	–	–	–	–	–	–	–	–	–	–
Netherlands	11.3	9.5	9.2	22.5	12.7	14.3	12.4	5.2	6.8	5.9	6.8	..
Norway	–	–	–	–	–	–	–	–	–	–	–	–
Portugal	–	2.8	1.5	0.9	0.8	–	–	–	–	–	–	–
Spain	6.3	7.1	10.1	8.7	9.1	14.7	14.0	14.0	13.9	12.9	14.5	14.0
Sweden	10.3	9.5	8.5	8.3	8.7	9.1	1.7	1.5	1.2	1.2	1.1	..
Switzerland	22.2	24.3	21.3	20.4	20.0	17.2	15.2	17.8	18.5	14.9	15.1	14.8
Turkey	–	–	–	–	–	–	–	–	–	–	–	–
United Kingdom	53.3	44.9	38.6	30.2	28.8	28.4	27.5	20.1	27.7	20.5	22.2	21.7
Total Reported[3]	**1 079.5**	**1 055.0**	**947.3**	**937.1**	**1 010.4**	**969.6**	**991.5**	**885.2**	**845.8**	**772.6**	**..**	**..**

1. Data do not include the new Länder of Germany prior to 1992.
2. Luxembourg has no energy R&D programme.
3. Yearly totals are not comparable because of missing data.

Sources: *OECD Economic Outlook*, OECD Paris, 2000, and country submissions.

Table B11

IEA Government R&D Budgets for Renewables

(US$ million at 2000 prices and exchange rates)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Canada	11.8	9.8	9.4	10.8	9.7	11.2	11.0	10.9	8.4	8.7	10.6	12.0
United States	145.1	134.5	178.9	250.7	239.9	246.4	297.8	219.6	206.6	253.7	264.2	210.7
Australia	4.0	..	..	..	7.0	..	3.4	..	5.0	..	..	..
Japan	132.1	131.0	127.2	121.6	126.5	116.8	117.7	120.7	119.8	132.1	140.0	167.6
New Zealand	..	0.3	0.3	..	0.6	0.7	0.8	1.1	1.1	1.2	0.8	0.9
Austria	2.8	1.9	4.3	3.7	5.0	6.4	7.6	5.9	7.0	9.2	8.6	..
Belgium[1]	0.5	..	0.3	1.8	2.1	2.2	3.5	2.6	2.9	1.2	0.9	..
Czech Republic	..	..	..	..	..	..	..	..	..	..	..	..
Denmark	10.3	8.2	16.5	17.5	18.7	16.2	15.2	12.2	15.9	17.3	14.8	14.9
Finland	..	2.1	1.7	1.8	5.3	5.0	5.1	6.5	10.5	7.7	5.2	..
France	7.3	7.6	6.9	6.8	4.9	4.6	4.5	4.3	2.6	3.6	11.6	..
Germany[2]	77.4	91.9	100.6	106.1	115.8	76.5	67.5	83.8	65.5	73.4	62.7	55.8
Greece	7.8	3.9	3.9	4.2	3.0	1.6	2.9	2.7	5.6	..	..	..
Hungary	..	..	..	..	..	..	0.3	0.1	..	–	..	..
Ireland	..	0.4	..	..	..	..	..	..	..	..	..	..
Italy	37.5	42.7	32.6	..	24.1	27.3	37.3	34.8	32.1	29.9	..	..
Luxembourg[3]	–	–	–	–	–	–	–	–	–	–	–	–
Netherlands	20.9	31.6	30.8	18.3	18.2	15.8	17.8	17.6	26.1	19.4	39.5	..
Norway	3.3	5.5	9.9	10.9	8.7	7.1	4.7	4.3	4.3	5.0	4.9	4.9
Portugal	3.1	1.6	1.5	2.1	1.4	0.5	0.5	1.0	0.5	1.1	1.2	0.7
Spain	13.1	17.5	14.6	19.9	17.9	13.1	12.7	12.7	12.7	15.9	13.5	13.2
Sweden	18.4	15.5	10.4	25.2	12.6	15.2	11.8	7.5	7.7	12.4	12.2	..
Switzerland	21.7	26.4	28.2	33.5	34.9	32.9	32.2	30.7	32.4	31.4	32.3	35.0
Turkey	0.9	0.2	0.1	1.2	0.3	0.4	0.1	0.1	2.0	1.6	1.1	1.1
United Kingdom	31.2	30.3	32.9	29.8	27.3	16.2	15.8	10.3	7.0	5.2	7.1	8.5
Total Reported[4]	**549.0**	**562.8**	**611.1**	**665.8**	**684.0**	**616.4**	**670.0**	**589.3**	**575.6**	**629.9**	**..**	**..**

1. Figures for 1991 refer to Wallonia only.
2. Data do not include the new Länder of Germany prior to 1992.
3. Luxembourg has no energy R&D programme.
4. Yearly totals are not comparable because of missing data.

Sources: *OECD Economic Outlook*, OECD Paris, 2000, and country submissions.

Table B12

Total Reported Government R&D Budgets for Renewable Energy Sources

(US$ million at 2000 prices and exchange rates)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Solar Heating	46.3	50.3	51.5	249.1	49.6	47.7	45.2	30.8	31.4	29.1	26.1	..
Solar Photo Electric	193.0	196.2	212.1	148.4	371.2	228.4	235.3	209.5	212.6	231.3	251.5	..
Solar Thermal Electric	29.4	41.9	41.2	16.9	21.0	46.1	48.9	41.8	40.8	29.2	29.6	..
Wind	77.9	87.9	84.9	64.8	74.5	84.2	106.5	101.1	86.9	91.0	88.4	..
Ocean	10.8	12.6	11.5	3.0	4.3	4.0	2.4	2.2	2.3	12.3	7.3	..
Biomass	93.1	78.9	102.8	79.2	74.0	129.2	135.6	119.3	119.6	160.6	151.0	..
Geothermal	98.0	94.9	102.5	89.8	80.9	66.4	82.8	73.4	72.3	68.3	64.9	..
Large Hydro (>10 MW)	..	..	3.8	7.7	7.3	8.8	11.7	8.5	6.4	5.3	6.3	..
Small Hydro (<10 MW)	0.3	0.3	0.5	6.8	1.3	1.6	1.7	2.8	3.2	3.0	6.1	..
TOTAL	**549.0**	**562.8**	**611.1**	**665.8**	**684.0**	**616.4**	**670.0**	**589.3**	**575.6**	**629.9**	**..**	**..**

Note: Yearly totals are not comparable because of missing data (see Table B11).
Sources: *OECD Economic Outlook*, OECD Paris, 2000, and country submissions.

Table B13

IEA Government R&D Budgets for Electricity

(US$ million at 2000 prices and exchange rates)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Canada	4.2	3.6	3.1	8.5	9.2	8.6	8.4	7.2	4.0	4.3	4.4	6.0
United States	62.8	66.7	65.2	46.6	48.1	129.3	143.6	129.4	131.8	131.0	129.9	123.8
Australia	8.2	..	..	..	5.3	..	4.2	..	3.9	..	..	..
Japan	98.1	104.8	105.9	107.7	66.4	75.9	76.1	79.8	82.1	140.9	146.0	180.5
New Zealand	..	–	–	..	–	–	0.1	0.2	0.2	0.2	0.5	0.5
Austria	4.2	2.6	4.9	3.1	3.2	4.1	3.4	4.0	3.5	3.9	2.8	..
Belgium[1]	1.3	..	0.1	2.3	6.6	3.7	5.0	5.0	1.6	4.3	2.5	..
Czech Republic	..	..	..	..	..	..	..	..	..	..	..	..
Denmark	2.9	4.6	3.7	4.4	5.0	3.7	3.5	3.8	3.8	3.9	3.5	3.2
Finland	..	10.5	10.3	12.1	10.3	14.4	14.7	11.0	14.2	13.0	10.5	..
France	–	–	–	–	–	–	–	–	–	–	–	..
Germany[2]	7.7	8.1	5.6	4.2	2.3	2.8	1.9	10.9	18.8	19.9	7.1	5.1
Greece	0.6	0.4	0.8	0.1	–	0.1	0.1	0.1	0.2	..	..	..
Hungary	..	..	..	..	..	..	–	–	..	0.1	–	..
Ireland	..	–	..	..	..	..	..	..	..	..	..	..
Italy	89.5	27.5	47.9	..	10.1	17.6	14.0	14.3	13.2	13.8	..	..
Luxembourg[3]	–	–	–	–	–	–	–	–	–	–	–	–
Netherlands	1.6	1.6	1.6	18.0	29.5	31.8	15.5	15.3	13.8	12.9	10.7	..
Norway	4.0	5.0	0.7	2.9	2.9	2.9	3.6	2.7	2.4	2.1	1.8	2.2
Portugal	0.2	0.1	–	–	–	–	–	–	–	–	–	–
Spain	–	–	–	–	–	–	0.3	0.3	0.3	0.3	1.1	1.4
Sweden	1.8	1.6	2.4	1.8	3.4	8.5	4.0	1.0	9.7	6.9	14.3	..
Switzerland	16.6	19.0	18.4	22.2	18.6	16.2	16.3	17.3	13.6	15.0	14.6	14.8
Turkey	0.3	0.1	–	–	0.1	0.1	–	–	0.1	0.1	0.5	0.6
United Kingdom	–	1.7	2.1	3.0	–	6.6	5.3	1.8	1.8	1.9	2.2	3.0
Total Reported[4]	**303.9**	**257.8**	**272.8**	**236.8**	**221.0**	**326.0**	**319.8**	**304.0**	**319.0**	**374.4**	**..**	**..**

1. Figures for 1991 refer to Wallonia only.
2. Data do not include the new Länder of Germany prior to 1992.
3. Luxembourg has no energy R&D programme.
4. Yearly totals are not comparable because of missing data.

Sources: *OECD Economic Outlook*, OECD Paris, 2000, and country submissions.

Table B13A

IEA Government R&D Budgets for Energy Systems Analysis & Others

(US$ million at 2000 prices and exchange rates)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Canada	15.1	9.9	10.0	17.3	6.4	7.7	7.6	11.8	13.6	10.3	19.8	19.9
United States	642.2	548.3	679.2	904.7	973.2	855.3	811.0	843.9	854.7	847.6	1 005.4	912.9
Australia	1.4	..	..	..	10.2	..	14.0	..	10.9	..	..	..
Japan	23.4	23.8	99.5	117.4	105.0	124.3	129.5	130.3	133.5	117.8	76.7	82.2
New Zealand	..	–	–	..	–	0.2	0.1	–	–	0.5	0.2	0.3
Austria	0.9	0.6	1.0	1.3	2.0	1.1	1.6	1.9	2.6	3.4	2.8	..
Belgium[1]	–	..	1.8	2.0	1.1	1.7	1.7	1.1	1.3	0.9	0.5	..
Czech Republic	..	..	..	..	..	..	..	..	..	..	..	..
Denmark	1.6	1.5	3.4	3.9	4.2	3.7	4.9	5.1	5.1	6.2	6.2	4.6
Finland	..	2.8	2.4	2.3	2.4	5.7	8.5	7.4	6.6	4.1	2.2	..
France	–	–	–	–	–	–	–	–	–	–	–	..
Germany[2]	1.3	1.8	1.7	4.8	16.4	17.3	5.5	10.0	8.4	7.4	6.1	6.9
Greece	0.4	0.9	1.6	0.8	1.2	0.5	1.2	1.9	1.0	..	..	..
Hungary	..	..	..	..	..	..	–	–	..	0.2	–	..
Ireland	..	0.2	..	..	..	..	..	..	..	..	..	..
Italy	268.5	254.7	238.6	..	59.9	52.5	59.9	40.6	28.6	30.8	..	..
Luxembourg[3]	–	–	–	–	–	–	–	–	–	–	–	–
Netherlands	24.8	28.9	28.2	8.7	8.4	6.7	11.5	11.4	14.0	15.1	11.4	..
Norway	8.5	7.9	10.0	7.5	7.3	4.8	4.9	5.3	4.9	4.0	3.8	3.8
Portugal	1.6	1.8	1.3	0.1	–	–	–	–	–	0.2	0.2	0.2
Spain	13.8	–	18.6	18.2	17.1	16.4	11.8	11.5	11.8	1.8	6.4	6.7
Sweden	17.8	17.2	17.6	18.3	14.2	11.5	10.3	10.4	13.3	10.5	12.9	..
Switzerland	9.0	7.6	7.8	9.6	9.3	10.6	10.5	9.5	9.4	7.1	7.3	7.7
Turkey	–	–	–	0.2	0.2	0.1	0.2	0.2	0.2	0.1	0.1	0.1
United Kingdom	6.5	8.2	8.9	6.7	1.1	8.6	8.8	6.8	29.4	29.9	28.6	29.7
Total Reported[4]	**1 036.9**	**916.1**	**1 131.5**	**1 123.9**	**1 239.7**	**1 128.4**	**1 103.7**	**1 109.0**	**1 149.1**	**1 097.9**	**..**	**..**

1. Figures for 1991 refer to Wallonia only.
2. Data do not include the new Länder of Germany prior to 1992.
3. Luxembourg has no energy R&D programme.
4. Yearly totals are not comparable because of missing data.

Sources: *OECD Economic Outlook*, OECD Paris, 2000, and country submissions.

Table B14

IEA Government Energy R&D Expenditure by Country, 1999 and 2000

(US$ million at 2000 prices and exchange rates)

	Australia[1]				Austria[2]			
	1999		2000		1999		2000	
	$	%	$	%	$	%	$	%
1.1 Industry	..	..	..	..	1.51	6.15	..	..
1.2 Residential. Commercial	..	..	..	..	3.00	12.22	..	..
1.3 Transportation	..	..	..	..	1.61	6.54	..	..
1.4 Other Conservation	..	..	..	..	0.95	3.85	..	..
TOTAL CONSERVATION	**..**	**..**	**..**	**..**	**7.07**	**28.76**	**..**	**..**
2.1 Enhanced Oil & Gas	..	..	..	..	0.04	0.16	..	..
2.2 Refining. Transp. & Stor.	..	..	..	..	–	–	..	..
2.3 Oil Shale & Tar Sands	..	..	..	..	–	–	..	..
2.4 Other Oil & Gas	..	..	..	..	0.09	0.37	..	..
Total Oil & Gas	..	..	..	..	0.13	0.53	..	..
3.1 Coal Prod.. Prep.. & Trans.	..	..	..	..	0.08	0.33	..	..
3.2 Coal Combustion	..	..	..	..	0.36	1.48	..	..
3.3 Coal Conversion	..	..	..	..	0.00	0.02	..	..
3.4 Other Coal	..	..	..	..	0.02	0.09	..	..
Total Coal	..	..	..	..	0.47	1.92	..	..
TOTAL FOSSIL FUELS	**..**	**..**	**..**	**..**	**0.60**	**2.45**	**..**	**..**
4.1 Solar Heating & Cooling	..	..	..	..	0.62	2.52	..	..
4.2 Solar Photo–Electric	..	..	..	..	1.00	4.08	..	..
4.3 Solar Thermal–Electric	..	..	..	..	0.09	0.36	..	..
Total Solar	..	..	..	..	1.71	6.95	..	..
5. Wind	..	..	..	..	0.31	1.27	..	..
6. Ocean	..	..	..	..	–	–	..	..
7. Biomass	..	..	..	..	6.24	25.39	..	..
8. Geothermal	..	..	..	..	0.00	0.00	..	..
9.1 Large Hydro (>10 MW)	..	..	..	..	0.11	0.46	..	..
9.2 Small Hydro (<10 MW)	..	..	..	..	0.21	0.85	..	..
Total Hydro	..	..	..	..	0.32	1.31	..	..
TOTAL RENEWABLE ENERGY	**..**	**..**	**..**	**..**	**8.58**	**34.93**	**..**	**..**
10.1 Nuclear LWR	..	..	..	..	–	–	..	..
10.2 Other Converter Reactors	..	..	..	..	–	–	..	..
10.3 Nuclear Fuel Cycle	..	..	..	..	–	–	..	..
10.4 Nuclear Supporting Tech.	..	..	..	..	0.35	1.44	..	..
10.5 Nuclear Breeder	..	..	..	..	–	–	..	..
Total Nuclear Fission	..	..	..	..	0.35	1.44	..	..
11. Nuclear Fusion	..	..	..	..	2.38	9.69	..	..
TOTAL NUCLEAR	**..**	**..**	**..**	**..**	**2.73**	**11.13**	**..**	**..**
12.1 Electric Power Conversion	..	..	..	..	0.92	3.75	..	..
12.2 Electricity Transm.. & Distr.	..	..	..	..	1.21	4.91	..	..
12.3 Energy Storage	..	..	..	..	0.68	2.76	..	..
TOTAL POWER & STORAGE	**..**	**..**	**..**	**..**	**2.81**	**11.42**	**..**	**..**
13.1 Energy Systems Analysis	..	..	..	..	0.87	3.55	..	..
13.2 Other Tech. or Research	..	..	..	..	1.91	7.76	..	..
TOTAL OTHER TECH./RESEARCH	**..**	**..**	**..**	**..**	**2.78**	**11.31**	**..**	**..**
TOTAL ENERGY R&D	**..**	**..**	**..**	**..**	**24.57**	**100.00**	**..**	**..**

1. Australia has not provided data for 1999 and 2000.
2. Austria has not provided data for 2000.
3. Belgium has not provided data for 2000.

Sources: *OECD Economic Outlook*, OECD Paris, 2000, and country submissions.

Belgium[3]				Canada				Denmark			
1999		2000		1999		2000		1999		2000	
$	%	$	%	$	%	$	%	$	%	$	%
0.77	1.65	..	..	14.55	8.41	15.31	9.31	5.57	14.01	7.05	17.43
0.81	1.74	..	..	9.21	5.33	9.26	5.63	1.60	4.03	3.66	9.05
2.16	4.63	..	..	12.78	7.39	12.86	7.82	1.22	3.07	1.15	2.84
0.06	0.12	..	..	4.10	2.37	3.34	2.03	0.33	0.83	–	–
3.79	**8.13**	**..**	**..**	**40.64**	**23.50**	**40.77**	**24.79**	**8.72**	**21.94**	**11.85**	**29.32**
0.23	0.49	..	..	8.59	4.97	8.27	5.03	1.54	3.87	1.46	3.61
–	–	..	..	7.19	4.15	5.44	3.31	0.52	1.31	0.22	0.55
–	–	..	..	11.28	6.52	9.78	5.95	–	–	–	–
–	–	..	..	11.08	6.41	11.30	6.87	0.19	0.48	–	–
0.23	0.49	..	..	38.13	22.05	34.79	21.16	2.25	5.66	1.68	4.16
0.07	0.15	..	..	0.65	0.37	0.62	0.38	–	–	0.02	0.06
0.12	0.27	..	..	0.67	0.39	0.65	0.39	0.04	0.10	–	–
0.13	0.28	..	..	2.56	1.48	1.51	0.92	–	–	–	–
0.21	0.45	..	..	1.36	0.79	1.32	0.80	–	–	–	–
0.54	1.15	..	..	5.24	3.03	4.10	2.49	0.04	0.10	0.02	0.06
0.77	**1.65**	**..**	**..**	**43.37**	**25.07**	**38.89**	**23.65**	**2.29**	**5.76**	**1.71**	**4.22**
0.42	0.91	..	..	1.21	0.70	1.33	0.81	2.44	6.14	1.69	4.19
0.05	0.10	..	..	1.99	1.15	1.19	0.73	0.53	1.34	1.61	3.97
–	–	..	..	0.11	0.06	0.11	0.07	–	–	–	–
0.47	1.01	..	..	3.31	1.91	2.63	1.60	2.97	7.49	3.30	8.16
0.05	0.10	..	..	1.55	0.90	2.70	1.64	6.41	16.12	5.90	14.58
–	–	..	..	0.08	0.04	0.07	0.05	1.02	2.56	1.85	4.59
0.05	0.10	..	..	4.15	2.40	4.46	2.71	4.39	11.04	3.88	9.60
–	–	..	..	0.08	0.04	0.07	0.05	–	–	–	–
–	–	..	..	0.15	0.08	0.58	0.35	–	–	–	–
0.37	0.80	..	..	1.27	0.73	1.47	0.89	–	–	–	–
0.37	0.80	..	..	1.41	0.82	2.05	1.25	–	–	–	–
0.93	**2.00**	**..**	**..**	**10.58**	**6.11**	**11.99**	**7.29**	**14.78**	**37.20**	**14.93**	**36.93**
21.16	45.37	..	..	0.43	0.25	0.36	0.22	–	–	–	–
–	–	..	..	52.32	30.25	45.21	27.49	–	–	–	–
2.58	5.53	..	..	0.43	0.25	0.37	0.23	–	–	–	–
9.15	19.62	..	..	0.46	0.27	0.40	0.24	2.54	6.40	2.44	6.02
–	–	..	..	0.43	0.25	0.36	0.22	–	–	–	–
32.89	70.52	..	..	54.06	31.26	46.71	28.40	2.54	6.40	2.44	6.02
5.19	11.13	..	..	0.13	0.07	0.12	0.07	1.65	4.16	1.66	4.10
38.08	**81.66**	**..**	**..**	**54.19**	**31.33**	**46.83**	**28.48**	**4.19**	**10.56**	**4.09**	**10.12**
2.06	4.43	..	..	1.16	0.67	1.20	0.73	2.87	7.23	2.48	6.14
0.47	1.00	..	..	1.06	0.61	1.03	0.62	–	–	–	–
–	–	..	..	2.22	1.28	3.81	2.32	0.65	1.63	0.72	1.77
2.53	**5.42**	**..**	**..**	**4.44**	**2.57**	**6.03**	**3.67**	**3.52**	**8.86**	**3.20**	**7.92**
0.11	0.24	..	..	1.89	1.09	0.83	0.51	3.38	8.51	2.51	6.21
0.42	0.90	..	..	17.86	10.32	19.11	11.62	2.85	7.17	2.14	5.29
0.53	**1.14**	**..**	**..**	**19.75**	**11.42**	**19.94**	**12.13**	**6.23**	**15.67**	**4.65**	**11.49**
46.63	**100.00**	**..**	**..**	**172.97**	**100.00**	**164.46**	**100.00**	**39.74**	**100.00**	**40.43**	**100.00**

Table B14 (continued)

IEA Government Energy R&D Expenditure by Country, 1999 and 2000

(US$ million at 2000 prices and exchange rates)

	Finland[1]				France[2]			
	1999		2000		1999		2000	
	$	%	$	%	$	%	$	%
1.1 Industry	11.50	21.79	..	..	3.12	0.54	..	..
1.2 Residential. Commercial	9.14	17.31	..	..	3.26	0.57	..	..
1.3 Transportation	0.91	1.73	..	..	4.25	0.74	..	..
1.4 Other Conservation	1.96	3.72	..	..	0.14	0.02	..	..
TOTAL CONSERVATION	**23.52**	**44.55**	**..**	**..**	**10.77**	**1.88**	**..**	**..**
2.1 Enhanced Oil & Gas	–	–	..	..	9.35	1.63	..	..
2.2 Refining. Transp. & Stor.	2.09	3.96	..	..	–	–	..	..
2.3 Oil Shale & Tar Sands	–	–	..	..	–	–	..	..
2.4 Other Oil & Gas	–	–	..	..	17.43	3.04	..	..
Total Oil & Gas	2.09	3.96	..	..	26.78	4.67	..	..
3.1 Coal Prod.. Prep.. & Trans.	0.02	0.03	..	..	–	–	..	..
3.2 Coal Combustion	0.17	0.31	..	..	–	–	..	..
3.3 Coal Conversion	–	–	..	..	–	–	..	..
3.4 Other Coal	1.86	3.53	..	..	–	–	..	..
Total Coal	2.04	3.87	..	..	–	–	..	..
TOTAL FOSSIL FUELS	**4.13**	**7.83**	**..**	**..**	**26.78**	**4.67**	**..**	**..**
4.1 Solar Heating & Cooling	1.52	2.87	..	..	1.28	0.22	..	..
4.2 Solar Photo–Electric	–	–	..	..	2.83	0.49	..	..
4.3 Solar Thermal–Electric	–	–	..	..	–	–	..	..
Total Solar	1.52	2.87	..	..	4.11	0.72	..	..
5. Wind	0.33	0.62	..	..	2.13	0.37	..	..
6. Ocean	–	–	..	..	–	–	..	..
7. Biomass	3.28	6.21	..	..	3.68	0.64	..	..
8. Geothermal	–	–	..	..	1.13	0.20	..	..
9.1 Large Hydro (>10 MW)	0.04	0.08	..	..	–	–	..	..
9.2 Small Hydro (<10 MW)	–	–	..	..	0.57	0.10	..	..
Total Hydro	0.04	0.08	..	..	0.57	0.10	..	..
TOTAL RENEWABLE ENERGY	**5.16**	**9.78**	**..**	**..**	**11.62**	**2.03**	**..**	**..**
10.1 Nuclear LWR	3.82	7.24	..	..	89.13	15.54	..	..
10.2 Other Converter Reactors	–	–	..	..	3.40	0.59	..	..
10.3 Nuclear Fuel Cycle	1.62	3.07	..	..	245.72	42.84	..	..
10.4 Nuclear Supporting Tech.	1.36	2.57	..	..	140.57	24.51	..	..
10.5 Nuclear Breeder	–	–	..	..	17.71	3.09	..	..
Total Nuclear Fission	6.80	12.88	..	..	496.54	86.56	..	..
11. Nuclear Fusion	0.47	0.89	..	..	27.92	4.87	..	..
TOTAL NUCLEAR	**7.27**	**13.77**	**..**	**..**	**524.45**	**91.43**	**..**	**..**
12.1 Electric Power Conversion	9.01	17.07	..	..	–	–	..	..
12.2 Electricity Transm.. & Distr.	1.53	2.89	..	..	–	–	..	..
12.3 Energy Storage	–	–	..	..	–	–	..	..
TOTAL POWER & STORAGE	**10.54**	**19.96**	**..**	**..**	**–**	**–**	**..**	**..**
13.1 Energy Systems Analysis	2.00	3.79	..	..	–	–	..	..
13.2 Other Tech. or Research	0.17	0.32	..	..	–	–	..	..
TOTAL OTHER TECH./RESEARCH	**2.17**	**4.11**	**..**	**..**	**–**	**–**	**..**	**..**
TOTAL ENERGY R&D	**52.79**	**100.00**	**..**	**..**	**573.63**	**100.00**	**..**	**..**

1. Finland has not provided data for 2000. Coal production, preparation and transport includes coal conversion. Other coal
2. France has not provided data for 2000.
3. Greece has not provided data for 1999 and 2000.
4. Hungary has not provided data for 2000. Data for 1999 are not complete.

Sources: *OECD Economic Outlook*, OECD Paris, 2000, and country submissions.

	Germany				Greece[3]				Hungary[4]			
	1999 $	%	2000 $	%	1999 $	%	2000 $	%	1999 $	%	2000 $	%
	4.12	3.86	3.04	3.06	..	..	..	..	..	..	..	..
	12.33	11.54	11.08	11.17	..	..	..	..	..	..	..	..
	–	–	–	–	..	..	..	..	..	..	..	..
	–	–	–	–	..	..	..	..	..	..	..	..
	16.45	**15.40**	**14.11**	**14.23**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**
	–	–	–	–	..	..	..	..	..	..	..	..
	–	–	–	–	..	..	..	..	..	..	..	..
	–	–	–	–	..	..	..	..	..	..	..	..
	–	–	–	–	..	..	..	..	..	..	..	..
	–	–	–	–	..	..	..	..	..	..	..	..
	0.18	0.16	0.20	0.21	..	..	..	..	..	..	..	..
	13.90	13.01	16.86	17.00	..	..	..	..	..	..	..	..
	–	–	–	–	..	..	..	..	..	..	..	..
	0.37	0.34	0.18	0.18	..	..	..	..	..	..	..	..
	14.44	13.52	17.25	17.39	..	..	..	..	..	..	..	..
	14.44	**13.52**	**17.25**	**17.39**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**
	4.54	4.25	4.42	4.46	..	..	..	..	..	..	..	..
	34.02	31.85	29.87	30.12	..	..	..	..	..	..	..	..
	3.27	3.06	1.94	1.95	..	..	..	..	..	..	..	..
	41.83	39.16	36.23	36.53	..	..	..	..	..	..	..	..
	19.23	18.00	18.08	18.23	..	..	..	..	..	..	..	..
	–	–	–	–	..	..	..	..	..	..	..	..
	–	–	–	–	..	..	..	..	..	..	..	..
	1.55	1.45	1.44	1.45	..	..	..	..	..	..	..	..
	–	–	–	–	..	..	..	..	..	..	..	..
	0.11	0.10	0.07	0.07	..	..	..	..	..	..	..	..
	0.11	0.10	0.07	0.07	..	..	..	..	..	..	..	..
	62.72	**58.72**	**55.82**	**56.28**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**
	–	–	–	–	..	..	..	..	0.18	61.25	..	..
	–	–	–	–	..	..	..	..	–	–	..	..
	–	–	–	–	..	..	..	..	–	–	..	..
	–	–	–	–	..	..	..	..	0.10	35.29	..	..
	–	–	–	–	..	..	..	..	–	–	..	..
	–	–	–	–	..	..	..	..	0.28	96.54	..	..
	–	–	–	–	..	..	..	..	–	–	..	..
	–	**–**	**–**	**–**	**..**	**..**	**..**	**..**	**0.28**	**96.54**	**..**	**..**
	6.06	5.67	4.54	4.58	..	..	..	..	–	–	..	..
	–	–	–	–	..	..	..	..	0.00	1.60	..	..
	1.04	0.97	0.55	0.55	..	..	..	..	0.01	1.86	..	..
	7.10	**6.64**	**5.09**	**5.13**	**..**	**..**	**..**	**..**	**0.01**	**3.46**	**..**	**..**
	0.62	0.58	0.41	0.42	..	..	..	..	–	–	..	..
	5.49	5.14	6.49	6.55	..	..	..	..	–	–	..	..
	6.11	**5.72**	**6.91**	**6.96**	**..**	**..**	**..**	**..**	**–**	**–**	**..**	**..**
	106.82	**100.00**	**99.17**	**100.00**	**..**	**..**	**..**	**..**	**0.29**	**100.00**	**..**	**..**

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Table B14 (continued)

IEA Government Energy R&D Expenditure by Country, 1999 and 2000

(US$ million at 2000 prices and exchange rates)

	Ireland[1]				Italy[2]			
	1999		2000		1999		2000	
	$	%	$	%	$	%	$	%
1.1 Industry	..	..	..	..	..	..	..	..
1.2 Residential. Commercial	..	..	..	..	..	..	..	..
1.3 Transportation	..	..	..	..	..	..	..	..
1.4 Other Conservation	..	..	..	..	..	..	..	..
TOTAL CONSERVATION	..	..	..	..	..	..	..	..
2.1 Enhanced Oil & Gas	..	..	..	..	..	..	..	..
2.2 Refining. Transp. & Stor.	..	..	..	..	..	..	..	..
2.3 Oil Shale & Tar Sands	..	..	..	..	..	..	..	..
2.4 Other Oil & Gas	..	..	..	..	..	..	..	..
Total Oil & Gas	..	..	..	..	..	..	..	..
3.1 Coal Prod.. Prep.. & Trans.	..	..	..	..	..	..	..	..
3.2 Coal Combustion	..	..	..	..	..	..	..	..
3.3 Coal Conversion	..	..	..	..	..	..	..	..
3.4 Other Coal	..	..	..	..	..	..	..	..
Total Coal	..	..	..	..	..	..	..	..
TOTAL FOSSIL FUELS	..	..	..	..	..	..	..	..
4.1 Solar Heating & Cooling	..	..	..	..	..	..	..	..
4.2 Solar Photo-Electric	..	..	..	..	..	..	..	..
4.3 Solar Thermal-Electric	..	..	..	..	..	..	..	..
Total Solar	..	..	..	..	..	..	..	..
5. Wind	..	..	..	..	..	..	..	..
6. Ocean	..	..	..	..	..	..	..	..
7. Biomass	..	..	..	..	..	..	..	..
8. Geothermal	..	..	..	..	..	..	..	..
9.1 Large Hydro (>10 MW)	..	..	..	..	..	..	..	..
9.2 Small Hydro (<10 MW)	..	..	..	..	..	..	..	..
Total Hydro	..	..	..	..	..	..	..	..
TOTAL RENEWABLE ENERGY	..	..	..	..	..	..	..	..
10.1 Nuclear LWR	..	..	..	..	..	..	..	..
10.2 Other Converter Reactors	..	..	..	..	..	..	..	..
10.3 Nuclear Fuel Cycle	..	..	..	..	..	..	..	..
10.4 Nuclear Supporting Tech.	..	..	..	..	..	..	..	..
10.5 Nuclear Breeder	..	..	..	..	..	..	..	..
Total Nuclear Fission	..	..	..	..	..	..	..	..
11. Nuclear Fusion	..	..	..	..	..	..	..	..
TOTAL NUCLEAR	..	..	..	..	..	..	..	..
12.1 Electric Power Conversion	..	..	..	..	..	..	..	..
12.2 Electricity Transm.. & Distr.	..	..	..	..	..	..	..	..
12.3 Energy Storage	..	..	..	..	..	..	..	..
TOTAL POWER & STORAGE	..	..	..	..	..	..	..	..
13.1 Energy Systems Analysis	..	..	..	..	..	..	..	..
13.2 Other Tech. or Research	..	..	..	..	..	..	..	..
TOTAL OTHER TECH. / RESEARCH	..	..	..	..	..	..	..	..
TOTAL ENERGY R&D	..	..	..	..	..	..	..	..

1. Ireland has not provided data for 1999 and 2000.
2. Italy has not provided data for 1999 and 2000.
3. Luxembourg has no energy R&D programme.
4. Netherlands has not provided data for 2000.

Sources: *OECD Economic Outlook*, OECD Paris, 2000, and country submissions.

Japan				Luxembourg[3]				Netherlands[4]			
1999		2000		1999		2000		1999		2000	
$	%	$	%	$	%	$	%	$	%	$	%
473,34	11,97	553,97	13,69	-	-	-	-	21.02	15.78	..	..
48.42	1.22	29.97	0.74	-	-	-	-	17.88	13.42	..	..
33.97	0.86	35.13	0.87	-	-	-	-	6.50	4.88	..	..
31.72	0.80	17.78	0.44	-	-	-	-	4.05	3.04	..	..
587.46	**14.85**	**636.86**	**15.73**	**-**	**-**	**-**	**-**	**49.45**	**37.13**	**..**	**..**
26.31	0.67	19.02	0.47	-	-	-	-	3.06	2.30	..	..
3.07	0.08	3.29	0.08	-	-	-	-	2.07	1.55	..	..
-	-	-	-	-	-	-	-	-	-	..	..
7.10	0.18	6.59	0.16	-	-	-	-	2.11	1.58	..	..
36.48	0.92	28.90	0.71	-	-	-	-	7.24	5.43	..	..
12.39	0.31	9.55	0.24	-	-	-	-	0.09	0.06	..	..
39.61	1.00	13.63	0.34	-	-	-	-	0.43	0.32	..	..
88.20	2.23	63.79	1.58	-	-	-	-	0.60	0.45	..	..
1.37	0.03	2.42	0.06	-	-	-	-	0.78	0.58	..	..
141.57	3.58	89.40	2.21	-	-	-	-	1.90	1.42	..	..
178.05	**4.50**	**118.29**	**2.92**	**-**	**-**	**-**	**-**	**9.13**	**6.86**	**..**	**..**
0.56	0.01	0.58	0.01	-	-	-	-	1.34	1.00	..	..
99.66	2.52	132.18	3.27	-	-	-	-	18.52	13.91	..	..
-	-	-	-	-	-	-	-	-	-	..	..
100.22	2.53	132.76	3.28	-	-	-	-	19.86	14.91	..	..
4.91	0.12	5.79	0.14	-	-	-	-	8.44	6.34	..	..
5.13	0.13	4.48	0.11	-	-	-	-	0.09	0.06	..	..
-	-	-	-	-	-	-	-	10.42	7.83	..	..
29.74	0.75	24.55	0.61	-	-	-	-	0.56	0.42	..	..
-	-	-	-	-	-	-	-	-	-	..	..
-	-	-	-	-	-	-	-	0.09	0.06	..	..
-	-	-	-	-	-	-	-	0.09	0.06	..	..
140.00	**3.54**	**167.58**	**4.14**	**-**	**-**	**-**	**-**	**39.46**	**29.62**	**..**	**..**
153.24	3.87	128.72	3.18	-	-	-	-	0.69	0.52	..	..
62.95	1.59	107.02	2.64	-	-	-	-	1.59	1.20	..	..
1 007.18	25.46	856.59	21.16	-	-	-	-	1.25	0.94	..	..
1 100.36	27.82	1 112.50	27.49	-	-	-	-	2.71	2.04	..	..
234.21	5.92	398.02	9.83	-	-	-	-	-	-	..	..
2 557.93	64.66	2 602.86	64.31	-	-	-	-	6.25	4.69	..	..
269.67	6.82	259.34	6.41	-	-	-	-	6.81	5.11	..	..
2 827.60	**71.48**	**2 862.20**	**70.71**	**-**	**-**	**-**	**-**	**13.05**	**9.80**	**..**	**..**
60.19	1.52	90.29	2.23	-	-	-	-	8.27	6.21	..	..
46.67	1.18	52.15	1.29	-	-	-	-	1.90	1.42	..	..
39.10	0.99	38.02	0.94	-	-	-	-	0.52	0.39	..	..
145.97	**3.69**	**180.46**	**4.46**	**-**	**-**	**-**	**-**	**10.68**	**8.02**	**..**	**..**
1.58	0.04	1.70	0.04	-	-	-	-	6.33	4.75	..	..
75.08	1.90	80.50	1.99	-	-	-	-	5.08	3.82	..	..
76.66	**1.94**	**82.20**	**2.03**	**-**	**-**	**-**	**-**	**11.41**	**8.57**	**..**	**..**
3 955.74	**100.00**	**4 047.59**	**100.00**	**-**	**-**	**-**	**-**	**133.19**	**100.00**	**..**	**..**

Table B14 (continued)

IEA Government Energy R&D Expenditure by Country, 1999 and 2000

(US$ million at 2000 prices and exchange rates)

	New Zealand				Norway			
	1999		2000		1999		2000	
	$	%	$	%	$	%	$	%
1.1 Industry	0.22	7.84	0.22	7.47	0.40	0.81	0.23	0.54
1.2 Residential. Commercial	0.13	4.41	0.15	5.04	1.06	2.15	1.25	2.97
1.3 Transportation	–	–	–	–	–	–	–	–
1.4 Other Conservation	0.09	3.12	0.09	2.97	–	–	–	–
TOTAL CONSERVATION	**0.44**	**15.38**	**0.45**	**15.49**	**1.45**	**2.96**	**1.48**	**3.51**
2.1 Enhanced Oil & Gas	0.50	17.65	0.49	16.81	7.52	15.34	4.89	11.62
2.2 Refining. Transp. & Stor.	–	–	–	–	2.38	4.84	1.93	4.59
2.3 Oil Shale & Tar Sands	–	–	–	–	0.40	0.81	–	–
2.4 Other Oil & Gas	–	–	–	–	19.13	39.02	15.91	37.84
Total Oil & Gas	0.50	17.65	0.49	16.81	29.43	60.01	22.74	54.05
3.1 Coal Prod.. Prep.. & Trans.	0.07	2.61	0.07	2.49	–	–	–	–
3.2 Coal Combustion	0.22	7.92	0.22	7.63	–	–	–	–
3.3 Coal Conversion	–	–	–	–	–	–	–	–
3.4 Other Coal	–	–	–	–	–	–	–	–
Total Coal	0.30	10.54	0.29	10.12	–	–	–	–
TOTAL FOSSIL FUELS	0.80	28.19	0.78	26.93	29.43	60.01	22.74	54.05
4.1 Solar Heating & Cooling	–	–	–	–	0.66	1.35	0.57	1.35
4.2 Solar Photo–Electric	–	–	–	–	0.55	1.13	0.60	1.43
4.3 Solar Thermal–Electric	–	–	–	–	–	–	–	–
Total Solar	–	–	–	–	1.21	2.48	1.17	2.78
5. Wind	0.09	3.10	0.10	3.58	0.45	0.91	0.85	2.03
6. Ocean	–	–	–	–	0.46	0.94	0.34	0.81
7. Biomass	0.20	6.93	0.25	8.47	0.87	1.78	0.83	1.97
8. Geothermal	0.56	19.77	0.56	19.15	–	–	–	–
9.1 Large Hydro (>10 MW)	–	–	–	–	1.94	3.96	1.72	4.08
9.2 Small Hydro (<10 MW)	–	–	–	–	–	–	–	–
Total Hydro	–	–	–	–	1.94	3.96	1.72	4.08
TOTAL RENEWABLE ENERGY	**0.84**	**29.80**	**0.91**	**31.20**	**4.94**	**10.06**	**4.91**	**11.68**
10.1 Nuclear LWR	–	–	–	–	–	–	–	–
10.2 Other Converter Reactors	–	–	–	–	–	–	–	–
10.3 Nuclear Fuel Cycle	–	–	–	–	1.98	4.04	1.82	4.32
10.4 Nuclear Supporting Tech.	–	–	–	–	5.67	11.57	5.12	12.16
10.5 Nuclear Breeder	–	–	–	–	–	–	–	–
Total Nuclear Fission	–	–	–	–	7.65	15.61	6.93	16.49
11. Nuclear Fusion	–	–	–	–	–	–	–	–
TOTAL NUCLEAR	**–**	**–**	**–**	**–**	**7.65**	**15.61**	**6.93**	**16.49**
12.1 Electric Power Conversion	0.51	18.09	0.50	17.23	–	–	–	–
12.2 Electricity Transm.. & Distr.	–	–	–	–	1.81	3.69	1.91	4.54
12.3 Energy Storage	–	–	–	–	–	–	0.32	0.76
TOTAL POWER & STORAGE	**0.51**	**18.09**	**0.50**	**17.23**	**1.81**	**3.69**	**2.23**	**5.30**
13.1 Energy Systems Analysis	–	–	–	–	1.43	2.91	0.89	2.11
13.2 Other Tech. or Research	0.24	8.55	0.27	9.15	2.34	4.76	2.89	6.86
TOTAL OTHER TECH./RESEARCH	**0.24**	**8.55**	**0.27**	**9.15**	**3.76**	**7.67**	**3.77**	**8.97**
TOTAL ENERGY R&D	**2.83**	**100.00**	**2.91**	**100.00**	**49.04**	**100.00**	**42.06**	**100.00**

1. Sweden has not provided a breakdown of the data for 2000.

Sources: *OECD Economic Outlook*, OECD Paris, 2000, and country submissions.

Portugal				Spain				Sweden[1]			
1999 $	%	2000 $	%	1999 $	%	2000 $	%	1999 $	%	2000 $	%
0.17	8.92	0.19	13.81	2.31	4.88	2.78	6.06	7.23	11.14	..	..
–	–	–	–	0.34	0.73	–	–	2.29	3.53	..	..
–	–	–	–	0.19	0.39	0.58	1.26	7.06	10.88	..	..
–	–	–	–	–	–	–	–	3.97	6.12	..	..
0.17	**8.92**	**0.19**	**13.81**	**2.84**	**5.99**	**3.35**	**7.32**	**20.55**	**31.66**	**..**	**..**
0.11	5.86	0.06	4.46	–	–	–	–	–	–	..	..
–	–	–	–	–	–	–	–	–	–	..	..
–	–	–	–	–	–	–	–	–	–	..	..
–	–	–	–	0.08	0.17	0.08	0.18	–	–	..	..
0.11	5.86	0.06	4.46	0.08	0.17	0.08	0.18	–	–	..	..
–	–	–	–	0.86	1.81	0.69	1.51	–	–	..	..
0.20	10.83	0.24	17.34	2.28	4.82	0.97	2.12	–	–	..	..
–	–	–	–	–	–	–	–	–	–	..	..
–	–	–	–	1.39	2.93	1.63	3.55	0.04	0.07	..	..
0.20	10.83	0.24	17.34	4.53	9.55	3.29	7.18	0.04	0.07	..	..
0.31	16.69	0.30	21.80	4.61	9.72	3.37	7.37	0.04	0.07	..	..
0.28	14.66	0.34	25.05	1.22	2.57	0.25	0.54	1.56	2.41	..	..
0.02	0.92	0.00	0.27	1.48	3.12	2.05	4.47	0.63	0.97	..	..
–	–	–	–	4.67	9.84	5.25	11.45	–	–	..	..
0.29	15.58	0.34	25.32	7.37	15.53	7.54	16.45	2.19	3.37	..	..
0.03	1.76	–	–	4.37	9.21	2.43	5.30	2.87	4.42	..	..
0.49	25.82	0.15	10.70	–	–	–	–	–	–	..	..
0.10	5.46	0.16	11.43	1.80	3.79	3.27	7.15	6.67	10.27	..	..
0.28	14.65	0.06	4.22	–	–	–	–	–	–	..	..
–	–	–	–	–	–	–	–	–	–	..	..
–	–	–	–	–	–	–	–	0.46	0.71	..	..
–	–	–	–	–	–	–	–	0.46	0.71	..	..
1.19	**63.29**	**0.70**	**51.68**	**13.54**	**28.54**	**13.24**	**28.90**	**12.19**	**18.78**	**..**	**..**
–	–	–	–	1.73	3.65	0.84	1.84	–	–	..	..
–	–	–	–	0.53	1.11	0.78	1.70	–	–	..	..
–	–	–	–	0.90	1.90	0.81	1.76	0.96	1.47	..	..
–	–	–	–	1.33	2.80	1.32	2.87	–	–	..	..
–	–	–	–	–	–	–	–	2.89	4.46	..	..
–	–	–	–	4.49	9.46	3.74	8.17	3.85	5.93	..	..
–	–	–	–	14.48	30.52	13.98	30.52	1.11	1.71	..	..
–	**–**	**–**	**–**	**18.97**	**39.99**	**17.73**	**38.69**	**4.96**	**7.64**	**..**	**..**
–	–	–	–	0.16	0.33	0.31	0.67	12.13	18.68	..	..
0.01	0.75	0.01	1.02	0.92	1.93	1.11	2.42	1.78	2.75	..	..
–	–	–	–	–	–	–	–	0.35	0.54	..	..
0.01	**0.75**	**0.01**	**1.02**	**1.07**	**2.26**	**1.42**	**3.09**	**14.26**	**21.97**	**..**	**..**
0.01	0.75	0.01	1.02	0.88	1.86	1.44	3.13	0.72	1.10	..	..
0.18	9.59	0.15	10.69	5.52	11.64	5.26	11.49	12.19	18.78	..	..
0.19	**10.35**	**0.16**	**11.70**	**6.40**	**13.50**	**6.70**	**14.63**	**12.91**	**19.88**	**..**	**..**
1.88	**100.00**	**1.36**	**100.00**	**47.43**	**100.00**	**45.81**	**100.00**	**64.92**	**100.00**	**68.86**	**100.00**

Table B14 (continued)

IEA Government Energy R&D Expenditure by Country, 1999 and 2000

(US$ million at 2000 prices and exchange rates)

	Switzerland[1]				Turkey			
	1999		2000		1999		2000	
	$	%	$	%	$	%	$	%
1.1 Industry	3.64	3.38	..	..	0.08	2.25	0.10	2.71
1.2 Residential. Commercial	6.95	6.45	..	..	0.05	1.42	0.01	0.31
1.3 Transportation	5.32	4.94	..	..	0.05	1.62	0.08	2.24
1.4 Other Conservation	3.15	2.92	..	..	0.00	0.14	0.00	0.13
TOTAL CONSERVATION	**19.05**	**17.68**	**19.55**	**17.65**	**0.18**	**5.43**	**0.19**	**5.39**
2.1 Enhanced Oil & Gas	6.91	6.42	7.11	6.42	0.08	2.29	0.11	2.97
2.2 Refining. Transp. & Stor.	–	–	–	–	0.02	0.54	0.01	0.36
2.3 Oil Shale & Tar Sands	–	–	–	–	0.02	0.50	0.01	0.29
2.4 Other Oil & Gas	–	–	–	–	..	..	..	.. 1.31
Total Oil & Gas	6.91	6.42	7.11	6.42	0.11	3.34	0.13	3.62
3.1 Coal Prod.. Prep.. & Trans.	–	–	–	–	1.26	37.12	1.23	34.30
3.2 Coal Combustion	–	–	–	–	0.02	0.70	0.02	0.56
3.3 Coal Conversion	–	–	–	–	–	–	–	– 0.02
3.4 Other Coal	–	–	–	–	..	..	..	..
Total Coal	–	–	–	–	1.28	37.82	1.25	34.86
TOTAL FOSSIL FUELS	**6.91**	**6.42**	**7.11**	**6.42**	**1.39**	**41.16**	**1.38**	**38.48**
4.1 Solar Heating & Cooling	4.66	4.32	..	..	0.15	4.37	0.07	1.92
4.2 Solar Photo–Electric	13.08	12.14	..	..	0.01	0.28	0.01	0.22
4.3 Solar Thermal–Electric	4.32	4.01	..	..	..	..	0.08	2.23
Total Solar	22.07	20.48	23.70	21.39	0.16	4.66	0.16	4.38
5. Wind	0.62	0.57	0.59	0.53	0.12	3.54	0.14	3.90
6. Ocean	–	–	–	–	–	–	0.01	0.22
7. Biomass	4.34	4.02	4.74	4.28	0.26	7.67	0.24	6.58
8. Geothermal	1.75	1.62	2.37	2.14	0.54	15.85	0.57	15.82
9.1 Large Hydro (>10 MW)	0.79	0.74	..	..	–	–	–	–
9.2 Small Hydro (<10 MW)	2.76	2.56	..	..	0.00	0.03	0.00	0.01
Total Hydro	3.55	3.30	3.55	3.21	0.00	0.03	0.00	0.01
TOTAL RENEWABLE ENERGY	**32.32**	**29.99**	**34.95**	**31.55**	**1.07**	**31.74**	**1.11**	**30.91**
10.1 Nuclear LWR	0.75	0.70	..	..	–	–	–	–
10.2 Other Converter Reactors	0.08	0.07	..	..	..	..	–	–
10.3 Nuclear Fuel Cycle	3.81	3.53	..	..	0.02	0.51	0.01	0.38
10.4 Nuclear Supporting Tech.	7.74	7.18	..	..	0.14	4.18	0.15	4.26
10.5 Nuclear Breeder	0.06	0.06	..	..	–	–	–	–
Total Nuclear Fission	12.44	11.54	11.85	10.70	0.16	4.69	0.17	4.64
11. Nuclear Fusion	15.12	14.03	14.81	13.37	0.00	0.04	0.00	0.09
TOTAL NUCLEAR	**27.56**	**25.57**	**26.66**	**24.06**	**0.16**	**4.72**	**0.17**	**4.73**
12.1 Electric Power Conversion	5.72	5.31	..	..	0.25	7.46	0.21	5.97
12.2 Electricity Transm.. & Distr.	3.91	3.62	..	..	0.08	2.49	0.28	7.92
12.3 Energy Storage	4.95	4.59	..	..	0.13	3.79	0.12	3.24
TOTAL POWER & STORAGE	**14.58**	**13.53**	**14.81**	**13.37**	**0.46**	**13.74**	**0.61**	**17.13**
13.1 Energy Systems Analysis	6.38	5.92	..	..	–	–	0.03	0.89
13.2 Other Tech. or Research	0.96	0.90	..	..	0.11	3.20	0.09	2.46
TOTAL OTHER TECH./RESEARCH	**7.35**	**6.82**	**7.70**	**6.95**	**0.11**	**3.20**	**0.12**	**3.35**
TOTAL ENERGY R&D	**107.76**	**100.00**	**110.78**	**100.00**	**3.38**	**100.00**	**3.58**	**100.00**

1. Switzerland has not provided complete data for 2000.
2. Because of missing data for Australia, Austria, Belgium, Finland, France, Greece, Hungary, Ireland, Italy, Netherlands

Sources: *OECD Economic Outlook*, OECD Paris, 2000, and country submissions.

	United Kingdom				United States				Total Reported[2]			
	1999		**2000**		**1999**		**2000**		**1999**		**2000**	
	$	**%**	**$**	**%**	**$**	**%**	**$**	**%**	**$**	**%**	**$**	**%**
	0.35	0.53	0.98	1.37	166.19	7.10	137.42	6.06	716.08	9.19	..	..
	0.08	0.12	0.08	0.11	121.39	5.18	123.11	5.43	237.93	3.05	..	..
	0.69	1.05	0.68	0.95	202.84	8.66	228.76	10.09	279.56	3.59	..	..
	–	–	–	–	–	–	49.56	2.19	50.52	0.65	..	..
	1.12	**1.70**	**1.74**	**2.43**	**490.42**	**20.94**	**538.84**	**23.77**	**284.09**	**16.48**	**..**	**..**
	2.50	3.79	2.83	3.94	51.56	2.20	58.75	2.59	118.29	1.52	..	..
	–	–	–	–	10.13	0.43	14.14	0.62	27.45	0.35	..	..
	–	–	–	–	–	–	–	–	11.69	0.15	..	..
	1.99	1.82	2.53	12.94	0.55	13.67	0.60	71.47	0.92	..	..	
	3.81	5.77	4.64	6.47	74.63	3.19	86.56	3.82	228.91	2.94	..	..
	0.16	0.24	0.09	0.12	5.11	0.22	4.23	0.19	20.93	0.27	..	..
	0.77	1.16	2.39	3.33	84.41	3.60	75.37	3.33	143.21	1.84	..	..
	0.03	–	–	10.16	0.43	6.93	0.31	101.69	1.31	..	..	
	–	–	–	–	29.51	1.26	34.36	1.52	36.91	0.47	..	..
	0.95	1.43	2.48	3.45	129.20	5.52	120.89	5.33	302.73	3.89	..	..
	4.76	**7.21**	**7.12**	**9.92**	**203.82**	**8.70**	**207.45**	**9.15**	**531.64**	**6.82**	**..**	**..**
	–	–	–	–	3.63	0.16	1.92	0.08	26.07	0.33	..	..
	2.16	3.27	2.42	3.37	74.99	3.20	64.57	2.85	251.52	3.23	..	..
	–	–	–	–	17.14	0.73	14.92	0.66	29.60	0.38	..	..
	2.16	3.27	2.42	3.37	95.76	4.09	81.41	3.59	307.19	3.94	..	..
	1.39	2.10	1.51	2.11	35.08	1.50	31.73	1.40	88.37	1.13	..	..
	–	–	0.76	1.05	–	–	–	–	7.26	0.09	..	..
	3.24	4.91	3.63	5.06	101.33	4.33	69.38	3.06	151.01	1.94	..	..
	–	–	–	–	28.74	1.23	23.33	1.03	64.93	0.83	..	..
	–	–	–	–	3.28	0.14	4.86	0.21	6.31	0.08	..	..
	0.31	0.47	0.15	0.21	–	–	–	–	6.14	0.08	..	..
	0.31	0.47	0.15	0.21	3.28	0.14	4.86	0.21	12.45	0.16	..	..
	7.10	**10.75**	**8.47**	**11.81**	**264.19**	**11.28**	**210.72**	**9.30**	**631.22**	**8.10**	**..**	**..**
	–	–	–	–	–	–	–	–	271.12	3.48	..	..
	–	–	–	–	–	–	–	–	120.87	1.55	..	..
	–	–	–	–	–	–	–	–	266.44	16.25	..	..
	–	–	–	–	22.97	0.98	34.77	1.53	295.46	16.63	..	..
	–	–	–	–	–	–	–	–	255.31	3.28	..	..
	–	–	–	–	22.97	0.98	34.77	1.53	209.20	41.19	..	..
	22.24	33.70	21.68	30.22	225.22	9.62	238.26	10.51	592.39	7.60	..	..
	22.24	**33.70**	**21.68**	**30.22**	**248.19**	**10.60**	**273.03**	**12.05**	**801.59**	**48.79**	**..**	**..**
	2.16	3.27	3.03	4.22	88.28	3.77	86.46	3.81	199.76	2.56	..	..
	–	–	–	–	37.11	1.58	33.95	1.50	98.46	1.26	..	..
	–	–	–	–	4.54	0.19	3.39	0.15	54.17	0.70	..	..
	2.16	**3.27**	**3.03**	**4.22**	**129.93**	**5.55**	**123.79**	**5.46**	**352.39**	**4.52**	**..**	**..**
	0.81	1.22	0.84	1.17	–	–	–	–	27.02	0.35	..	..
	27.83	42.15	28.87	40.24	005.41	42.93	912.92	40.27	163.64	14.93	..	..
	28.63	**43.38**	**29.70**	**41.41**	**005.41**	**42.93**	**912.92**	**40.27**	**190.66**	**15.28**	**..**	**..**
	66.01	**100.00**	**71.74**	**100.00**	**341.97**	**100.002**	**266.75**	**100.00**	**791.59**	**100.00**	**..**	**..**

and Sweden, Total Reported has not been calculated for 2000.

ANNEX

PRESS RELEASE OF THE SPECIAL SESSION OF THE GOVERNING BOARD ON 4 OCTOBER 2000

IEA GOVERNING BOARD MEETS, ASSESSES WORLD OIL SITUATION

The Governing Board of the International Energy Agency met today in Paris to discuss the current state of the oil market. It concluded that crude oil available to the market is sufficient to meet current demand, with a small surplus for stock building. But because stocks generally are low, and there are some regional imbalances in product stocks, especially heating oil, there is unusual volatility in the short term; and current high oil prices, if sustained, could jeopardize global economic growth.

Stocks are low for a variety of reasons. In particular, growing energy demand driven by strong economic growth outstripped the constrained oil supply throughout 1999 and into the year 2000.

More crude oil is coming to the market as a result of recent decisions of producing countries to increase oil production, and the declared readiness of Saudi Arabia to increase production to satisfy market needs is encouraging.

The IEA welcomed the positive effect on the market of the recent decision by the United States government to release 30 million barrels of crude from its Strategic Petroleum Reserves to cope with a regional product supply imbalance.

In relation to the short-term tightness in oil markets, the IEA Governing Board:

- welcomed the meeting in Riyadh next month as a contribution to the continuing dialogue between the world's producers and consumers, including an exploration of the causes of the oil market's current situation;

- invited oil companies and refiners to consider intensified and reconfigured short-term refinery operations, particularly the production and distribution of heating oil, and encouraged them to make more of that product available to the global market. Such action would help to resolve regional product imbalances;

- reaffirmed the need for improved information, especially on oil production and crude and product stockholding worldwide, and commended IEA proposals to enhance market transparency.

In the interest of greater long-term stability in the oil market, the IEA Governing Board:

- affirmed its intention to give new impetus to longer-term policies to reduce oil demand, improve energy efficiency, diversify supplies and accelerate the deployment of new energy technologies;

- confirmed the availability of security stocks in IEA countries and their readiness for use in the event of significant supply disruption;

- reaffirmed Member governments' commitment to take co-ordinated action in such a situation, drawing upon professional industrial advice, and undertook to ensure that the procedures for reacting to a supply emergency are ready and in good order.

D

ANNEX

IEA STATEMENT ON SUSTAINABLE DEVELOPMENT (April 2001)

Energy and Sustainability: Key Features

Energy has deep and broad relationships with each of the three pillars of sustainable development – the economy, the environment and social welfare. It remains a strategic commodity: social and economic development can be attained only so long as a secure, reliable and affordable supply of energy is ensured. Energy services help to fulfil basic needs such as food and shelter. They contribute to social development by improving education and public health and, overall, help alleviate poverty. Access to modern energy services can be environmentally beneficial, for example by reducing deforestation and decreasing pollution through more efficient energy use.

These different dimensions are intrinsically linked. Sustainable development is dependent upon balancing the interplay of policies and their effective implementation to achieve economic, environmental and social needs. Economic growth requires a secure and reliable energy supply, but is sustainable only if it does not threaten the environment or social welfare. Environmental quality is more readily protected if basic economic needs are also met, and social development needs both economic growth and a healthy environment. Sometimes the policies are mutually reinforcing and sometimes they are in conflict, and trade-offs will often need to be made. Lower fuel prices widen access to energy, but also encourage inefficient utilisation of energy resources and accelerated resource depletion. Conversely, if energy prices are raised too quickly in an effort to combat environmental concerns, energy may become too costly and thus placed beyond the reach of those who need it most.

The path to a more sustainable energy future is not static. It must be continuously redefined and rebalanced with revised forecasts, reassessment of progress, identification of new problems and the development of new technical solutions and technologies. All countries – developed and developing – will need to design their own policy mix; it is clear that national circumstances will affect the scope for action and the appropriate policy choices in and between countries. The policy-makers' task is to assess the risks to, and from, today's energy systems. They must determine what changes would advance economic, social and environmental objectives. Policy-makers must look to the long term, taking action today to avoid longer-term social, economic or environmental disruptions, while retaining flexibility to alter course when the existing path proves to be unsustainable.

Are we on a Sustainable Energy Path? Not unless we Make Considerable Changes.

Projecting the current energy situation and energy policies into the future suggests growing pressures on the global economy and the environment. Governments need to develop policies to address the projected 57% increase in the predominantly fossil-fuel based global energy demand over the next 20 years. Governments also need to take action to modify longer-term trends in greenhouse gas emissions within the framework of the United Nations Framework Convention on Climate Change. Policies will need to take into account that the energy demand of non-OECD countries will soon surpass that of OECD countries, and that developed countries' already high levels of energy demand will continue their upward trend. Policies will also need to address potential decline in energy security as the sources of oil and gas production become more concentrated in regions of geopolitical uncertainty. Capital markets and governments will need to seek ways to mobilise the enormous resources to meet growing energy needs.

Sustainability demands that we seek to change present trends. The challenge is to fuel world-wide economic growth with a secure and reliable energy supply, without despoiling our environment. It is possible. Energy supply needs to be further de-carbonised, diversified and the energy intensity of economic growth reduced. Global energy security can be enhanced through collective efforts and efficient but well-regulated markets can make energy affordable.

Towards a Solution

The transition to a sustainable energy future will be complex and will take time. We need to change not only the structure of the energy sector, but also behaviour in our societies and economies.

Consistent with the Shared Goals of the International Energy Agency which call for policies that balance energy security, economic growth and environmental protection, Member Governments of the IEA seek to create the conditions in which the energy sectors of their economies can make the fullest possible contribution to sustainable development. These include:

- *Safeguarding energy supplies* through diversification and through co-ordination of the use of flexible response mechanisms in the event of supply disruptions.

- *Promoting further improvements in energy efficiency*, along with further development and diffusion of non-fossil fuel technologies, including renewable energies.

- *Ensuring that energy markets operate in a competitive and transparent manner with minimum distortions*. As prices shape behaviour and technology, price signals reflecting full costs should reach consumers. This will entail the gradual elimination of environmentally harmful subsidies and internalisation of externalities (such as environmental costs and benefits), ideally through the use of market-based instruments. Reduction of trade and tariff barriers will help markets operate openly and competitively and improve confidence in the marketplace.

- *Creating a stable framework for decision-making, one that includes clear signals to the market.* Incentives, regulatory measures and standards will be needed to stimulate sustainable choices in a marketplace that is still economically imperfect.

- *Continuing to liberalise energy markets with frameworks to protect the environment and enhance social welfare.* These frameworks should be stable and predictable, and promote open and competitive energy infrastructure.

- *Encouraging the systematic introduction of the best technological solutions where energy investments are made.* Capital stock turnover and new additions to the capital stock offer important opportunities for increasing the use of cleaner, more efficient technology.

- *Participating in a global effort to provide electricity for those currently without access*, through the development and diffusion of technologies and the development of stable legal, fiscal and energy policy frameworks, particularly in developing countries, that stimulate the flow of private capital.

- *Ensuring high safety standards* in the operation and maintenance of energy equipment, plants and infrastructures, and putting in place appropriate mechanisms to respond to potential accident or failure.

- *Sponsoring energy research and development, information exchange (including data and statistics) and dissemination* with a view to encouraging commercial applications and changes in consumer behaviour. Transparent decision-making processes are required with broad policy-maker participation – for example from transport, industry, trade, environment and finance – as well as wider stakeholder involvement.

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ANNEX

COMMUNIQUE

IEA Meeting of the Governing Board at Ministerial Level
15-16 May 2001

We the Ministers met to discuss energy security and the place of energy in a sustainable future. Energy market developments and the IEA's World Energy Outlook to 2020 provided a backdrop for our deliberations.

The reference scenario of the IEA's World Energy Outlook 2000 (WEO) paints a challenging picture:

- *Continuation of past trends would mean a 60% increase in world energy demand by 2020 with much of the increase occurring in developing countries.*
- *Oil, coal, gas and nuclear power will continue to dominate the energy mix, with sources of oil and gas concentrating in a few countries.*
- *A large proportion of the world's population continues to lack access to basic energy services.*
- *Our collective efforts to curb greenhouse gas emissions will fall short of the targets set at Kyoto.*

The World Energy Outlook suggests some paths to improvement through the diversification of energy sources in power generation, through emissions trading and through reform of transport systems. Through individual and collective actions, the outcome can be significantly better.

Our meeting has been held at a time of higher and volatile oil prices, continuing increases in global oil demand, localised supply problems for some forms of energy, concern about long-term security of supply and increasing attention to the environmental impact from energy use. The experiences of the last two years have underscored that a secure supply of affordable energy is not a foregone conclusion.

We emphasize that energy remains an essential ingredient of human progress and prosperity. Economic development requires access to secure and affordable energy. For billions of the earth's poorer people, access to affordable energy will accelerate the escape from poverty. Yet, while assuring growth, we cannot allow energy use to impose unacceptable burdens on any part of global society or on the natural environment.

We welcome the constructive and improved dialogue between producers and consumers as manifested in the Seventh International Energy Forum held in Riyadh last November and we expect this dialogue will be further enhanced in the next forum to be held in Japan in 2002. We also welcome the expanding energy dialogue, particularly with China, India and Russia, as well as recent initiatives linking the IEA, key non-member countries and other international organisations.

We welcome other positive developments. Many countries have made significant progress on energy-related policies and actions through commitment to market and regulatory reform. This has contributed to reduced costs and greater efficiency in energy use and has also helped create new opportunities for innovative energy solutions.

In all of our countries, technological developments are improving prospects for greater energy efficiency, broader commercial application of cleaner fuel technologies, renewable energy and combined heat and power generation. We encourage Secretariat efforts to accelerate these improvements world-wide.

In light of these considerations and circumstances, we affirm the importance of the guiding principles of the IEA "Shared Goals" – energy security, environmental protection and economic growth. These remain essential to sustainable development. New and flexible responses are required if these goals are to be reached. As part of this, we also need to take action to modify longer-term trends in greenhouse gas emissions within the framework of the United Nations Framework Convention on Climate Change.

We commit ourselves, in our own countries and within the framework of the IEA, to strengthen energy security across the full range of primary energies; to continue energy market and regulatory reform; to expand access to energy services; to improve energy efficiency; to support the development and transfer of energy technologies; and to foster a sustainable energy future. We welcome the renewed emphasis on energy in several Member countries and in the European Union, including efforts to expand domestic energy supplies and curb energy demand as appropriate.

We recognise the need for less volatility in oil prices in the interest of global economic growth. We note that rapidly expanding gas demand is being met by ever more distant supplies, often crossing multiple territorial borders. We hold the view that while the framework for energy markets will be shaped by government policies, under normal circumstances markets work best when allowed to operate freely.

With the world oil market characterized by continuing volatility, IEA Members stand ready to respond quickly should supply problems occur. However, we note with concern that the level of assurance relative to global oil security needs is declining. As the balance of demand shifts away from OECD economies, *all* countries should develop appropriate mechanisms for effective response to supply disruptions. We reaffirm the importance of building and holding adequate stocks.

We call for early action to create greater transparency in world energy markets, especially the oil market. We support the Secretariat's initiative to improve the quality, availability and reliability of data supplied by nations and by international organisations, and we welcome the support for this goal expressed at the Riyadh Forum.

We support the continuing diversification of our energy systems – both by energy type and by source. National circumstances and policies will determine the mix of fuels necessary to contribute to our collective energy security, to our economic growth, and to address the challenge of achieving sustainable development.

We recognize that each country will choose that mix of fuels it considers most appropriate: oil, gas, coal, nuclear or renewables. We intend that renewable energy should play an increasing role and accept the European Union's invitation to collaborate in a concerted effort to give new impetus to both the diversity and the efficiency of all forms of energy.

While our most pressing global environmental challenge is climate change, localised and regional problems associated with the production and use of fuels are also important. New technology developments as well as new policy instruments, such as emissions trading, joint implementation, and clean development mechanisms, can promote a cleaner environment, while simultaneously increasing energy efficiency and enhancing security. We commit ourselves to develop and use the most effective possible means to achieve sustainable development, as expressed in the IEA Statement on Sustainable Development.

We recognise that energy technology research, development and demonstration (RD&D) are essential to achieving energy security, environmental protection and economic growth. We accept the need for a government role in supporting long-term RD&D and encouraging the participation of industry. The IEA provides a unique forum and structure for collaboration to promote the availability of advanced technologies and reduce their cost.

We warmly welcome the advance of regulatory reform world-wide, which promises to deliver long-term benefits. We acknowledge, however, that market reform can imply a difficult period of transition before the full benefits are realised.

Effective action in relation to energy involves many sectors and the responsibilities of many Ministers. We will work closely with our Ministerial colleagues in a continued effort to advance our common objectives.

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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, 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.

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.)

G

ANNEX

MEASUREMENT OF FINANCIAL SUPPORT FOR COAL PRODUCTION USING A PRODUCER SUBSIDY EQUIVALENT CALCULATION

Introduction

This annex describes the Producer Subsidy Equivalent (PSE) calculation and provides an interpretation of its application to forms of financial support for coal production. The purpose of the PSE is to provide a single measure of the financial support provided by a variety of components so that the extent of support between countries and the movement over time can be considered. The aim has been to include in the PSE all items of support provided to the current domestic production of coal that the industry itself would normally be expected to cover in a competitive situation. These include not only direct state payments but also the value of protection provided by import constraints and the practical effects of special sales agreements.

PSEs and their Interpretation

A PSE defines the monetary payment to domestic producers equivalent to the total value of existing support provided at current levels of production, consumption and trade, and hence world prices. Put in another way, it is the payment that would just keep all domestic production competitive with imports at existing levels of coal output, current producer incomes and import prices. It thus evaluates the support system that maintains domestic production and imports at their current levels. Clearly, if all support systems for high-cost coal production in all countries were withdrawn at once, world coal import requirements would likely rise, and with them coal import prices in the short term. In the resulting equilibrium situation, with no systems of support remaining, the PSE would be zero. However, the PSE in a given year does not presuppose some different level of imports, it only evaluates the system of support that is maintaining the existing situation.

It is important to keep in mind this aspect of the PSE as a static measure when interpreting the results of the calculations. In the 1987 review of *Coal Prospects and Policies in IEA Countries*, for example, it is argued that the coal prices that prevailed in the international markets of 1987 are not sustainable in the longer run in the sense that at these prices coal exporters would not be willing to invest in significant additional production facilities because they would be unable to earn an adequate rate of return on the capital involved. Similarly, appraisal analyses for investment, disinvestment or policy change decisions would need to take account of expected future prices. In the medium to longer term it would be prudent to assume that future prices will be close to sustainable levels when additional production capacity will be needed to meet growing coal demand. However, the PSE methodology does not anticipate situations in the future; for each particular year it uses data from that year only; it does not use data relating to some other year, a trend year or an optimal situation.

The PSE method is purely descriptive. It merely provides a measure that can be used as an aid evaluating the support systems for domestic coal production that maintain the current situation in terms of the levels of domestic production, trade and world prices. The PSE does not provide a useful basis for making decisions on mine closures or coal purchase contracts. Nor is it a measure of savings that could be realised immediately if protected production were closed down.

The PSE does provide, however, a useful but limited indication of the scale of support to indigenous coal production and the differences between countries in this respect. No alternative measure is available for these purposes. The PSE is not a prescriptive tool; it cannot be used to explain why a support system exists nor can it suggest how, how much or how fast a support system should be changed. It takes no account of the social, regional and unemployment problems experienced to date, or likely to arise in the future, from actions to reduce protection or of the costs of dealing with those problems. It does not reflect changes in policy taken now to reduce support in the future and it does not distinguish between temporary support to pave the way to a viable coal industry and long-term support with no such prospect. It takes no account of emerging trends of domestic coal production and the increasing importance of imported coal. It takes no account of any price distortions arising from supportive financial measures, royalties or taxes in coal exporting countries. Above all, the PSE measure, as calculated in the tables, is not precise.

The General Method

In the tables given in the individual country reviews, the total PSE for each country examined is obtained by adding together the relevant net budgetary payments to producers and the calculated value of the indirect measures, as described below. The aim is to include in the PSE the total value of those forms of protection provided to the domestic coal industry that the industry itself would normally be expected to cover in a competitive situation.

Support for production normally takes two forms: direct (or budgetary) assistance and price support. Many direct monetary payments to producers, such as government deficit payments, clearly help to maintain current domestic production and are therefore included in the calculation of the PSE. Other direct payments are designed to speed contraction of the industry, or are otherwise unrelated to current production, and are therefore excluded from the PSE.

Price support is typically provided in one of two main ways:

- By government-imposed limitations on coal imports.
- As the result of some long-term agreements between coal producers and large coal consumers (usually electric utilities), arranged directly and on a bilateral basis or involving government in tripartite agreements.

The details of these latter arrangements are frequently complex and specified in statutes or private contracts. Many of the arrangements are of long standing, though they may have been modified over the years. Published information is limited and sometimes unavailable when confidential, commercial contracts are involved.

There is scope for argument about whether specific long-term arrangements between coal producers and major consumers, particularly electricity generating utilities, constitute support when they are not underpinned by government measures such as restrictions on coal imports. The issue turns on the extent to which:

- The utility in question entered into these arrangements because it considered that to fulfil its own obligations to maintain electricity supplies, it needed an assured long-term local source of coal supply, or
- It entered into the arrangement for reasons of national policy.

Whatever the answer to this question in a specific case, the practical effect of the arrangement on coal imports and prices in either case is the same as if there were protection for indigenous coal production. For the purposes of this study, all such arrangements have been included in the calculations of PSEs for the countries concerned.

Selection of an appropriate reference price, against which the domestic price is to be compared, is clearly critical to an accurate measurement of the level of support provided through high prices. Ideally, the two sets of prices should compare like with like – that is, they should relate to commodities of similar quality and conditions of exchange (e.g. contract lengths). With coal, as with many commodities, however, it is often the case that none of the available reference price series perfectly fits this ideal, and so the result must inevitably be approximate.

Because price information is not usually available for individual transactions, both the domestic and the reference prices have been calculated for an average or typical consumer. Where possible, however, the difference between the actual price received by domestic consumers and the reference price has been calculated for comparable coal qualities and for similar lengths of contract. Differences in thermal quality between domestic and imported steam coals have been adjusted by expressing prices (and quantities) in thermal-equivalent terms. When comparing coking coal, other properties, such as coke strength, have been taken into account. Inevitably, such adjustments mean that individual prices are specified separately for each country. This causes no great conceptual problems as long as the general principles are applied consistently in each case.

For purposes of comparison, the total PSE for each country has been divided in each year by the affected production, to yield an average PSE per tonne produced. Such a calculation undoubtedly conceals any dispersion there may be in support for production within individual countries. Thus, some mines may require more support than the average and some less, perhaps none at all.

IEA Secretariat Estimates of Total Producer Subsidy Equivalent (PSE) for Coal Production in Selected IEA Countries

Country		*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000p*
France	Production (in million tce)	10.07	9.45	8.30	7.46	7.80	7.07	5.73	4.43	4.13	3.16
	Aid per tce (in FRF)	222	225	288	269	75	81	434	581	564	691
	Aid per tce (in USD)	39.42	42.51	50.79	48.41	14.95	15.73	74.41	98.69	91.76	97.15
Germany	Production (in million tce)	67.57	66.86	59.29	53.15	54.45	48.94	47.06	41.62	40.02	34.00
	Aid per tce (in DEM)	170	184	192	242	224	220.34	217	211	216.9	244.5
	Aid per tce (in USD)	102.40	117.93	115.93	149.20	156.15	146.41	124.94	119.83	118.2	115.4
Japan	Production (in million tce)	6.34	5.98	5.68	5.46	4.93	5.10	3.37	2.91	2.80	
	Aid per tce (in Yen)	17 289	15 649	17 192	17 184	16 878	15 553	16 849	13 772	15 107	n.a.
	Aid per tce (in USD)	128.54	123.52	154.60	168.14	179.36	142.95	139.24	105.62	134.29	n.a.
Spain	Production (in million tce)	11.60	12.39	12.33	12.39	11.94	11.95	12.07	11.00	10.34	10.38
	Aid per tce (in PTA)	6 354	6 073	6 133	10 370	11 593	11 058	11 591	12 624	11 376	12 652
	Aid per tce (in USD)	61.16	59.32	48.22	77.39	92.97	87.28	79.18	85.83	72.92	70.32
Turkey	Production (in million tce)	2.69	2.47	2.46	2.34	1.88	1.97	1.94	1.64	1.47	1.67
	Aid per tce (in '000 TL)	637	1 713	1 760	2 106	6 487	8 031	12 371	27 212	63 976	138 078
	Aid per tce (in USD)	151.61	248.32	160.02	70.66	141.95	98.79	81.60	104.54	155.8	220.95
UK	Production (in million tce)	78.11	69.75	56.41	41.23	46.97	43.10	41.70	35.42	32.06	27.5
	Aid per tce (in GBP)	14.45	15.51	3.45	5.03	2.76	2.67	4.30	0.00	0.00	2.15
	Aid per tce (in USD)	25.49	27.21	5.18	7.71	4.35	4.16	7.03	0.00	0.00	3.25

p Preliminary data, subject to revision.
Note: tce is tonne of coal equivalent.

Indicative Prices on the International Coal Market

(Average CIF* prices for hard coal imported into the european union from non-EU countries)

Country	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000p*
Power station steam coal (USD/tce)	52.00	51.81	44.70	43.68	50.20	48.64	47.89	41.28	36.80	36.61
Coking coal (USD/tonne)	59.55	57.93	56.15	54.20	57.82	57.50	57.53	55.41	47.83	47.50

* Cost, Insurance and Freight.
Source: European Commission.

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ANNEX

GLOSSARY AND LIST OF ABBREVIATIONS

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

bbl	barrel.
bcm	billion cubic metres.
b/d	barrels per day.
Btu	British thermal unit.
cal	calorie.
CERT	Committee on Energy Research and Technology of the IEA.
CFCs	chlorofluorocarbons.
CHP	combined production of heat and power; sometimes, when referring to industrial CHP, the term "co-generation" is used.
CO_2	carbon dioxide.
ECU	European Currency Unit.
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.
EFTA	Europe Free Trade Association: Iceland, Norway, Switzerland and Liechtenstein.
FCCC	Framework Convention on Climate Change.
FERC	Federal Electricity Regulatory Commission.
FSU	Former Soviet Union.
GDP	gross domestic product.
GHG	greenhouse gas.
GJ	gigajoule, or 1 joule $\times 10^9$.
GW	gigawatt, or 1 watt $\times 10^9$.

IEA	International Energy Agency whose Members are Australia, Austria, Belgium, Canada, the Czeck 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.
IPP	independent power producers.
J	joule; a joule is the work done when the point of application of a force of one newton is displaced through a distance of one metre in the direction of the force (a newton is defined as the force needed to accelerate a kilogram by one metre per second). In electrical units, it is the energy dissipated by one watt in a second.
LDC	local distribution company.
LNG	liquefied natural gas.
LPG	liquefied petroleum gas; refers to propane, butane and their isomers, which are gases at atmospheric pressure and normal temperature.
LWR	light water reactor.
mcm	million cubic metres.
Mt	million tonnes.
Mtoe	million tonnes of oil equivalent; see toe.
MW	megawatt of electricity, or 1 Watt $\times 10^6$.
MWh	megawatt-hour = one megawatt $\times$ one hour, or one watt $\times$ one hour $\times 10^6$.
NEA	the Nuclear Energy Agency of the OECD.
OECD	Organisation for Economic Co-operation and Development.
OPEC	Organisation of the Petroleum Exporting Countries.
ppm	parts per million.
PPP	purchasing power parity: the rate of currency conversion that equalises the purchasing power of different currencies, i.e. estimates the differences in price levels between different countries.
PSA	production sharing agreement.
PSE	producer subsidy equivalent.
R&D	research and development, especially in energy technology; may include the demonstration and dissemination phases as well.

SB	Single Buyer.
SLT	Standing Group on Long-Term Co-operation of the IEA.
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.
TW	terawatt, or 1 watt $\times 10^{12}$.
TWh	terawatt $\times$ one hour, or one watt $\times$ one hour $\times 10^{12}$.
WTO	World Trade Organisation.

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ANNEX

FOOTNOTES TO ENERGY BALANCES AND KEY STATISTICAL DATA

[1] Includes lignite and peat, except for Finland, Ireland and Sweden. In these three cases, peat is shown separately.
[2] Comprises solid biomass, liquid biomass, biogas, industrial waste and municipal waste. Data are often based on partial surveys and may not be comparable between countries.
[3] Other includes tide, wave and ambient heat used in heat pumps.
[4] Total net imports include combustible renewables and waste.
[5] Total supply of electricity represents net trade. A negative number indicates that exports are greater than imports.
[6] Includes non-energy use.
[7] Includes less than 1% non-oil fuels.
[8] Includes residential, commercial, public service and agricultural sectors.
[9] Inputs to electricity generation include inputs to electricity, CHP and heat plants. Output refers only to electricity generation.
[10] Losses arising in the production of electricity and heat at public utilities and autoproducers. For non-fossil-fuel electricity generation, theoretical losses are shown based on plant efficiencies of 33% for nuclear, 10% for geothermal and 100% for hydro.
[11] Data on "losses" for forecast years often include large statistical differences covering differences between expected supply and demand and mostly do not reflect real expectations on transformation gains and losses.
[12] Toe per thousand US dollars at 1995 prices and exchange rates.
[13] Toe per person.
[14] "Energy-related CO_2 emissions" specifically means CO_2 from the combustion of the fossil fuel components of TPES (i.e. coal and coal products, peat, crude oil and derived products and natural gas), while CO_2 emissions from the remaining components of TPES (i.e. electricity from hydro, other renewables and nuclear) are zero. Emissions from the combustion of biomass-derived fuels are not included, in accordance with the IPCC greenhouse gas inventory methodology. 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.

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(61 2001 36 1 P) ISBN 92-64-19659-5 - 2001