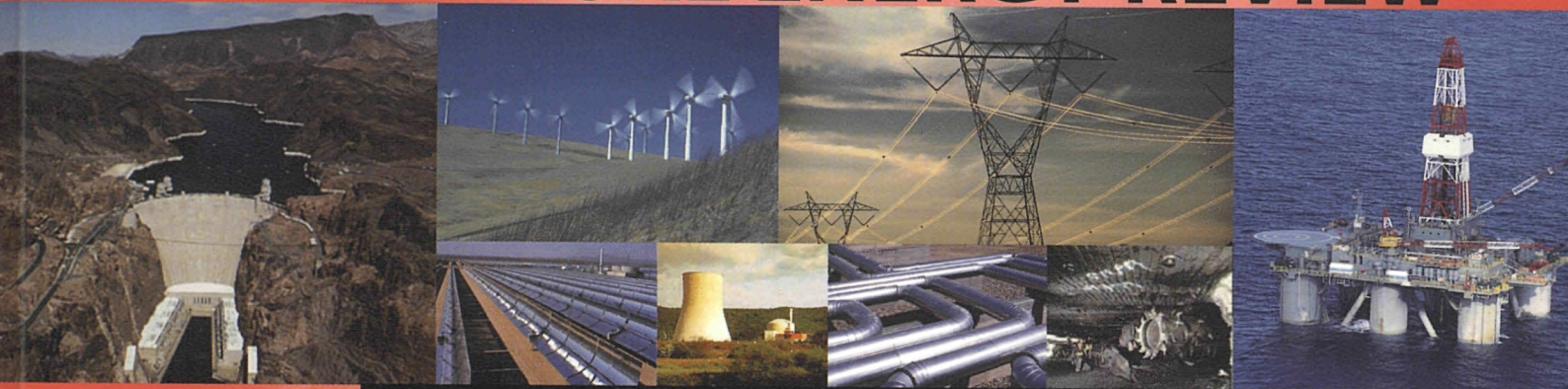


2000 — ANNUAL ENERGY REVIEW



JANUARY 2001



EUROPEAN
COMMISSION

Annual energy review



January 2001

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European Commission
Directorate-General for Energy and Transport

2000 — ANNUAL ENERGY REVIEW

JANUARY 2001



**Includes a CD-ROM with global
energy balances and indicators
for 135 countries in the world**

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The European Commission does not guarantee the accuracy of the data included in this report, nor does it accept responsibility for any use made thereof.

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A great deal of additional information on the European Union is available on the Internet. It can be accessed through the Europa server (<http://europa.eu.int>).

Any comments and questions on this publication may be sent to: tren-info@cec.eu.int

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**FOREWORD BY VICE-PRESIDENT de PALACIO del VALLE-LERSUNDI
(RELATIONS WITH THE EUROPEAN PARLIAMENT, TRANSPORT AND ENERGY)**

Europe's dependency on imported energy sources continues to increase steadily: currently almost 50% of our energy is imported and dependency is forecast to reach 70 % by 2030. Existing patterns of energy production and consumption are putting the environment at risk: energy production and consumption accounts for 80% of man-made greenhouse gases emissions. The energy sector operates in a newly competitive market that needs constant monitoring to identify situations where intervention is called for.

To tackle the growing challenges the European Union will have to strive to develop new and radical approaches to energy policy. These will in turn require endorsement and support from all parts of society. In publishing a Green Paper on Security of Supply, the Commission is launching a debate on the need for a renewed commitment from all stakeholders, including Member States, industries, and non-governmental organisations, to achieve a secure and sustainable energy policy for future generations.

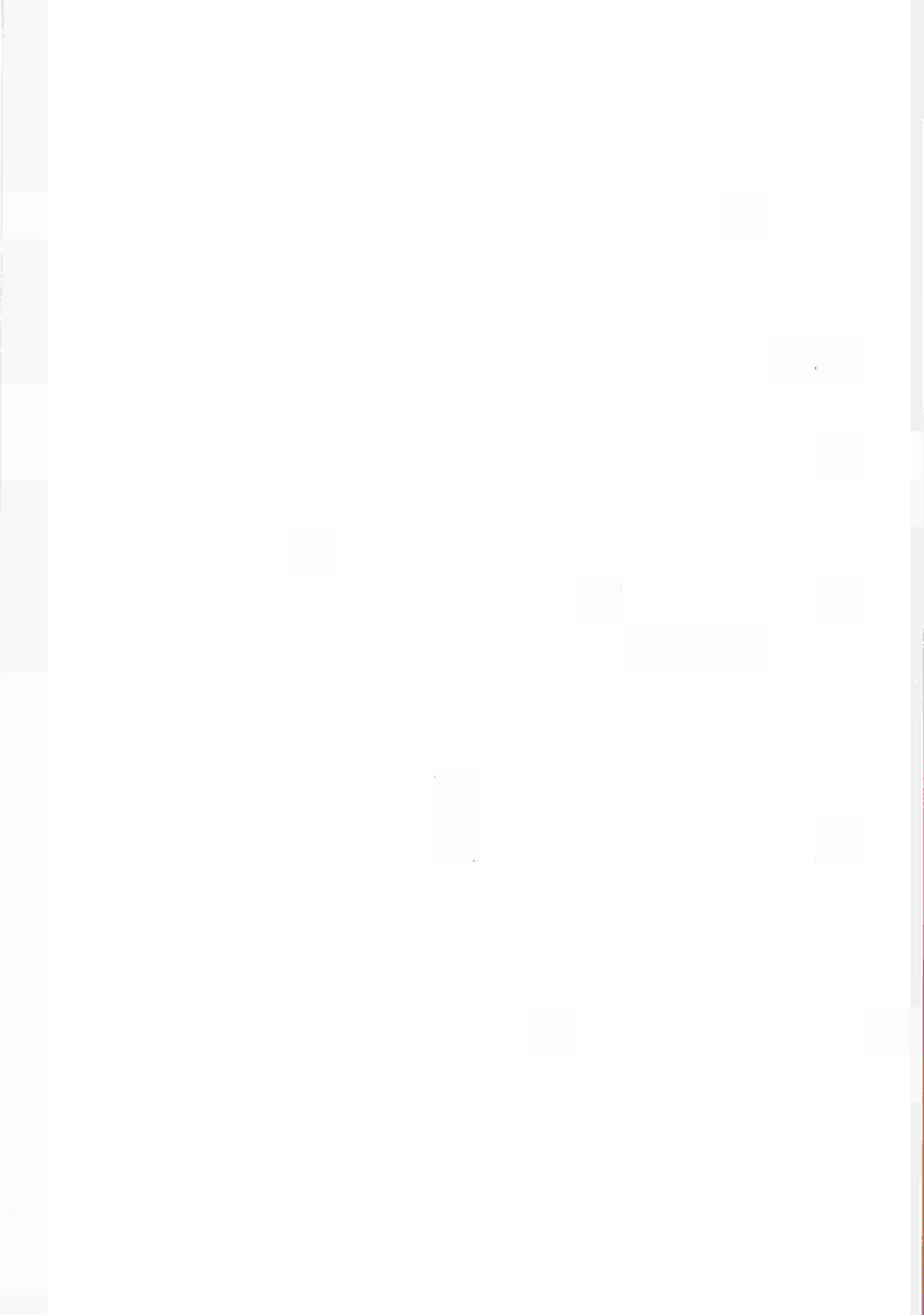
Effective and workable solutions cannot be found in the energy sector alone. The transport sector has been identified as a pivotal sector in terms of its energy consumption and increase in emissions. The Commission, with its decision to merge energy and transport policy in a unified Directorate-General, has led the way to a new lateral approach. The reactions to the autumn rise in crude oil prices provide us with yet another reminder and with further motivation for co-ordinated energy and transport policy. Other actions will be needed. Strengthening and accelerating the single market for electricity and gas will indeed remain a key objective for the Commission. The success of renewable energies in the open market needs to be promoted more actively.

The Annual Energy Review faces new challenges of its own. While answering the traditional needs of its established readership, adapting the Review to the contemporary policy and market situation has always featured high on the agenda. If the Review has always paid attention to transport-related energy consumption, a careful appraisal of the potential for further synergies between the energy and transport sectors is now necessary.

Long-term policy objectives are pointless if they do not encompass the new geographical boundaries of the Union. All policy analyses and actions will need to take into account the enlargement of the European Union. This edition of the Annual Energy Review pays special attention to this and devotes a specific chapter to the candidate countries.

The editors are exploring possible new areas for the Annual Energy Review, including its format and content. In this context your ideas are welcome. All your comments can be mailed to our electronic letterbox: tren-info@cec.eu.int. On our site, http://europa.eu.int/comm/dgs/energy_transport/index_en.html you will find more information on energy and transport markets and policies. I hope our old and new readers of the Annual Energy Review will have much productive reading in this volume.





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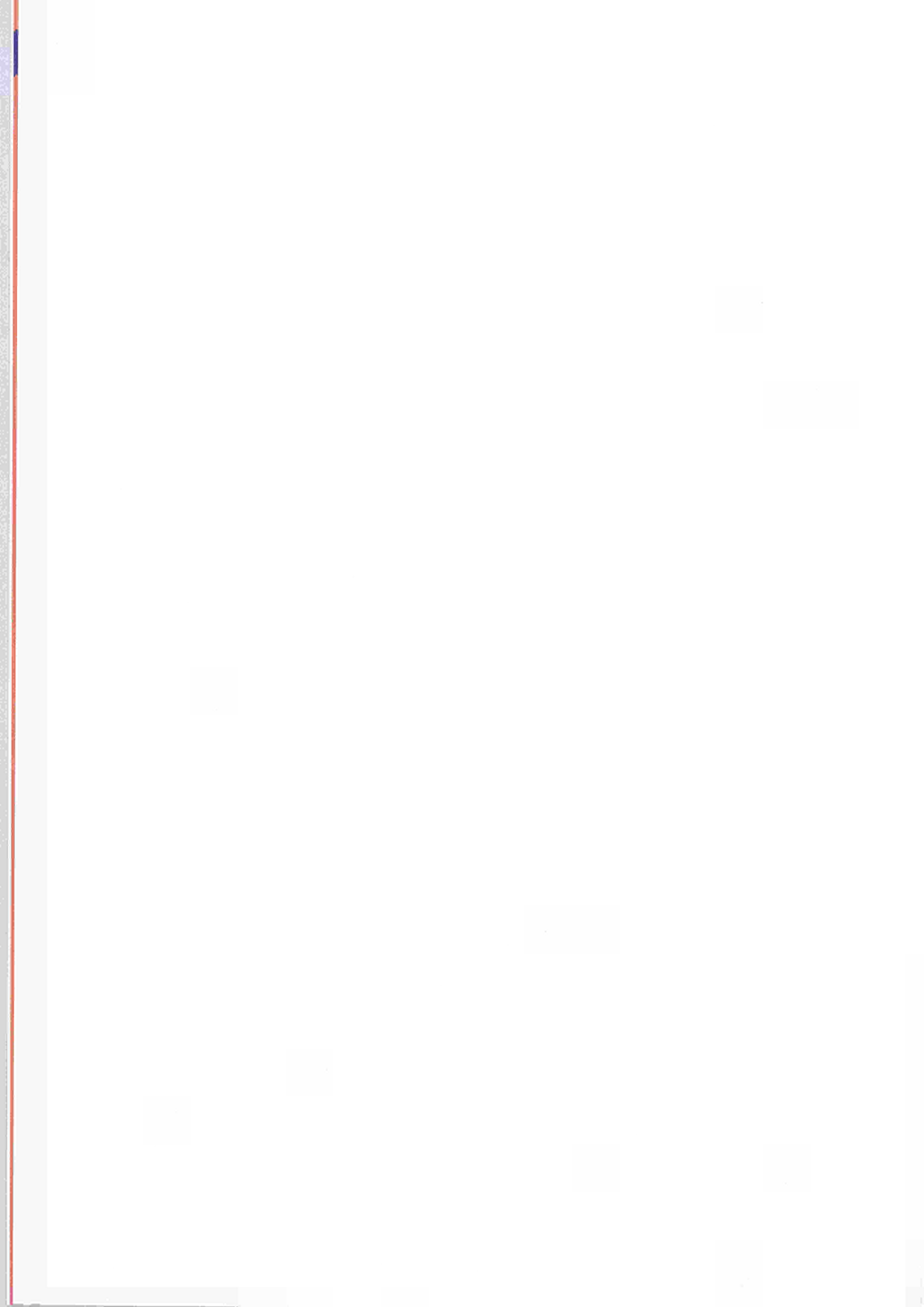
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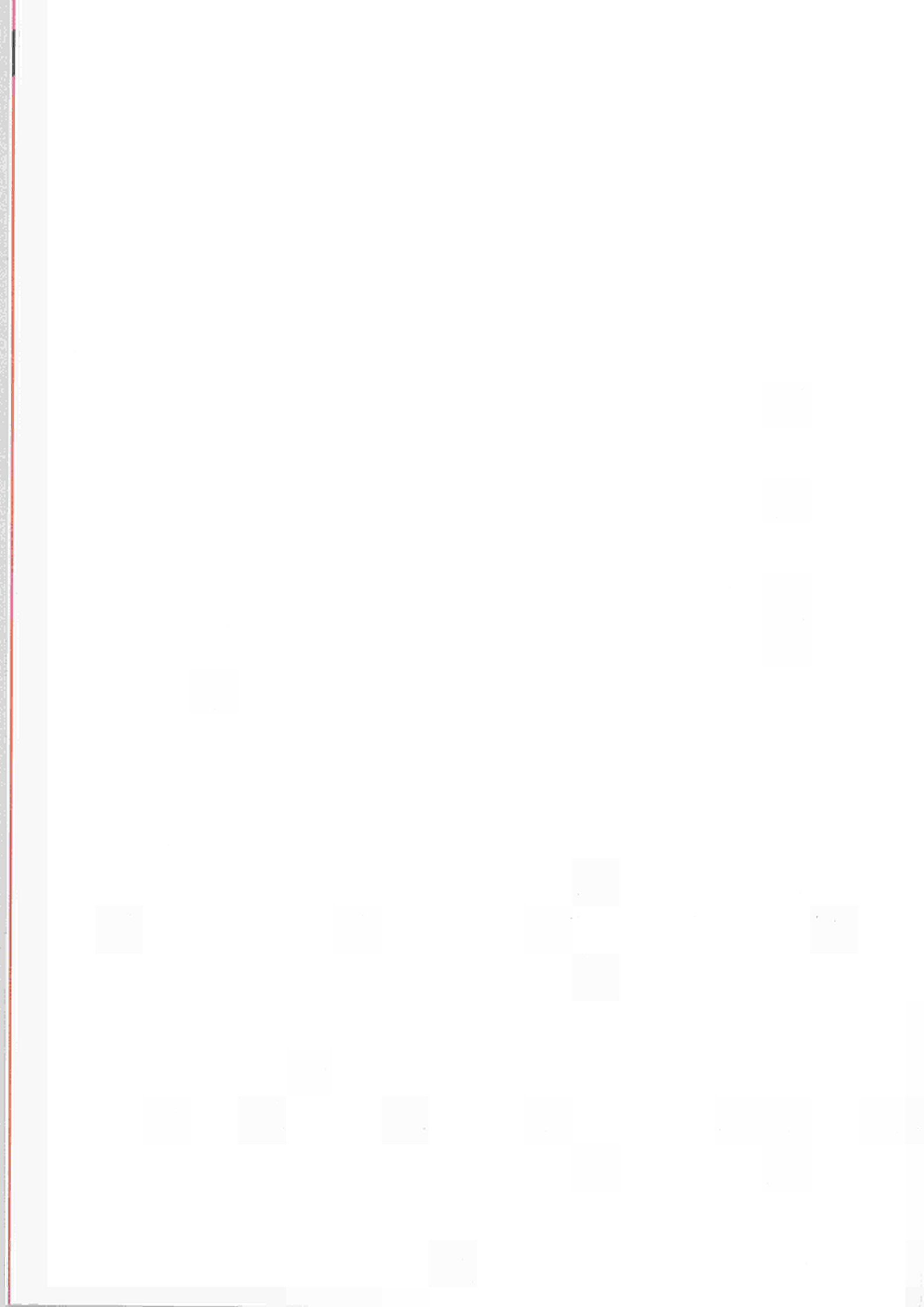
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ABBREVIATIONS, DEFINITIONS AND UNITS

CEEC	Central and Eastern European Countries
CIS	Community of Independent States
DG TREN	Directorate-General for Energy and Transport of the European Commission
EFTA	European Free Trade Association
Energy Intensity	Ratio of Energy Consumption to GDP
EU	European Union
GCC	Gulf Co-operation Council
GDP	Gross Domestic Product
GIC	Gross Inland Consumption
GW	GigaWatt, or 10^9 Watt
GWh	GigaWatt.hour or 10^9 Watt.hour
IEA	International Energy Agency
IMF	International Monetary Fund
Kgoe	Kilogram oil equivalent
kl	Thousand litre
km	Kilometer
ktoe	Thousand toe
kWh	Thousand Watt.hour
l	Litre
MEUR	Million EURO
Mt	Million metric tonne
Mtoe	Million toe
NAFTA	North American Free Trade Agreement
OECD	Organisation for Economic Co-operation and Development (excluding Hungary, Czech Republic and Poland)
OLADE	Organizacion Latinoamericana de Energia
SOEC	Statistical Office of the European Communities
t	Metric tonne, or 1.000 kilograms
toe	Tonne of oil equivalent, or 10^7 kilocalories, or 41.86 GJ
TWh	Tera Watt.hour, or 10^{12} Watt.hour
UN	United Nations
WB	World Bank



ENERGY HIGHLIGHTS...

... IN THE EUROPEAN UNION:

- Energy consumption grew 1.9 % in 1998, mainly tracking strong economic performance (+2.9 %) since heating requirements were practically the same as in 1997. Indications suggest that the strong growth continued in 1999;
- Over the 90's, final energy demand grew faster than overall use of primary energies, reflecting changes in the final energy mix and improved efficiency in power generation;
- Natural gas continued growing robustly (4.3 %) in 1998, and renewable energies also showed a strong increase of 3.7 %. Solid fuel decline (-0.3 %) was not as pronounced as it had been earlier;
- Indigenous production declined (1.1 %) for the second year in a row after the production peak of 1996;
- The increase in final energy consumption over the 90's was due to growth in transport and tertiary/domestic sectors, in an almost fifty-fifty split, while overall industrial consumption remained practically unchanged;
- Energy prices saw substantial ups-and-downs, tracking crude oil prices, which in late 1998 were around 10 dollars per barrel to reach over 30 dollars by March 2000;
- Energy intensity improved 0.7 % annually over the 90's;
- Carbon emissions in 1998 were 1 % above the 1990 benchmark.

... AND IN THE WORLD:

- Energy demand fell by 0.1% in 1998 as a result of the Asian crisis and its extension to Latin America and CIS. It increased by 0.5% in the OECD region and declined by 0.7% in the non-OECD world;
- Final energy demand was driven by transport and the tertiary-domestic sectors (where the potential for growth remains enormous in the developing regions) while industrial use remained stable;
- The fuel mix is changing in favour of gas, but oil still remains predominant;
- Privatisation, mergers and electricity reforms continued to restructure the world energy market;
- Increasing contribution of Asia to world energy production;
- OECD absorbed 80% of world interregional exchanges of energy;
- World energy intensity improved by about 2.2% in 1997 and 1998;
- Worldwide CO₂ emissions increased by 7% since 1990.

WORLD

PRIMARY ENERGY CONSUMPTION DECLINED SLOWLY IN 1998

• Between 1990 and 1998 world primary energy consumption grew by 1.3% per year on average. In 1998, for the first time since 1992, global energy demand fell as a result of the Asian crisis and its extension to Latin America and CIS. But regional trends differed substantially:

- Energy needs continued to increase in the OECD area by 1.5% per year on average since 1990 but the growth rate slowed down to 1.2% in 1997 and only 0.5% in 1998;
- In the non-OECD world, growth in demand was limited to 1.0% annually due to the significant decreases in Central and Eastern Europe (-2.3% per year on average) and the former USSR (-5.1%). In 1998, demand decreased by 0.7% following the fall of 2.0% which occurred in Asia;
- Despite the difficult economic situation in 1998, demand grew rapidly in all developing regions since 1990: 5.5% in the Middle East, 3.9% in Latin America, 3.5% in Asia and 2.4% in Africa;
- Structurally the weight of Asia increased substantially since 1980 to represent in 1997 23.8% of world energy consumption against only 15.7% in 1980. On the contrary, the share of CIS declined from 15.5% to 9.2% and that of CEEC from 4.9% to 2.9%, while the share of the OECD as a whole decreased from 52.7% in 1980 to 49.5% in 1998.

INCREASING DEMAND IN TRANSPORT AND THE TERTIARY-DOMESTIC SECTOR WHILE INDUSTRY REMAINED STABLE

• Final energy consumption by sector followed very different trends since 1980.

- Energy consumption for transport increased steadily since 1980 by about 2.0% per year in the OECD and by 2.6% in the non-OECD region, the share of OECD still being about 66% in 1997. The near future will be marked by two major elements: the increasing contribution of transport in final energy demand (from 22.1% in 1980 to 26.2% in 1997) and sustained growth in emerging regions where the potential for development remained enormous (7.6% increase per year since 1990 in Asia, 5.7% in the Middle East and 5.2% in Latin America). In contrast in CIS, which represented 10% of the world energy demand for transport in 1990, energy demand halved in only 8 years.
- Energy consumption in the tertiary and domestic sector depends on climatic conditions and the rising share of services in economic activities. It increased on average by 1.5% since 1980, with a contrasting evolution between the OECD region (+0.9% per year) and the non-OECD region (+1.9% per year) caused by increasing living standards and growing urbanisation in emerging regions. Consequently, the share of the OECD region declined

from 43% in 1980 to 40% in 1997. But this evolution was not uniform. Between 1990 and 1997, substantially warmer in the Western Hemisphere, energy consumption by the tertiary-domestic sector increased faster in the OECD region (+1.7% per year on average) than in the rest of the world (+1.0%).

- Energy consumption by industry was at the same level as in 1980 and still 5.9% below the peak reached in 1988. Even though this is the consequence of the sharp decline in CEEC and CIS, the long-term evolution also reflects the efforts made by industry to reduce specific energy consumption. Although consumption declined in the OECD region by 0.9% on average per year since 1980, it grew by 0.7% in non-OECD regions, pushed by rapid industrial development over the last 20 years. The non-OECD share rose from 52% in 1980 to 59% in 1997. The growth was spectacular in Asia, driven by China and South East Asia, reaching 3.9% per year on average since 1980. It was followed by the Middle East with 2.7% per year on average and by Latin America with 2.5%. In 1997, Asia, excluding Japan and New Zealand, absorbed 32% of world energy consumption for industry.

THE FUEL MIX IS CHANGING IN FAVOUR OF GAS, BUT OIL STILL REMAINS PREDOMINANT

• Oil remains the predominant energy source, keeping its share of 37% since 1990. Oil demand accelerated significantly since 1995 even though oil consumption in 1998 was lower than anticipated largely because of the recession in Southeast Asia. Consequently crude oil prices of around 17\$/bbl at the beginning of 1998 declined regularly to reach about 10\$/bbl in December. These low oil prices reinforced the competitiveness of oil products in all markets. Developing regions - Asia, Latin America, Middle East and Africa - which increased their share of world oil consumption from 25.1% in 1990 to 34.0% in 1997, propelled oil consumption. The near future will be marked by the increasing contribution of transport in final demand, sustained by the enormous potential for development in the emerging regions;

- Since 1990, natural gas consumption has grown faster than overall energy consumption despite the limited growth registered in 1997 and 1998, following major increases in 1995 and 1996. This resulted from warm climatic conditions in the Western Hemisphere and continuous decline in the CIS and CEEC. In recent years the bulk of increased consumption arose from power generation that increased by 2.3% per year on average since 1990. The gas share stagnated in final energy demand as consumption declined by 1.7% in 1998 given the improved competitiveness of oil products. Gas demand accelerated in developing countries, mainly in Asia (+8.9% per year on average since 1990), in the Middle East (+7.1%) and Latin America (+6.2%), but also in the European Union (+4.5%);
- Solid fuels have been steadily losing market shares since 1990, principally in the European Union. This trend was substantially rein-



forced in 1998 by the marked decline (-3.1%) in the consumption of solid fuels. Consumption, increasingly concentrated in the power sector, occurred close to the main producers. Asia, in particular, absorbed 39.4% of the world consumption in 1998 against 32.7% in 1990 in spite of the set-back by 6% of Asian consumption in 1998;

- The carbon-free energy sources (nuclear and renewables) increased by 1.9% per year on average since 1990. The bulk of biomass production and consumption concerned non-commercial uses mainly located in Asia (52% of total biomass production), Africa (21%), NAFTA (9%) and Latin America (8%). Since 1980, the contribution of biomass to world energy production has remained stable at about 11%. Low fossil fuel prices continued to constrain development of the world's renewable energy sources dedicated to commercial uses. Nevertheless wind energy experienced some of the strongest growth among the renewable energy sources, the top five markets being located in Germany (2874 MWe installed), the United States (1927 MWe), Denmark (1450 MWe), India (968 MWe) and Spain (834 MWe).

PRIVATISATION AND ELECTRICITY REFORMS CONTINUED APACE IN 1998

Electricity is - and is likely to remain - the fastest growing component of final energy demand. Electricity's share in final energy consumption increased by about 40% since 1980, from 11.4% to 15.8%. In the OECD region, electricity demand showed strong growth since 1980 at 2.7% per year on average in contrast to 0.7% annual growth in total final energy demand. Electricity consumption in the rest of the world grew by 3.9% per year since 1980 although total final demand increased by only 1.6%. Since 1990, electricity generation increased by 2.1% per year world-wide:

- Nuclear production increased fastest even though capacity increased by only 7% since 1990. Historically the first slow down of nuclear production was registered in 1997 due to power plant closures in the United States and Canada. Even though the performance of nuclear reactors improved worldwide, the prospects for increased reliance on nuclear power for electricity generation are dimming. Public concern about the safety of nuclear reactor operations, plant decommissioning and the disposal of nuclear waste makes the ordering of new nuclear facilities difficult;
- Hydro production continued to increase, with major developments in Asia and Latin America;
- Since 1993 the contribution of thermal generation has accelerated, meeting more than 70% of incremental production. In 1997 it contributed as much as 96% of additional production due to the slowdown of nuclear output. Solid fuels dominated power station fuel consumption, with a major predominance in producing countries (United States, China and CIS) where its use increased steadily. Gas use has more than doubled since 1980, and this trend will be accentuated with the increasing contribu-

tion of Independent Private Producers (IPPs) based on gas combined cycle units.

- Privatisation and electricity reform measures continued apace in 1998. Central and South America have led the developing world in the privatisation of electricity and implementation of electricity reform. In 1998 Brazil followed the path, commenced first by Chile and later by Argentina, in selling off state-owned electricity assets to the public. Both South Korea and Thailand are undertaking greater market reform of their electricity sectors. The pace of foreign investment in developing nations' electricity sectors hinged strongly on the implementation of electricity reform and the application of transparent and consistent regulatory and investment policies.

INCREASING CONTRIBUTION OF ASIA IN WORLD ENERGY PRODUCTION:

- World primary energy production increased since 1980 by about 1.5% year. In the last four years production jumped by 1.8% per year on average in line with surging demand. Even in 1998, production continued to grow by 0.7% to restore stocks. The major contribution came from crude oil (+73 Mtoe) supported by low international oil prices, followed by natural gas (+28 Mtoe) and non-fossil fuels (+26 Mtoe) while solid fuel production decreased (-61 Mtoe) to retrieve a level of production comparable with that of 1990;
- In 1998, the major developments were located in oil producing regions: the Middle East and Latin America. In contrast energy production diminished in Western Europe (mainly of hydrocarbons) and in Asia, where the reduction concentrated only on solids;
- Since 1990, OECD production has grown by 1.5% per year, against 1.1% in the non-OECD region. Major gains occurred in the EFTA region (+6.6% per year since 1990), Latin America (+5.2%), OECD Pacific (+4.0%) and the Middle East (+3.7%);
- The 1990's were marked by substantial cutbacks of energy production in CEEC and CIS countries. Since 1990 CIS energy production has declined by 28% and by 17% in CEEC;
- The main energy producer in 1998 remained the NAFTA region with about 23% of total world energy production, followed by Asia with 21%, the Middle East with 13%, the CIS with 12% and Western Europe with 10%.

OECD ABSORBED 80% OF WORLD INTERREGIONAL EXCHANGES OF ENERGY:

- The European Union remains by far the largest net energy importer with a steady annual growth of 2.5% since 1985, reaching a peak of 723 Mtoe in 1998. NAFTA is the second ranking with a growth rate of about 13% per year on average since 1985. The OECD Pacific region is the third ranking with a relative stable level



since 1980;

- In 1998, the OECD absorbed about 80% of world inter-regional net exchanges but all these exchanges represented only 18% of total world energy consumption - the same share as in 1980;
- Asia continuously increased its imports starting from a negligible level in 1980 to reach 270 Mtoe in 1998, 35 Mtoe below the peak reached in 1997. As a result of recent trends, Asia will rapidly become the second largest importer of energy amongst the main world regions;
- Net exporters remained, traditionally, the Middle East (893 Mtoe in 1998), Africa (350 Mtoe), CIS (283 Mtoe) and EFTA (164 Mtoe), all four mainly exporters of hydrocarbons;
- Oil accounted for 81% of interregional energy exchanges in 1998, natural gas for 12% and solids for 7%;
- OPEC continued to dominate the oil market and Russia accounted for 42% of natural gas trade in 1998.

WORLD ENERGY INTENSITY IMPROVED BY ABOUT 2.2% IN 1997 AND 1998

- World energy intensity improved by about 0.8% per year between 1990 and 1994, remained stable between 1994 and 1996, but improved by 2.3% in 1997 and 2.2% in 1998;
- OECD regions with the lowest energy intensity improved their performance marginally (-0.6%) since 1990 despite marked improvement in 1997 and 1998: 2.1% and 1.8% respectively. In the OECD Pacific region energy intensity increased by 0.4% per year since 1990 due to the difficult economic situation in Japan;
- The rest of the world was characterised by a substantial reduction of energy intensity (-1.8% per year on average since 1990) despite the substantial increase in CIS (+2.1% per year) and in the Middle East (+2.4% per year). Asia experienced the major improvement since 1990, at about 3.0% per year on average.

WORLDWIDE CO₂ EMISSIONS INCREASED BY 7% SINCE 1990 WHILE EUROPEAN UNION EMISSIONS STABILISED

- Worldwide emissions of CO₂ increased steadily by 1.4% per year during the 1980's and by 0.9% per year since then, leading to a global increase by 7% in 1998 compare to the 1990 level;
- Since 1990, CO₂ emissions have been increasing in almost all regions in the world, in some cases by more than 5% per year (Asia and Middle East) - with the exception of former Centrally Planned Economies due to the drastic reduction of energy consumption observed in these countries since 1990;
- The European Union (+0.2% per year) was the best performer amongst industrialised regions. It benefited from energy efficiency and carbon intensity improvements as the climatic conditions of 1990 and 1998 were similar. At the same time CO₂ emissions increased by 12% in the OECD Pacific region, 13% in the NAFTA

region and 18% in EFTA since 1990;

- CO₂ emissions from power generation represented about 34% of total world emissions in 1997 against 28% in 1980. In contrast the contribution from industry declined from 26% in 1980 to 17% in 1997;
- CO₂ emissions per capita showed a reduction of 0.6% a year on average since 1990 at the world level and carbon intensity declined steadily, the main improvement being observed in the tertiary-domestic sector (-11% since 1990) and in industry (-7%).

EUROPEAN UNION

SINCE 1995 CHANGES IN ENERGY CONSUMPTION WERE RELATED TO GDP GROWTH

- In 1998, with climatic conditions similar to those of 1997, final energy demand increased by 1.6% as a response to the 2.9% growth of GDP.
- With the exception of solid fuels, that declined by 8.8% in line with the average reduction observed since 1990, all the other fuels experienced rising consumption in 1998: heat by 1.1%, oil products by 1.5%, electricity by 2.5%, natural gas by 2.8% and renewable energy sources by 3.3%;
- Since 1990, final energy demand has increased on average by 1.2% per year while GDP increased by 1.7% - implying an elasticity of about two thirds. But excluding the induced effects of the German reunification, final energy consumption increased in the European Union at the same rate as GDP;
- Since 1994, industrial consumption of energy has grown at 1.1% per year on average while industrial production has increased by 2.9% on average. Energy intensity of industry fell by 2.7% in 1997 and 3.6% in 1998. This was a consequence of new investment generated by the high level of economic activity, higher capacity utilisation rates and continued development of small to medium-sized enterprises dedicated to high value-added products. Significant differences exist between Member States and the greater improvements of energy intensity occurred with sustained industrial production growth;
- Transport energy demand grew between 1985 and 1998 at an average annual rate of 3.0% but, in the period 1990-98, growth remained limited to 2.1% per year despite jumps of 2.8% in 1996 and 3.4% in 1998. In 1998, transport energy demand represented 31.6% of total energy demand compared with only 24.6% in 1985. Between 1985 and 1998 transport contributed 78% of the total increase of final energy demand. But since 1990 it contributed only 54% of the total increase, the rest being absorbed by the tertiary-domestic sector. Since 1994 energy demand grew more slowly than before and the energy intensity, measured against GDP, stabilised;



- Energy consumption in the domestic and tertiary sector increased by 0.6% annually on average since 1985, but by 1.4% per year since 1990 which experienced similar climatic conditions to those in 1998. Demand increased under the pressure of continual increases of specific uses (electrical appliances...) and living standards (central heating and house size). Year-to-year changes of energy demand in this sector continue to be strongly tied to the weather. In 1998, energy consumption increased by 1.4% while degree-days grew by only 0.6%;
- Gross inland consumption was 9.0% higher in 1998 than in 1990 while GDP showed 14.8% growth, indicating a 5.1% energy intensity improvement since 1990, or about 0.7% per year.

NATURAL GAS DEMAND GREW THE FASTEST OF THE FOSSIL FUELS

- Natural gas demand increased by about 4.5% per year on average since 1990, demonstrating continuous growth. Increases were spectacular in the three main markets: +104% in the power sector, +32% for the tertiary-domestic sector and +16% in industry. In 1998, sustained by low energy prices and economic growth, gas consumption increased by 4.3%, of which +7.8% was in power generation and +2.8% in final demand. Resource availability, government energy and environmental policy, and infrastructure development all favour increased use of natural gas;
- Due to low oil prices on the international market, oil consumption increased by 2.3% in 1998. Since 1990, all the increase in oil product consumption, about 56 Mtoe, was concentrated on transportation fuel (including kerosene) and feedstocks. Other changes were more marginal, with the energy branch (+5 Mtoe) compensating for the limited reduction which occurred in the power generation sector (-3 Mtoe) and the more marked decline in industry (-6 Mtoe). Consumption by the tertiary-domestic sector remained flat. Consequently the European oil market became increasingly captive to specific markets (transport and petrochemicals) reaching 62% of total oil demand in 1998;
- Solid fuels steadily lost major market shares in all markets between 1990 and 1997. In 1998 the rebound in power generation, due to the increased contribution of thermal units, compensated the continuing decline in final use where solid fuels represented only 4.5% of total energy consumption in 1998 against 12.3% in 1985. Total solid fuel consumption is now 26% lower than in 1990 with major declines in Germany and the United Kingdom, the two main producers, where the reduction reached 35%.
- Electricity consumption continued to grow more rapidly than final demand, at about 1.8% per year on average since 1990. Electricity's share reached 29% in industry and 26.2% in the tertiary-domestic sector although the development of new applications was compensated by the introduction of more energy-efficient equipment to replace obsolete appliances. Electricity growth was largely driven by the tertiary sector. In 1998, with similar climatic conditions

to those in 1997, industrial demand grew by 2.4%, domestic demand by 2.3% and services by 3.4%;

- In 1998, for the first time since nuclear power was exploited in the European Union, both installed capacity and generation fell - by respectively 0.7% and 1.4%. Possible expansion of nuclear capacity is now limited to France (but without any specific projects at present), with a de facto moratorium on new ordering in all other EU countries. Additionally a progressive phase-out of the nuclear contribution was decided in Germany in early 2000. Consequently it will be difficult for nuclear to continue to cover 40% of total EU incremental electricity production as it has since 1990. Thermal electricity production jumped by 4.8% in 1998 to compensate for the contraction of nuclear generation, contributing 80% of incremental generation, and renewables 20%. In the near future, as the prospects both for new nuclear capacity and for hydro are strongly limited, incremental generation requirements will be mainly covered by thermal units and renewables;
- The opening of European electricity markets through the EU Directive in February 1999 was the first stage of a three-part process to liberalisation. Led by the United Kingdom, several European countries have opened their markets more quickly than required, introducing important electricity reforms. To varying degrees these reforms have reduced government oversight and increased the role of market forces in balancing electricity supply and demand. The United Kingdom first began to privatise its electricity industry in 1990 and completed the final phase of privatisation in 1996.

INDIGENOUS PRODUCTION PEAKED IN 1996

- Indigenous production of primary energy declined by 1.1% in 1998, continuing the trend begun in 1997 after the peak registered in 1996;
- Oil production showed an average annual increase of 6.4% between 1990 and 1995, driven by the application of more efficient and economical methods for offshore exploitation and reached a new peak in 1995. In 1996 and 1997 production remained stable but again reached a new peak in 1998. Oil import dependency declined from 80% in 1990 to 75% in 1998;
- The recent increase in natural gas production was impressive, with a rise of 5.4% per year on average between 1990 and 1996. This trend was mainly sustained by the United Kingdom, the largest European gas producer in 1996, which has doubled its production since 1990; and by the Netherlands, which played the role of swing producer with its major Groningen gas field, characterised by very low production costs. In 1997 and 1998, faced with declining European demand due to warmer weather conditions, the Netherlands played this swing role by reducing gas production by about 11% and 5% respectively. At the European level, gas production declined by 3.5% in 1997 and only 0.4% in 1998. Gas import



dependency remained almost stable at 41% despite the rapid increase of consumption since 1990;

- Solid fuels output declined faster and faster until 1995 with a reduction of about 45% since 1990, with production both of steam coal and lignite falling at similar rates. Solid fuel import dependency increased from 29% in 1990 to 45% in 1998;
- Thanks to an improving utilisation rate of its capacity - one of the best performances in the world - nuclear production grew faster than gross inland consumption until 1997, adding to energy self-sufficiency. But it slowed down in 1998, given the closure of some units. As no new plant commissioning is expected in the near future, the share of nuclear will diminish - opening the door for additional use of imported fossil fuels;
- The contribution of renewable energy sources continued to grow rapidly, 3.5% per year on average since 1990, even though some jumps (as in 1997) were due to statistical changes in some Member States. The contribution of renewable energy sources represented 11.3% of total primary energy production and 5.9% of gross inland energy consumption in 1998;
- Total energy import dependency remained unchanged at around 48% since 1990 even though it increased by 2.0% in 1997 and 2.4% in 1998. The overall net import of energy was 723 Mtoe in 1998, and had increased by 1.5% per year on average since 1990.

ENERGY CONSUMER PRICES DECLINED IN 1998

- The turn of the millennium witnessed strong up and down movements in crude oil prices, with tripling of prices in 18 months;
- Overproduction related to the Asian economic crisis depressed oil prices on international markets in 1998;
- Oil product prices in the EU market declined substantially in 1998: -3.7% for unleaded gasoline, -6.0% for diesel, -14% for heating oil and -17% for heavy fuel oil. The level of reduction directly depended upon the share of excise duties and taxes in product prices;
- Natural gas prices declined by 6.5% in industrial markets and by 1.3% in the heating market;
- Electricity prices decreased by 3.5% on industrial markets and by 2.1% for tertiary-domestic uses as a result of increasing competition between producers and declining fossil fuel prices;
- Compared to the prices of the main competitors inside the OECD, European energy prices for industry cannot compete with those of the United States, with price differences of between 27% to 36%. This price comparison was, and remains, even more unfavourable compared to non-OECD regions.

ENERGY INTENSITY IMPROVED BY 0.7% PER YEAR SINCE 1990

- Overall energy intensity improved by 0.7% per year on average between 1990 and 1998, being favourably influenced by the 2.8%

improvement in 1997. The comparison between 1990, 1997 and 1998 is particularly pertinent as these years were characterised by similar weather conditions;

- Intensity improvements in industry since 1990 (-1.8% per year on average) and power generation (-0.6% per year on average) were the main drivers in reducing the overall energy intensity. Technological improvements are increasingly becoming the driving force for energy saving in both industry and the power sector;
- On the other hand, the energy intensity of the tertiary-domestic sector decreased slowly since 1990 (-0.3% per year on average). The increasing commercial and services floor area and the growing number of households, combined with the reduced incentives to use energy rationally, together offset much of the gains provided by technological improvements;
- Although the energy intensity of the transport sector still increased by 0.3% per year on average in the period 1990-98, the first signs of stabilisation appeared in 1993. Energy intensity fell by 2.5% in 1995 and has remained stable since then. Initial analysis suggests this improvement is associated with the improved efficiency of new vehicles, in particular passenger cars, and better management of traffic flows.

CO₂ EMISSIONS IN 1998 WERE 1% ABOVE THE 1990 LEVEL

- With weather conditions in 1998 similar to those in 1997 and 1990 CO₂ emissions increased by 1.9% in 1998 to reach a level 1% above that of 1990. In the period 1990-98, CO₂ emissions increased by 0.1% per year on average. This resulted from three main factors: the continuous improvement of technologies reducing specific energy consumption; the growing contribution of non-fossil fuels, mainly nuclear together with some wind energy and biomass; and greater penetration of natural gas both for power generation and in final markets in substitution of solid fuels and oil products;
- Within the final demand sectors, transport was the only one with steadily increasing emissions since 1990 (+18% including air transport). The contribution of this sector grew from 24% in 1990 to 28% in 1998. The tertiary-domestic sector stabilised its emissions, whilst industry provided the largest fall in CO₂ emissions since 1990 (-12.3%). Power generation remained the largest sector in term of emissions although they have fallen by 3% since 1990.
- In 1998 incremental emissions came from the power sector (37 million tons of CO₂), and transport (30 million tons of CO₂), partly compensated by the reduction in industry (11 million tons of CO₂). This important increase in emissions from the power sector - as a consequence of the first reduction of total EU nuclear capacity - clearly underlined the implications of this new trend.

The World is divided into the following regions:

EUROPEAN UNION

Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom;

EFTA

Iceland, Norway and Switzerland;

NAFTA

Canada, Mexico and the United States of America;

OECD PACIFIC

Australia, Japan and New Zealand;

OTHER OECD COUNTRIES

Include EFTA, NAFTA, OECD Pacific regions and Turkey;

Rem : The new members (Czech Republic, Hungary, Poland and South Korea) are still considered in their original region to respect the coherence of the analysis;

CENTRAL AND EASTERN EUROPE

Albania, Bulgaria, Czech Republic, Hungary, Poland, Romania, Slovakia and former Yugoslavia;

BALTIC STATES

Estonia, Latvia and Lithuania;

CIS

Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine and Uzbekistan;

AFRICA

North Africa (Algeria, Egypt, Libya, Morocco and Tunisia) and Sub-Saharan Africa including all other African countries;

MIDDLE EAST

Bahrain, Israel, Iran, Iraq, Lebanon, Kuwait, Oman, Qatar, Saudi Arabia, Syria, United Arab Emirates and Yemen;

ASIA

China, Newly Industrialising Economies (Hong Kong, Singapore, South Korea and Taiwan) and all other Asian countries not included elsewhere and the Pacific islands;

LATIN AMERICA

Brazil, Venezuela and all other Central and South American countries.

Data cover the period from 1980 to 1998 for the OECD Countries and up to 1997 for all non-OECD Countries. Data for 1998 in non-OECD Countries are shown wherever provisional figures were available.

FOLLOWING SOURCES ARE USED:

ENERGY DATA

- Statistical Office of the European Communities (SOEC) for EU statistics;
- International Energy Agency (IEA) for OECD statistics (non-EU countries), non-OECD statistics.
- PlanEcon for additional energy statistics on CEI and CEEC.
- Olade for additional energy statistics on Latin America.
- United Nations for biomass and generating capacities statistics.
- ESAP (Belgium) for generating capacities.
- Energy Information Administration, US Department of energy for provisional data for 1998 in non-OECD countries
- BP Statistical Review of World Energy for provisional data for 1998 in non-OECD countries;

PRICE DATA

- IEA for all average price fuels in the European Union's countries
- European Commission Directorate General for Energy and Transport for oil price statistics;

MACROECONOMIC AND POPULATION DATA

- Eurostat for European Union
- United Nations, World Bank, IMF and Planecon for the rest of the world.

Data for non-OECD Countries should be used with caution. Comparisons between series of absolute values are only indicative.

The editor is pleased to acknowledge the support and contribution of the International Energy Agency. The IEA, an autonomous body within the framework of the Organisation for Economic Cooperation and Development, provides a large share of the statistics presented here – for OECD Member countries other than the European Union and for non-Members throughout the world.



A FEW WORDS ON METHODOLOGY AND DEFINITIONS ARE NECESSARY.

GENERAL

- **Primary hydro-electricity** production is considered in terms of net calorific value (1 GWh = 86 toe) and **primary nuclear** production is calculated as fuel equivalent to produce the same amount of electricity in a power station with a thermal efficiency of 33%.

- **Biomass** data for OECD Countries (excluding European Union Member States) correspond to what the IEA shows in its energy balances under "Other Solid Fuels". Data for all non-OECD Countries correspond to IEA and UN data under the designation of "Vegetal Fuels". These data have been deeply revised for the present edition. In the case of the European Union see below.

- **Primary heat** (geothermal energy) is considered as being exclusively used for power generation. **Heat** shown in the final demand section is exclusively derived from other fuels (power generation and district heating). In the case of the European Union see below.

- In the **World Summary Energy Balance, gross energy consumption** corresponds to the total primary energy consumed including quantities delivered to marine bunkers. **Total final energy consumption** (TFEC) does not include any quantities used for non-energy purposes.

- **Energy intensity** is defined as the ratio of energy consumption to an economic activity indicator. In the case of total energy intensity, the ratio is between the Gross Inland Consumption and GDP.

- **CO₂ emissions** are given only on an indicative basis and were calculated using common emission factors across all countries. At world level, CO₂ emissions resulting from bunker fuels were included in the tables similarly to those resulting from fuels sold to airline transport.

EUROPEAN UNION

- The SOEC energy balance now available includes additional information on **renewable energy sources** (biomass, solar, wind and geothermal). The data related to renewable energy sources are available since 1985. This limits the analysis for Member States to the period 1985-1995 to ensure consistency in the times series.

- Data for **Germany** include both the former West Germany and the former German Democratic Republic.

More detailed definitions are shown in SOEC and IEA publications.

ADDITIONAL INFORMATION ABOUT THE PRINCIPAL SOURCES

The mission of the Energy Unit of Eurostat is to provide the European Union with a high-quality statistical service in the field of energy. In particular, the actions implemented by the Unit aim to:

1. Provide the European Commission with the harmonised, reliable and relevant statistical information needed to define, implement, follow and evaluate the Commission policies in the energy sector.
2. Provide the EU institutions, national administrations, enterprises, professional associations and EU citizens with high quality statistical services and products in the field of energy.
3. Improve the national statistical systems of the Member States in the field of energy.
4. Assist Candidate Countries in developing and harmonising their national statistical systems in accordance with EU standards in the field of energy statistics.

Eurostat collects statistics on energy from the Member States and the Candidate Countries. Statistics of the flows of energy commodities are collected on an annual and monthly basis. Price statistics are also collected. These statistics are available in both paper and electronic formats from the Eurostat Data Shops.

The results of specific projects implemented within the Member States (renewables, co-generation, energy efficiency, energy consumption in households/services) and the Candidate Countries are also available from the Eurostat Data Shops.

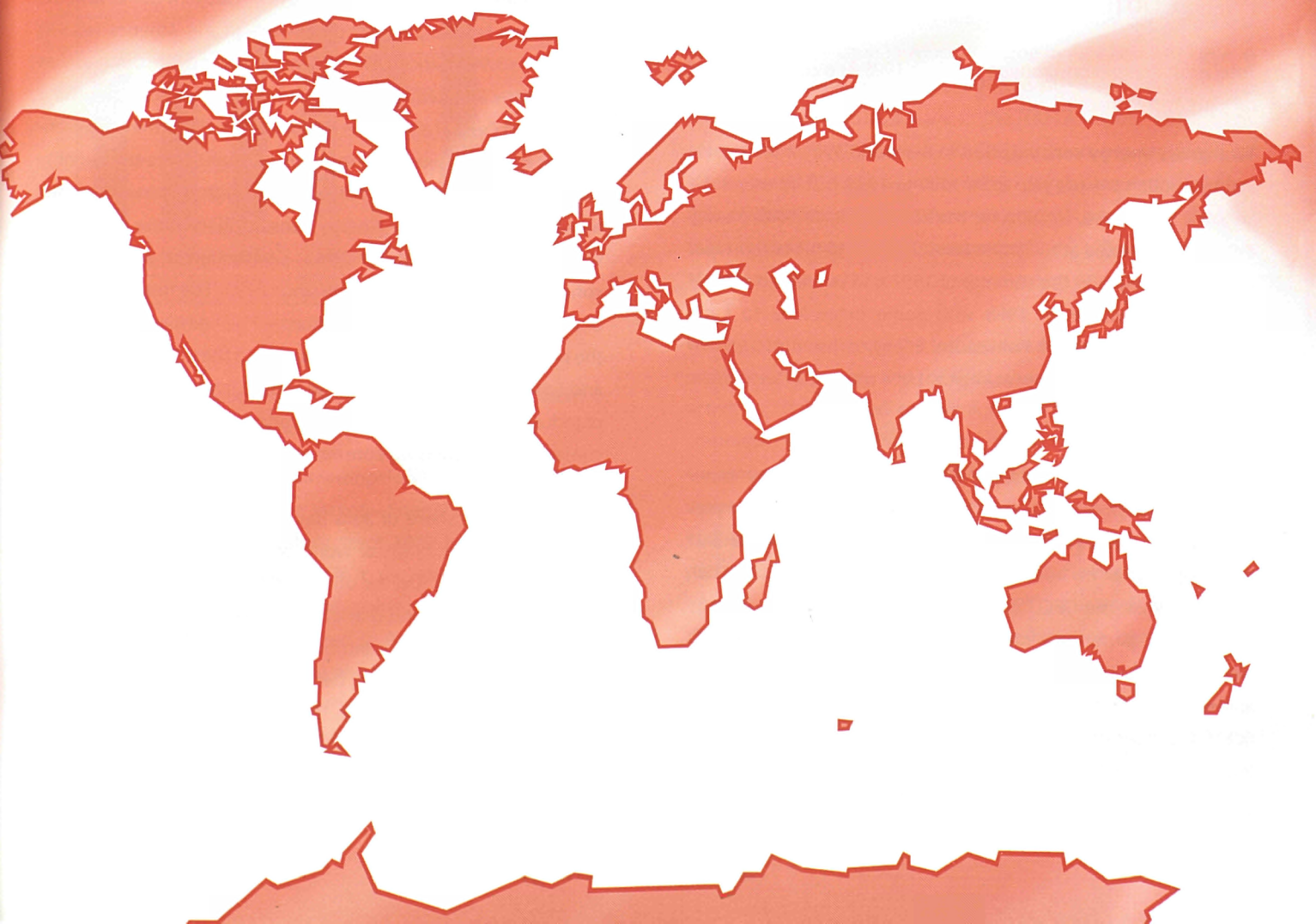
For further information contact the Eurostat Data Shop network or visit us on the Internet (<http://europa.eu.int/eurostat.html>).

The Paris-based International Energy Agency was founded in 1974, in the wake of the first oil-shock. Its core mission is to promote the security of energy supplies at reasonable prices. Its 25 member countries include most of the world's industrialised democracies, including all 15 members of the European Union. The IEA is convinced that energy security is best served where markets are both free and transparent. To that end, the Agency has developed an authoritative statistical service on global energy supply and demand.

The IEA's Energy Statistics Division gathers basic energy data from national administrations, from international and regional organisations and from an extensive network of industry officials, experts and consultants. Data from more than 140 countries and regions are published in Energy Statistics of OECD Countries and Energy Statistics of non-OECD Countries, and in Energy Balances for both OECD and non-OECD countries. The IEA also publishes yearly compendia of statistics on coal, natural gas, oil and electricity, and a book on worldwide CO₂ emissions.

Most IEA data are available on diskettes or CD-ROM or over the Internet. For more information, call the IEA's Energy Statistics Division at (33) 1 40 57 66 25 or fax to (33) 1 40 57 66 49. The IEA's World Wide Web site is at <http://www.iea.org>





WORLD: Major trends (1980-1998)

- Total gross energy consumption stable in 1998 as a consequence of the East Asia economic crisis
- Final energy consumption, driven by transport and domestic sectors, increased by 1.2% annually since 1980
- World primary energy production marked by a 28% reduction in CIS since 1990
- World energy production still dominated by oil, representing 37% of energy production since 1990
- NAFTA region contributed 23% of world primary energy production, just ahead of Asia
- Market share of OPEC increased steadily since 1990 to meet 42% of world oil production in 1998
- Depressed oil prices despite efforts by OPEC to manage production
- The share of developing regions in gas production reached 26% in 1998 against 11% in 1980
- Major development of gas infrastructure all around the world
- Solid production, driven by the United States and China, accounted for 23% of world energy supply
- Prospects for an increased nuclear contribution are dimming, even in developing countries
- Contribution of biomass to world energy production remained stable at 11% since 1980
- Electricity's share in final energy consumption increased by about 40% since 1980
- World power market characterised by privatisation, liberalisation, trade and foreign investment
- Power production remained largely dominated by thermal production that reinforced its share in the last two years
- Inputs for electricity generation increasingly dominated by solid fuels
- Refinery capacities, after major restructuring, increased again all over the world since 1995
- OECD continued to represent more than three-quarters of world GDP
- World energy consumption per capita stable but Asia grew by 46% since 1980
- World energy intensity improved on average by 1.0% per year since 1980
- World CO₂ emissions grew by 7% since 1990 but European Union emissions stabilised
- The share of CO₂ emissions from power generation and transport reached 56% in 1997 against 48% in 1980
- The OECD absorbed about 80% of world interregional exchanges of energy of which 81% were covered by oil

ENERGY OUTLOOK

Total gross energy consumption stable in 1998 as a consequence of the East Asia economic crisis...

Total **gross energy consumption** in the world as a whole increased by about 1.5% per year from 1980 to 1998, but by only 1.3% annually since 1990. In 1998, for the first time since 1982, energy demand contracted at the world level. The economic crisis in East Asia, which began in the summer of 1997 and continued to deepen into the winter of 1998 with some extensions to Latin America and CIS, was the main cause. Energy consumption growth in Asia, the most buoyant region over the last fifteen years, decreased by 2%.

Energy developments since 1980 are characterised by faster growth in the non-OECD area during the 1980's (2.7% per year against 0.9% per year in the OECD) driven by the Middle East (+6.0% per year on average), Asia (+4.2%) and Africa (3.3%). However, while the OECD area continued to increase its energy needs by 1.5% per year on average since 1990, the non-OECD world had a slower growth in demand limited on average to 1.0% annually. This drop in non-OECD demand resulted from the significant decreases in Central and Eastern Europe (-2.3% per year on average) and the former USSR (-5.1% per year on average). These

falls were just about compensated by the buoyant demand in the Middle East (+5.5% per year on average), Latin America (+3.9%) and Asia (+3.5%). Since 1990 total gross energy consumption has been greatly affected by developments in the region comprising the CIS and Central and Eastern countries. In 1990 they represented about 20% of world energy consumption. Since then energy demand in this region has fallen by 31% with the major contraction in CIS (-35%), while energy consumption in the rest of the world increased by about 20%. Consequently world energy consumption grew by only 10% since 1990. The future evolution of world gross energy consumption will be heavily influenced by the restructuring of the economies of both the CIS and the Central and Eastern region. In time these should lead to the resumption of industrial growth and of these economies as a whole with, as a consequence, increasing consumption of energy.

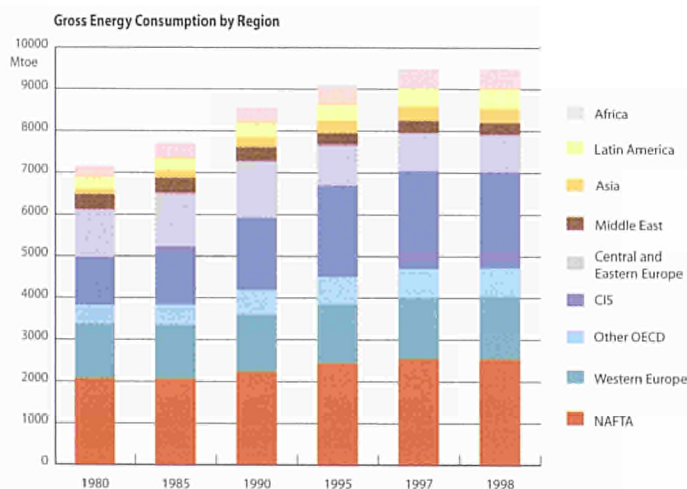
Structurally, the share of Asia has increased substantially since 1980 to represent 23.8% of world consumption in 1998 against only 15.8% in 1980. On the other hand, the share of CIS declined from 15.5% to 9.2%, and that of Central and Eastern Europe from 4.9% to 2.9%; while the contribution of the OECD as a whole to world energy consumption decreased from 52.9% in 1980 to 49.5% in 1998. The European Union represented about 15% of world consumption, a stable share since 1990.



TOTAL GROSS INLAND ENERGY CONSUMPTION : TOTAL BY REGION

Mtoe	1980	1985	1990	1995	1996	1997	1998	85/80	90/85	96/90	97/96	98/97
Annual % Change												
World	7300.6	7817.8	8708.0	9226.0	9504.2	9632.3	9621.3	1.4%	2.2%	1.5%	1.3%	-0.1%
Bunkers	109.0	89.1	102.8	105.5	103.1	103.7	105.1	-4.0%	2.9%	0.0%	0.6%	1.4%
Western Europe	1281.9	1285.9	1366.7	1414.3	1463.7	1462.5	1490.3	0.1%	1.2%	1.1%	-0.1%	1.9%
European Union	1240.8	1240.8	1318.1	1363.5	1412.7	1409.5	1435.6	0.0%	1.2%	1.2%	-0.2%	1.9%
EFTA	41.1	45.1	48.6	50.8	51.0	52.9	54.7	1.9%	1.5%	0.8%	3.8%	3.3%
Rest of OECD	2565.2	2577.8	2851.4	3124.4	3210.7	3273.0	3268.7	0.1%	2.0%	2.0%	1.9%	-0.1%
NAFTA	2103.6	2086.5	2258.8	2454.2	2514.1	2562.0	2564.0	-0.2%	1.6%	1.8%	1.9%	0.1%
OECD Pacific	430.4	452.4	540.1	608.0	628.9	639.8	632.3	1.0%	3.6%	2.6%	1.7%	-1.2%
Central and Eastern Europe	354.3	369.6	333.0	280.9	295.4	286.9	276.5	0.8%	-2.1%	-2.0%	-2.9%	-3.6%
CIS (1)	1131.9	1272.4	1347.8	963.5	937.2	900.9	885.1	2.4%	1.2%	-5.9%	-3.9%	-1.7%
Africa	285.8	350.3	396.8	448.5	455.7	472.5	478.8	4.2%	2.5%	2.3%	3.7%	1.3%
Middle East	133.1	191.4	239.0	317.0	335.5	355.3	367.2	7.5%	4.5%	5.8%	5.9%	3.3%
Asia	1150.2	1377.9	1730.3	2174.1	2281.9	2334.3	2286.6	3.7%	4.7%	4.7%	2.3%	-2.0%
Latin America	289.1	303.5	340.2	397.7	421.1	443.2	463.0	1.0%	2.3%	3.6%	5.3%	4.4%
of which (%)												
European Union	17.0	15.9	15.1	14.8	14.9	14.6	14.9	-1.4%	-0.9%	-0.3%	-1.5%	2.0%
OECD	52.7	49.4	48.4	49.2	49.2	49.2	49.5	-1.3%	-0.4%	0.3%	0.0%	0.6%

(1) Including Baltic countries for statistical reasons



Final energy consumption, driven by transport and domestic sectors, increased by 1.2% annually since 1980...

The evolution of **final energy consumption** by sector varied substantially between regions and sectors. Energy consumption for transport has increased regularly since 1980 by about 2% per annum in the OECD region and 2.6% in the non-OECD region as a whole, the share of OECD still being about 66% in 1997. Since 1990 major developments occurred in Asia (+7.6% per year on average), the Middle East (+5.7%) and Latin America (+5.2%). At the same time it increased by 1.8% per year on average in the European Union and by 2% in the rest of the OECD. In the CIS - which represented 10% of world energy use for transport in 1990 - energy demand has halved in only 8 years. The near future

will be marked by two major elements: the increasing contribution of transport in final energy demand (from 22.1% in 1980 to 26.2% in 1997); and the very sustained growth in emerging regions where the potential for development remained enormous with an average transport energy consumption per inhabitant ranging from 59 kgoe in Africa, 77 kgoe in Asia and 246 kgoe in Latin America to an average of 1091 kgoe for the OECD as a whole and a maximum of 1676 kgoe in the NAFTA region. Since 1990, energy consumption per capita for transport has increased by 10% in the OECD region and by 33% in developing regions (Africa, Asia, Middle East and Latin America). Consequently the share of these regions in total consumption reached 27.7% in 1997 against 18.5% in 1980.

Energy consumption by the tertiary and domestic sector depends on climatic conditions and the rising share of services in economic activities. It increased on average by 1.5% since 1980 with a contrasted evolution between the OECD region (+0.9% per year on average) and the non-OECD region (+1.9% per year) due to increasing living standards and growing urbanisation in emerging countries. As a consequence, the share of the OECD region declined from 43% in 1980 to 40% in 1997. Nevertheless this evolution was not uniform. Between 1990 and 1997, substantially warmer in the Western Hemisphere, energy consumption by the tertiary-domestic sector increased faster in the OECD region (1.7% per year on average) than in the rest of the world (+1.0%). In this case also the comparison of energy consumption per capita demonstrates very large discrepancies, a ratio higher than 3 between the OECD region and the non-OECD region, that will necessarily dimi-

TOTAL ENERGY CONSUMPTION BY INDUSTRY : TOTAL BY REGION

Mtoe	1980	1985	1990	1995	1996	1997	1998	85/80	90/85	96/90	97/96	98/97
Annual % Change												
World	1938.5	1929.1	2008.4	1930.7	1946.0	1940.1	na	-0.1%	0.8%	-0.5%	-0.3%	na
Western Europe	321.5	275.5	275.1	267.7	269.7	272.9	273.3	-3.0%	0.0%	-0.3%	1.2%	0.2%
European Union	310.7	264.1	265.2	257.5	259.6	262.6	262.5	-3.2%	0.1%	-0.4%	1.2%	-0.1%
EFTA	10.8	11.4	9.9	10.2	10.1	10.2	10.8	1.0%	-2.7%	0.4%	0.8%	6.2%
Rest of OECD	612.7	565.3	535.2	528.9	537.9	537.0	531.3	-1.6%	-1.1%	0.1%	-0.2%	-1.1%
NAFTA	478.1	431.4	385.5	374.5	378.9	375.3	371.5	-2.0%	-2.2%	-0.3%	-0.9%	-1.0%
OECD Pacific	127.4	125.4	137.7	141.3	143.1	144.5	142.1	-0.3%	1.9%	0.6%	0.9%	-1.7%
Central and Eastern Europe	130.0	126.6	104.2	71.9	76.1	70.4	na	-0.5%	-3.8%	-5.1%	-7.5%	na
CIS (1)	383.5	376.5	405.3	241.1	205.7	195.7	na	-0.4%	1.5%	-10.7%	-4.9%	na
Africa	53.3	55.5	63.1	59.9	62.9	65.7	na	0.8%	2.6%	-0.1%	4.5%	na
Middle East	35.0	39.1	27.3	48.4	51.9	54.7	na	2.2%	-7.0%	11.3%	5.4%	na
Asia	324.0	406.7	506.8	603.9	629.3	624.3	na	4.7%	4.5%	3.7%	-0.8%	na
Latin America	78.5	84.0	91.3	108.9	112.4	119.4	na	1.4%	1.7%	3.5%	6.3%	na
of which (%)												
European Union	16.0	13.7	13.2	13.3	13.3	13.5	na	-3.1%	-0.7%	0.2%	1.5%	na
OECD	48.2	43.6	40.3	41.3	41.5	41.7	na	-2.0%	-1.5%	0.5%	0.6%	na

TOTAL ENERGY CONSUMPTION BY TRANSPORT : TOTAL BY REGION

Mtoe	1980	1985	1990	1995	1996	1997	1998	85/80	90/85	96/90	97/96	98/97
Annual % Change												
World	1134.7	1214.3	1411.2	1539.8	1592.8	1635.4	na	1.4%	3.1%	2.0%	2.7%	na
Western Europe	197.1	211.7	264.6	286.8	294.8	300.5	310.7	1.4%	4.6%	1.8%	1.9%	3.4%
European Union	189.2	202.8	253.8	275.7	283.4	288.8	298.6	1.4%	4.6%	1.9%	1.9%	3.4%
EFTA	7.8	8.9	10.8	11.1	11.5	11.7	12.0	2.5%	4.0%	1.0%	2.4%	2.5%
Rest of OECD	583.5	602.2	687.7	757.3	775.7	790.6	806.1	0.6%	2.7%	2.0%	1.9%	2.0%
NAFTA	502.2	515.5	577.7	628.8	642.2	655.1	670.7	0.5%	2.3%	1.8%	2.0%	2.4%
OECD Pacific	75.7	80.1	100.5	116.3	120.5	123.3	124.0	1.1%	4.7%	3.1%	2.3%	0.6%
Central and Eastern Europe	25.9	24.1	27.8	24.5	28.0	28.8	na	-1.5%	3.0%	0.1%	2.8%	na
CIS (1)	123.8	134.1	139.9	77.3	77.0	74.1	na	1.6%	0.9%	-9.5%	-3.7%	na
Africa	31.1	36.1	38.1	41.4	42.7	43.7	na	3.0%	1.1%	1.9%	2.3%	na
Middle East	30.0	42.1	41.1	58.8	59.7	60.8	na	7.0%	-0.5%	6.4%	1.9%	na
Asia	80.5	102.1	143.3	206.3	223.1	239.3	na	4.9%	7.0%	7.6%	7.3%	na
Latin America	62.7	62.1	68.6	87.5	91.8	97.6	na	-0.2%	2.0%	5.0%	6.3%	na
of which (%)												
European Union	16.7	16.7	18.0	17.9	17.8	17.7	na	0.0%	1.5%	-0.2%	-0.8%	na
OECD	68.8	67.0	67.5	67.8	67.2	66.7	na	-0.5%	0.1%	-0.1%	-0.7%	na

TOTAL ENERGY CONSUMPTION BY TERTIARY-DOMESTIC SECTOR : TOTAL BY REGION

Mtoe	1980	1985	1990	1995	1996	1997	1998	85/80	90/85	96/90	97/96	98/97
Annual % Change												
World	2063.2	2257.3	2430.7	2630.5	2677.9	2655.7	na	1.8%	1.5%	1.6%	-0.8%	na
Western Europe	359.3	370.5	359.4	381.4	410.2	396.8	402.2	0.6%	-0.6%	2.2%	-3.3%	1.4%
European Union	344.9	355.0	343.1	364.4	392.2	379.6	384.4	0.6%	-0.7%	2.3%	-3.2%	1.3%
EFTA	14.4	15.5	16.2	17.1	18.0	17.2	17.8	1.5%	0.9%	1.7%	-4.2%	3.6%
Rest of OECD	549.1	564.8	593.5	652.6	679.2	674.5	658.6	0.6%	1.0%	2.3%	-0.7%	-2.4%
NAFTA	464.7	467.0	476.3	516.1	539.3	534.2	517.0	0.1%	0.4%	2.1%	-1.0%	-3.2%
OECD Pacific	70.9	82.6	100.3	117.0	119.7	119.2	120.7	3.1%	3.9%	3.0%	-0.5%	1.3%
Central and Eastern Europe	98.0	100.4	87.9	75.8	80.2	78.0	na	0.5%	-2.6%	-1.5%	-2.7%	na
CIS (1)	266.3	318.9	338.6	360.1	313.1	296.2	na	3.7%	1.2%	-1.3%	-5.4%	na
Africa	142.4	163.4	188.0	216.9	219.6	226.7	na	2.8%	2.9%	2.6%	3.2%	na
Middle East	22.2	37.3	76.7	83.8	88.9	93.3	na	10.9%	15.5%	2.5%	4.9%	na
Asia	554.1	627.7	705.3	768.6	792.9	795.3	na	2.5%	2.4%	2.0%	0.3%	na
Latin America	71.9	74.4	81.2	91.2	93.8	94.9	na	0.7%	1.8%	2.4%	1.1%	na
of which (%)												
European Union	16.7	15.7	14.1	13.9	14.6	14.3	na	-1.2%	-2.1%	0.6%	-2.4%	na
OECD	44.0	41.4	39.2	39.3	40.7	40.3	na	-1.2%	-1.1%	0.6%	-0.8%	na

(1) Including Baltic countries for statistical reasons



Main items

The vision of many citizens, analysts and policy makers has shifted increasingly over recent years to the global level. This change in focus reflects much improved communication and transportation; greater economic inter-dependence via trade and overseas direct investment; and, perhaps above all, the growing evidence of the many man-made impacts that are damaging the natural environment. Yet huge inequalities remain and for many millions of people the vision is much more limited. For them sheer survival remains the overwhelming imperative, given inadequate access to basic essentials such as food, water and shelter. One-third of the world's population still has no access to the commercial energy supplies which are regarded as a fundamental necessity by consumers in industrialised countries. Despite recent financial crises in some regions, continued economic growth is leading to a steady rise in global energy consumption - particularly in the developing countries. Energy use in central and Eastern Europe has fallen sharply as these regions make difficult adjustments to their economies through a gradual process of market reforms and structural change. Rapid growth in both electricity and transport demand is a key feature of most regions, reflecting rising standards of living and higher consumer expectations. World energy use remains heavily dependent (for some 81%) upon fossil fuels, with the carbon-free sources - renewables and nuclear power - providing the balance. Whilst there is growing recognition of the need to reduce global reliance upon fossil fuels, the shift away from this heavy dependence will - realistically - take very many decades. As the Kyoto Protocol and other similar international agreements reveal, concern about more sustainable development is achieving greater prominence in both public attitudes and policy responses. Yet, to date, significant global progress still remains an aspiration rather than a reality.

nished in the future with the improvement of living standards in developing regions. Energy consumption by industry was at the same level as in 1980 and still 5.9% below the peak reached in 1988. Even though this resulted from the sharp decline in Eastern Countries, the long-term evolution reflects all the efforts made by industrialists to reduce specific energy consumption per unit produced. Although consumption declined in the OECD region by 0.9% on average per year since 1980 as a consequence of these efforts, it grew by 0.7% in non-OECD regions, pushed by the rapid industrial development which has occurred over the last 20 years. The non-OECD region increased its share from 52% in 1980 to

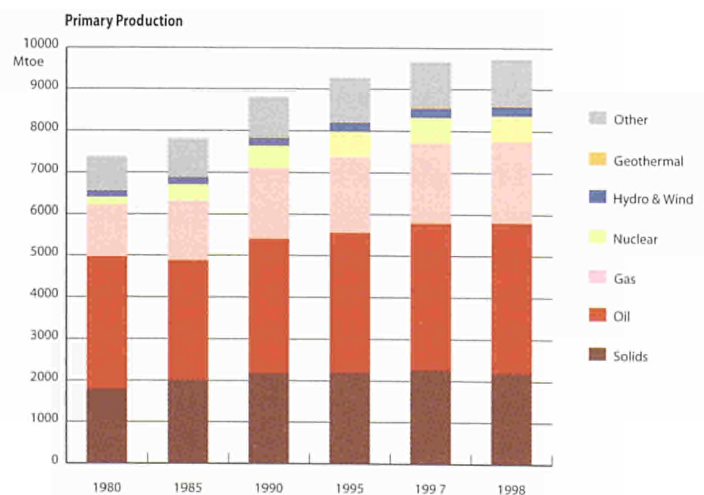
59% in 1997. The growth was spectacular in Asia, driven by China and South East Asia, reaching 3.9% per year on average since 1980. It was followed by the Middle East with 2.7% per year on average and by Latin America with 2.5%. In 1997, Asia, excluding Japan and New Zealand, absorbed 32% of world energy consumption by industry. As a result of this, it is clear that the growth in non-OECD regions will be the driving force for the future in this sector.

World primary energy production marked by a 28% reduction in CIS since 1990...

World **primary energy production** (equivalent to gross energy consumption aside from some stock variations and statistical errors) increased from 1980 to 1998 by about 1.5% per year, with a contrasted evolution in the 1990's. Growth was limited to 0.6% per annum for the first four years but jumped by 1.8% per year on average since then. The most recent position is marked by the large fall of energy production in CIS (-462 Mtoe or a reduction of 28% between 1990 and 1998) and CEEC (-40 Mtoe or a reduction of 17%) compensated by increases in all other regions of the world, mainly in Asia (+372 Mtoe or +22%), the Middle East (+322 Mtoe or +34%), Latin America (+178 Mtoe or +44%), NAFTA (+172 Mtoe or +8%), Africa (+148 Mtoe or +21%) and EFTA (+88 Mtoe or +67%).

World energy production still dominated by oil, representing 37% of total energy production since 1990...

In 1998, oil was still the most important single fuel with 37% of world primary energy production, a stable share since 1990 (compared with 43% in 1980). Oil production and consumption, however, grew only half as fast as total energy since 1980 but they have



TOTAL PRIMARY ENERGY PRODUCTION : TOTAL BY REGION

Mtoe	1980	1985	1990	1995	1996	1997	1998	85/80	90/85	96/90	97/96	98/97
Annual % Change												
World	7378.1	7797.6	8813.0	9276.4	9521.6	9664.9	9730.6	1.1%	2.5%	1.3%	1.5%	0.7%
Western Europe	668.0	818.6	838.4	933.8	984.3	987.0	972.6	4.1%	0.5%	2.7%	0.3%	-1.5%
European Union	604.5	735.2	707.2	739.1	764.4	761.8	753.0	4.0%	-0.8%	1.3%	-0.3%	-1.1%
EFTA	63.6	83.4	131.2	194.7	220.0	225.2	219.6	5.6%	9.5%	9.0%	2.4%	-2.5%
Rest of OECD	2066.3	2229.1	2387.7	2539.6	2593.2	2624.2	2653.8	1.5%	1.4%	1.4%	1.2%	1.1%
NAFTA	1910.0	2005.5	2117.0	2214.9	2260.3	2273.9	2289.3	1.0%	1.1%	1.1%	0.6%	0.7%
OECD Pacific	139.1	201.9	244.9	298.6	306.1	322.7	335.8	7.7%	3.9%	3.8%	5.4%	4.0%
Central and Eastern Europe	268.4	287.3	237.6	212.9	216.8	210.9	197.9	1.4%	-3.7%	-1.5%	-2.7%	-6.2%
CIS (1)	1357.8	1512.9	1624.6	1201.7	1197.2	1167.5	1162.8	2.2%	1.4%	-5.0%	-2.5%	-0.4%
Africa	556.9	594.2	694.4	768.4	802.8	837.2	841.9	1.3%	3.2%	2.4%	4.3%	0.6%
Middle East	999.7	599.6	952.1	1118.5	1136.4	1199.7	1273.9	-9.7%	9.7%	3.0%	5.6%	6.2%
Asia	1140.7	1404.3	1674.1	1987.5	2050.8	2071.3	2046.1	4.2%	3.6%	3.4%	1.0%	-1.2%
Latin America	320.3	351.6	404.2	514.0	540.0	566.9	581.7	1.9%	2.8%	4.9%	5.0%	2.6%
of which (%)												
European Union	8.2	9.4	8.0	8.0	8.0	7.9	7.7	2.9%	-3.2%	0.0%	-1.8%	-1.8%
OECD	37.1	39.1	36.6	37.4	37.6	37.4	37.3	1.1%	-1.3%	0.4%	-0.6%	-0.3%

(1) Including Baltic countries for statistical reasons

accelerated significantly since 1995. The second most important fuel remained solid fuels which kept a share of 22.7% - slowly declining since 1985 from a peak of 25.9% and losing about 1% market share every four years. Natural gas ranked third in meeting world needs with 20% in 1998 (17% in 1980). Gas experienced accelerating growth since 1980, excluding a relative slowdown between 1990 and 1995 due to the particular economic situation in the CIS where gas production and consumption have declined by about 18% since 1990. Renewable energy sources (hydro, geothermal, biomass and wind) come fourth in satisfying world energy consumption with almost 14% in 1997, a marginal increase compared to 1980, growing globally by 1.8% per year on average. Finally, nuclear energy grew the fastest in the period, mainly up to 1988 (13% per year). Its rate of growth has slowed down progressively since then and, for the first time since 1980, nuclear production diminished in 1997 but it rebounded in 1998 to reach a new peak.

Between 1980 and 1998, the OECD and non-OECD areas had approximately the same growth in total energy production (about 1.6% per year), but the evolution was slightly different over time and by regions. While between 1986 and 1990 the non-OECD world increased its production about three times faster than the OECD, on the contrary, between 1990 and 1996, primary energy production increased twice as fast in the OECD region as in the non-OECD area. In the last two years the non-OECD region again increased twice as fast under the pressure of the Middle East region.

NAFTA region contributed 23% of world primary energy production, just ahead of Asia...

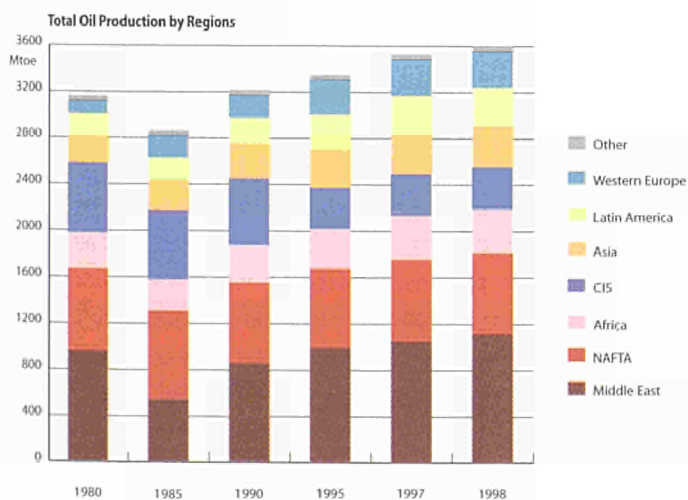
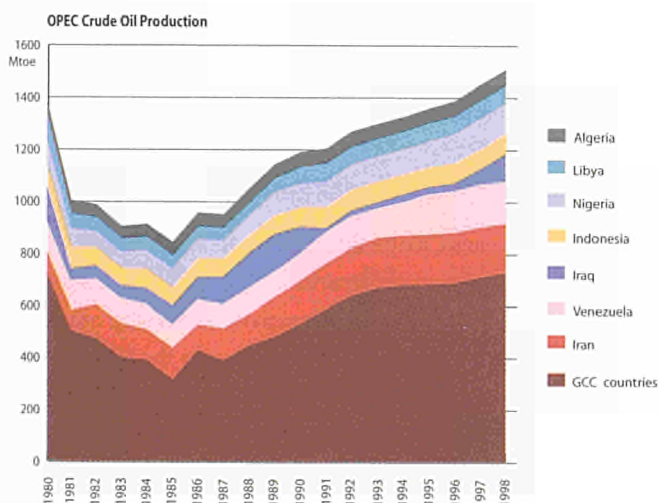
In 1998, to cover limited additional requirements, world energy production increased by only 0.7%. The major contribution came from crude oil (+73 Mtoe) supported by low international oil prices, followed by natural gas (28 Mtoe) and non-fossil fuels (26Mtoe) while solid fuel production decreased (-61Mtoe) to retrieve a level comparable with the 1990 level. Production continued to decline in CIS and CEEC to be close to 14% of world production in 1998 against 22% in 1980. On the other hand, sustained growth was observed in the Middle East (+6.2%), OECD Pacific (+4.0%) and Latin America (2.6%). In 1998 the European Union's production slowed down by 1.1% following the trend of gross inland consumption marked by warm weather conditions. The main contributor to energy production in 1998 remained the NAFTA region with about 23% of total world primary energy production (26% in 1980), followed by Asia with 21% (15% in 1980), the Middle East with 13% (14% in 1980), the CIS with 12% (18% in 1980) and Western Europe with 10% (9% in 1980).

Market share of OPEC increased steadily since 1990 to meet 42% of world oil production in 1998...

Oil remains the dominant fuel in world production and consumption although, as stated above, it has lost share in total energy production despite a sustained growth in 1997 (+3.0%) and 1998 (+2.1%). OPEC as a whole remains the major oil producer, but its



share of total world oil production fell from 44% in 1980 (54% in 1973) to 42% in 1998, with a minimum share of 29% in 1985. Since 1990 its share increased regularly by 1.6% per year on average. Between 1990 and 1996 the share of Western Europe has sharply increased (from 6% in 1990 to 9% in 1997) driven by rising North Sea production but since then production has stabilised so that its world market share has diminished marginally. Since 1990 production losses in CIS and Eastern countries, (about 214 Mtoe), have been compensated mainly by the Middle East (+257 Mtoe), Latin America (+113 Mtoe) and Western Europe (+115 Mtoe), although the NAFTA region, the second largest world oil producer, remained stable. Considering only the last two years, the rise in production in the Middle East was very impressive (+116 Mtoe) and corresponded to 66% of the total increase in world production. Crude oil production also demonstrated a first, but limited, recovery in CIS.



Some key oil supply developments in 1998 included¹:

- Economic development in Asia is crucial to long-term growth in oil markets. The projected growth of oil demand will strengthen economic ties between the Middle East and Asian markets;
- Despite relative low prices in the recent past, deepwater exploration and development initiatives are generally expected to be sustained worldwide, with offshore West Africa emerging as a major future source of oil production - with resource availability at prices ranging between \$18 and \$22 per barrel. The recent lower price environment will, however, slow the pace of development in some highly prospective areas, including especially the Caspian Basin region.
- OPEC stabilised its output quota at 27.5 million barrels per day at the end of 1998, including the Iraqi quota. This new quota more closely tracked production levels achieved at end 1998;
- OPEC members are expected to increase their market share significantly over the next decade. Competitive forces are expected to remain strong enough to forestall efforts to escalate real oil prices significantly for any prolonged period. Competitive forces operate within OPEC, between OPEC and non-OPEC sources of supply, and between oil and other sources of energy, particularly natural gas;
- Iraqi production averaged 2.5 million barrels per day at end 1998. Iraq has indicated a desire to expand its production capacity substantially, to about 6 million barrels per day, whenever United Nations sanctions are lifted and has held talks with outside investors about exploration deals;
- European oil production progressively reached a peak. Led by decreasing production in Norway, overall production in North Sea areas declined by 0.4% in 1997 and 1% in 1998;
- In South America notable gains in production occurred in the last two years in Argentina, Venezuela, Colombia and Brazil through agreements with foreign investors to revitalise production from existing oil fields;
- By October 1998, drilling activity in the United States was a quarter lower than its level a year earlier. The decline in Canada was even sharper.

Depressed oil prices despite efforts by OPEC to manage production...

Oil consumption in 1998 was lower than anticipated largely because the recession in Southeast Asia proved to be more severe than expected. By mid-1998, declining prices set in motion renewed efforts by OPEC to manage oil supplies. Agreements were sought to restrict production within OPEC, and initiatives were launched to gain co-operation of non-OPEC producers. In both March and June, OPEC and key non-OPEC producers (Mexico and Norway) announced plans to cut oil production. In the remain-

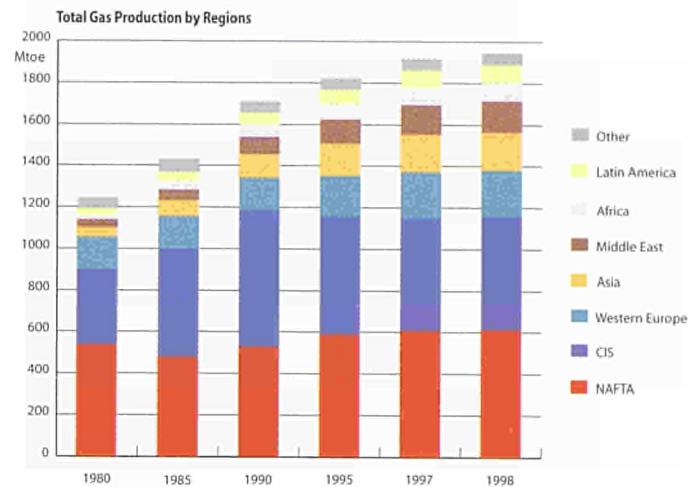
¹ International Energy Outlook 1999, Energy Information Administration, US Department of Energy, 1999.

ning months of 1998, however, announced and realised production cuts were not clearly synchronised, and production management efforts had at best only modest success. Consequently crude oil prices of around 17\$/bbl at the beginning of 1998 declined regularly to reach about 10\$/bbl in December. In December 1998, the OPEC basket price averaged \$9.69 per barrel, down \$1.50 from the November 1998 average price, and \$7.20 per barrel less than the price in December 1997 (\$16.89 per barrel). The December 1998 average price was the second lowest since the OPEC basket was first calculated (the July 1986 average price was \$9.04 per barrel). The average OPEC basket price for the fourth quarter of 1998 averaged \$10.98 per barrel, down \$1.35 from the average third quarter price. The average OPEC basket price for 1998 was \$12.28 per barrel (also the lowest since the OPEC basket price was first calculated).

By the end of 1998, other constraints on oil supply became increasingly evident. Stripper production in the United States was in decline. Exploration and development spending was being slashed. Rig utilisation rates, especially for onshore equipment, had fallen by 30%. Previously announced spending plans worldwide were reduced. Oil-producing countries faced severe fiscal deficits, causing national oil companies to cut capital spending. Private-sector restructuring entered a new stage as mergers involving leading multinational oil companies were announced or completed. A prime objective of the mergers was to rationalize corporate operations, reducing employment and eliminating investment activities with low profit prospects.

The share of developing regions in gas production reached 26% in 1998 against 11% in 1980...

Amongst the fossil fuels, **natural gas** production showed the largest increase between 1980 and 1990 with a total gain of 37%. But since 1990, production rose by only 14% following the 17% reduction observed in CIS production, the second largest world producer. The share of natural gas in world energy production grew from 17% in 1980 to 19% in 1990 and reached 20% in 1998. The two major contributors during this period were the CIS (360 Mtoe in 1980 and 547 Mtoe in 1998, with a peak of 656 Mtoe in 1990) and the NAFTA region (540 Mtoe in 1980, compared to 612 Mtoe in 1998). Their combined global share in total gas production fell from 72% in 1980 to 60% in 1998. Gas production is increasing rapidly in all developing regions: Africa at 8.8% per year on average, the Middle East at 8.3%, Asia at 7.9% and Latin America at 5.4%. In 1998 these latter regions accounted for 26% of total world production against only 11% in 1980. Since 1996,



production has declined slowly in the European Union, a reaction to the Netherlands playing the role of swing producer on the European market, faced with a slight slowdown of internal consumption. Since 1990, the bulk of the rise in gas use has occurred in power generation.

Major development of gas infrastructure all around the world...

Throughout the world, major efforts to reduce production, transmission and distribution constraints are proceeding. Worldwide there is a great deal of construction activity to develop gas distribution and transmission systems. According to the International Pipeline and Offshore Contractors Association, 34,000 miles of natural gas pipelines are expected to be installed between 1998 and 2000. The survey included only firm projects that have secured financing and did not include projects in the former Soviet Union and China.

Some key developments in the world's natural gas markets in 1998 included²:

- Several important pipelines were either completed or under construction in Central and South America in 1998. The first Uruguay-Argentina pipeline connection became operational. Progress was also made on the Bolivia-to-Brazil line, as well as on two Argentina-to-Brazil lines. Negotiations are underway to open another pipeline connection between Argentina and Brazil via a planned 3,000 kilometre Mercosur pipeline;
- Growth of Western Europe's gas infrastructure continued apace in 1998. Two major offshore pipeline systems, the Interconnector, running from England to Belgium, and the NorFra, running from Norway's North Sea Fields to France, began

² International Energy Outlook 1999, Energy Information Administration, US Department of Energy, 1999.



TOTAL SOLID PRODUCTION : TOTAL BY REGION

Mtoe	1980	1985	1990	1995	1996	1997	1998	85/80	90/85	96/90	97/96	98/96
Annual % Change												
World	1806.4	2022.9	2188.7	2216.2	2255.2	2271.6	2211.5	2.3%	1.6%	0.5%	0.7%	-2.6%
Western Europe	257.8	239.8	210.1	138.2	131.6	126.5	115.0	-1.4%	-2.6%	-7.5%	-3.8%	-9.1%
European Union	257.6	239.4	209.9	138.0	131.4	126.3	114.8	-1.5%	-2.6%	-7.5%	-3.9%	-9.1%
EFTA	0.2	0.4	0.2	0.2	0.2	0.3	0.2	11.9%	-10.6%	-4.5%	68.2%	-15.1%
Rest of OECD	541.0	605.2	704.8	722.2	741.5	767.4	782.1	2.3%	3.1%	0.8%	3.5%	1.9%
NAFTA	470.2	502.5	580.2	576.7	593.6	609.2	616.3	1.3%	2.9%	0.4%	2.6%	1.2%
OECD Pacific	64.6	92.1	112.3	133.4	135.7	145.1	151.8	7.3%	4.0%	3.2%	6.9%	4.6%
Central and Eastern Europe	189.5	200.3	164.8	146.8	150.7	146.1	136.2	1.1%	-3.8%	-1.5%	-3.1%	-6.8%
CIS (1)	338.7	312.5	300.5	190.4	180.1	173.6	164.7	-1.6%	-0.8%	-8.2%	-3.6%	-5.1%
Africa	69.9	103.1	104.6	121.1	121.0	128.5	128.7	8.1%	0.3%	2.5%	6.2%	0.1%
Middle East	0.6	0.8	0.8	0.7	0.6	0.6	0.6	6.8%	1.5%	-5.0%	0.0%	0.0%
Asia	402.6	550.7	684.8	874.2	905.3	902.5	855.2	6.5%	4.5%	4.8%	-0.3%	-5.2%
Latin America	6.2	10.5	18.3	22.6	24.4	26.4	29.0	11.2%	11.6%	5.0%	8.0%	9.7%
of which (%)												
European Union	14.3	11.8	9.6	6.2	5.8	5.6	5.2	-3.7%	-4.1%	-8.0%	-4.6%	-6.6%
OECD	43.9	41.2	41.2	38.3	38.2	38.8	39.9	-1.2%	0.0%	-1.3%	1.6%	3.0%

TOTAL OIL PRODUCTION : TOTAL BY REGION

Mtoe	1980	1985	1990	1995	1996	1997	1998	85/80	90/85	96/90	97/96	98/96
Annual % Change												
World	3162.3	2863.5	3218.2	3347.6	3425.9	3527.9	3600.6	-2.0%	2.4%	1.0%	3.0%	2.1%
Western Europe	119.4	190.4	201.3	302.0	320.3	319.1	315.9	9.8%	1.1%	8.0%	-0.4%	-1.0%
European Union	94.4	150.9	117.0	159.7	159.2	158.3	162.0	9.8%	-5.0%	5.3%	-0.6%	2.3%
EFTA	25.0	39.5	84.4	142.3	161.1	160.8	153.9	9.6%	16.4%	11.4%	-0.2%	-4.3%
Rest of OECD	721.8	789.0	714.5	703.9	713.4	726.4	722.3	1.8%	-2.0%	0.0%	1.8%	-0.6%
NAFTA	697.2	757.1	679.5	669.7	679.1	691.1	684.9	1.7%	-2.1%	0.0%	1.8%	-0.9%
OECD Pacific	22.2	29.7	31.2	30.7	30.8	31.9	34.1	6.0%	1.0%	-0.2%	3.5%	7.0%
Central and Eastern Europe	20.9	19.1	14.8	13.2	12.8	12.6	12.0	-1.8%	-5.0%	-2.4%	-1.4%	-5.3%
CIS (1)	606.2	598.2	573.5	354.6	351.9	359.6	361.7	-0.3%	-0.8%	-7.8%	2.2%	0.6%
Africa	310.5	269.6	324.0	344.3	368.4	379.8	379.6	-2.8%	3.7%	2.2%	3.1%	0.0%
Middle East	961.7	542.9	863.3	995.7	1004.6	1054.7	1120.2	-10.8%	9.7%	2.6%	5.0%	6.2%
Asia	227.9	262.3	304.0	333.6	337.5	345.4	352.7	2.9%	3.0%	1.8%	2.3%	2.1%
Latin America	193.9	192.0	222.7	300.2	317.1	330.4	336.3	-0.2%	3.0%	6.1%	4.2%	1.8%
of which (%)												
European Union	3.0	5.3	3.6	4.8	4.6	4.5	4.5	12.0%	-7.2%	4.2%	-3.4%	0.3%
OECD	26.5	34.1	28.3	29.9	30.1	29.5	28.7	5.2%	-3.6%	1.0%	-1.8%	-2.7%

TOTAL GAS PRODUCTION : TOTAL BY REGION

Mtoe	1980	1985	1990	1995	1996	1997	1998	85/80	90/85	96/90	97/96	98/96
Annual % Change												
World	1245.1	1431.9	1709.2	1823.6	1908.7	1917.1	1944.5	2.8%	3.6%	1.9%	0.4%	1.4%
Western Europe	156.1	155.3	157.0	194.8	225.4	223.1	222.8	-0.1%	0.2%	6.2%	-1.0%	-0.1%
European Union	133.3	131.9	132.9	166.6	188.6	182.1	181.5	-0.2%	0.2%	6.0%	-3.5%	-0.4%
EFTA	22.8	23.4	24.1	28.3	36.8	41.0	41.3	0.6%	0.6%	7.3%	11.6%	0.8%
Rest of OECD	549.9	496.2	553.5	621.2	635.2	640.8	645.8	-2.0%	2.2%	2.3%	0.9%	0.8%
NAFTA	539.7	480.0	530.5	590.3	603.0	608.3	612.5	-2.3%	2.0%	2.2%	0.9%	0.7%
OECD Pacific	10.2	16.2	22.8	30.8	32.0	32.3	32.8	9.7%	7.1%	5.8%	0.8%	1.6%
Central and Eastern Europe	43.6	44.2	32.0	24.3	23.0	20.9	18.9	0.3%	-6.2%	-5.4%	-9.2%	-9.5%
CIS (1)	359.6	520.1	656.3	569.0	573.0	541.7	547.0	7.7%	4.8%	-2.2%	-5.5%	1.0%
Africa	20.4	42.5	61.8	74.2	78.7	88.2	92.6	15.8%	7.8%	4.1%	12.1%	5.0%
Middle East	35.8	53.9	85.4	119.3	128.4	141.3	149.9	8.5%	9.6%	7.0%	10.0%	6.1%
Asia	46.9	76.3	110.8	153.7	172.8	181.2	183.0	10.2%	7.8%	7.7%	4.9%	1.0%
Latin America	32.8	43.4	52.3	67.2	72.1	79.9	84.6	5.8%	3.8%	5.5%	10.8%	5.8%
of which (%)												
European Union	10.7	9.2	7.8	9.1	9.9	9.5	9.3	-3.0%	-3.3%	4.1%	-3.9%	-1.8%
OECD	56.7	45.5	41.6	44.7	45.1	45.1	44.6	-4.3%	-1.8%	1.4%	-0.1%	-0.9%

(1) Including Baltic countries for statistical reasons



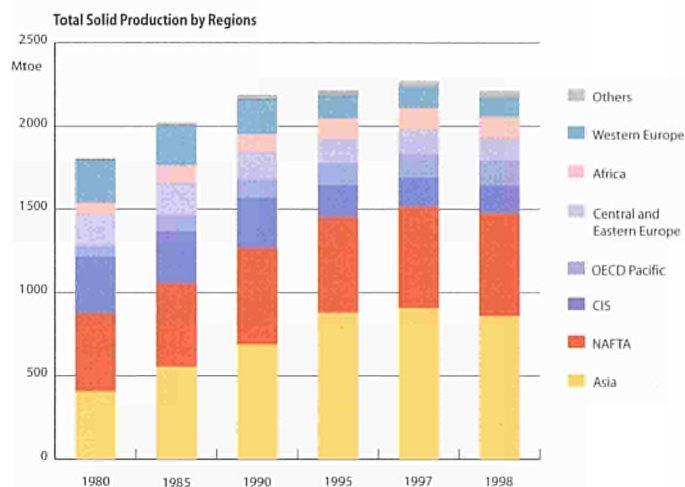
operating. Onshore construction of several major lines was completed: the Artere des Hauts-de-France, France's largest on-land gas pipeline; the trans-Belgium VTN-RTR pipeline; and Germany's Wedel line, which runs across western Germany;

- Substantial planned increases in pipeline capacity between the United States and Canada are underway. Most of the capacity expansion needed to support the consumption increase between 1998 and 2000 is either already under construction or in the final planning stages;
- In developing Asia, the news regarding gas markets has been mixed, an obvious result of the economic crisis that began in 1997 and continued throughout 1998. Various projects have been delayed or scaled back. In Thailand, for example, the state power company reduced expected investment in gas projects by 30% for the 1998-2006 period;
- On the other hand, there is fresh optimism that China will build a liquefied natural gas (LNG) regasification project in Guangdong, and there has been movement in the development of LNG projects in India - such as Enron's finalised agreement to purchase LNG from Oman for its Dabhol power project;
- Nigeria has taken steps toward reducing the amount of natural gas flared during oil production, which currently accounts for about three-quarters of all gas produced in the country. This gas will be used for domestic consumption, to deliver gas to Ghana as part of the West African Gas Pipeline and to supply gas for the Chevron-Sasol gas-to-liquids project. Nigeria expects to virtually eliminate gas flaring by 2004;
- The Russian Government, which owned 40% of Gazprom, agreed to sell part of its stake to foreign investors. In late 1998, Ruhrgas, Gazprom's biggest export customer, won a bid for 2.5% of Gazprom for 660\$ million.

Solid production, driven by the United States and China, accounted for 23% of world energy supply...

Coal's role in energy use worldwide has changed substantially over the decades, from a fuel used extensively in all sectors of the economy to one that is now used primarily for electricity generation and in a few key industrial sectors, such as steel, cement and chemicals. Although coal has lost market share to petroleum products and natural gas, it continues to be a key source of energy because of the dominant role it has maintained in its core markets and its success in penetrating markets in emerging economies. In 1998, coal accounted for 22.7% of world primary energy production but was experiencing a slow decline which began in 1985. The largest producer in 1998 remained Asia despite the decline by 5% registered that year (39% of the total compared to 22% in 1980), followed by NAFTA (28% in 1998, a limited increase from

the 26% reached in 1980). Since 1980 increased production in these two regions compensated for a slowdown in CIS and Eastern countries due to economic and political reforms, and mine closures in the European Union as a consequence of restructuring of the coal sector. In 1998, the two biggest coal producers were China (635 Mtoe) and the United States (570 Mtoe), followed by India (165 Mtoe), Australia (148 Mtoe) and South Africa (128 Mtoe). The two major producers accounted for 55% of total world production.



Prospects for an increased nuclear contribution are dimming, even in developing countries...

Even as the performance of nuclear reactors improves worldwide, the prospects for increased reliance on nuclear power for electricity generation are dimming. Public concern about the safety of nuclear reactor operations, plant decommissioning and the disposal of nuclear waste makes the ordering of new nuclear facilities difficult. The key developments affecting the nuclear power industry include:

- Plants continue to be retired early in North America. In 1998, three units were definitively closed in the United States. Owners cited high costs as making the units uncompetitive. Canada brought another two units off line, completing the shutdown of eight older units as part of a plan to focus on improving management at newer nuclear facilities;
- In 1996 Japan joined the ranks of countries in which local voting initiatives recorded strong public opposition to the construction of new nuclear facilities. At the beginning of 1999 safety issues moved to the forefront in Asia after several leaks at nuclear power plants and an accident at a fuel reprocessing plant in Japan. These events are likely to cause further public concern

about the ambitious plans for nuclear capacity expansion in the Far East;

- Competition in the United States electric industry led to sales of existing nuclear plants. Plant sales could lead to a consolidation of the US nuclear electricity industry, with a few large companies owning and operating a large number of plants. As a result, better management could lower costs and make nuclear plants more competitive in the deregulated electricity industry;
- Nuclear issues dominated accession talks in the European Union. The safety of older, Soviet-designed nuclear reactors in some candidate countries (Bulgaria, Lithuania and the Slovak Republic) dominated the discussions and the Commission made further negotiations contingent on commitments to close such reactors. All three candidate countries proposed to close reactors and they will receive financial aid from the European Commission and the European Bank for Reconstruction and Development to assist with decommissioning efforts;
- The new German government promised a complete nuclear phase out. A new coalition of Social Democrats and Greens included in its platform a pledge to remove from service all nuclear plants, with no compensation to the operators. Discussions with the utilities to agree a limit on the plants' lifetimes failed to produce an agreement but negotiations continued.

Contribution of biomass to world energy production remained stable at 11% since 1980...

The contribution of renewable energy sources (hydro, biomass, geothermal, wind...) must be analysed from two perspectives: commercial and non-commercial energy sources. The bulk of biomass production and consumption concerned non-commercial uses mainly located in Asia (52% of total biomass production), Africa (21%), NAFTA (9%) and Latin America (8%). Since 1980, the contribution of biomass to world energy production has remained stable at about 11%. With the exception of Africa, where biomass production increased faster, the average growth rate since 1980 was similar amongst the major contributors.

Low fossil fuel prices continue to constrain development of the world's renewable energy sources dedicated to commercial uses. While the costs of installing and generating electricity with renewable resources continue to fall, and technological advances improve generating efficiencies, they have not been able to keep pace with the declining costs of energy from fossil fuels, especially crude oil and oil products. Nevertheless, in Western Europe, for environmental reasons, and in rural areas of developing countries where populations live far from electricity grids, there is sustained

interest in increasing the use of renewable energy sources. In particular, wind energy is experiencing some of the strongest growth among the renewable energy sources, the five top markets being located in Germany (2,874 MWe installed at end 1998), the United States (1,927 MWe), Denmark (1,450 MWe), India (968 MWe) and Spain (834 MWe). At end 1998 about 9,800 MWe of wind turbines were installed around the world, of which 66% were in Europe, 20% in North America and 12% in Asia. The share of hydropower in world energy production remained stable at around 2.3% with major developments in non-OECD countries where the main potential for growth is located for geographic reasons.

Electricity's share in final energy consumption increased by about 40% since 1980...

Throughout the world, electricity is - and is likely to remain - the fastest growing component of final energy demand. Electricity's share in final energy consumption increased by about 40% since 1980, from 11.4% to 15.8%. In the OECD region, electricity showed strong growth between 1980 and 1998, at 2.7% per year on average, in contrast to 0.7% annual growth in total final energy demand - or some four times faster! In the industrialised world, where electrification has been fully achieved throughout all economic sectors, increased demand was driven by economic growth and growing electrical applications in industry as well as for computers, communications and other electronic applications for home and business uses. This demand growth is tempered by increases in energy efficiency encouraged by both regulation and technological innovation. Electricity consumption in the rest of the world grew by 3.9% per year on average since 1980 although total final energy demand increased by only 1.6% in the same period. Nevertheless, although non-OECD electricity consumption grew by 4.7% per year on average during the 1980's, the growth rate slowed down to only 2.7% per year since 1990. In the developing world, there are many opportunities for the expansion of electrical applications. The marginal benefit of introducing electricity into a rural village is considerable. High value-added applications, such as refrigeration and communication, are the reasons why the provision of electricity to the wider population is a priority for most political leaders in the developing world.

World power market characterised by privatisation, liberalisation, trade and foreign investment...

Highlights of recent developments in electricity markets around the world are:

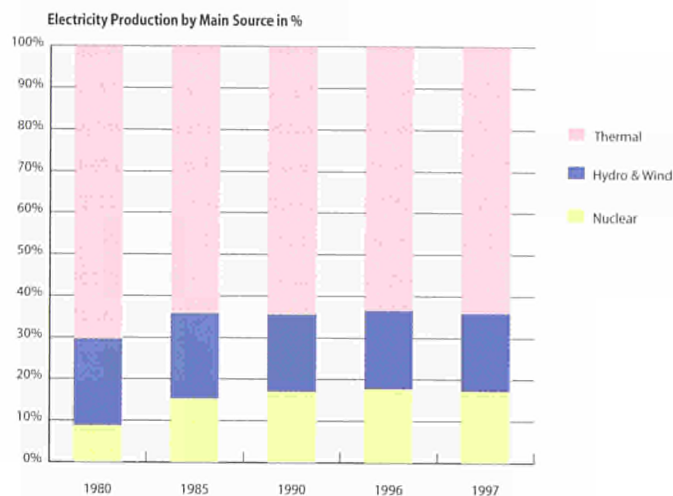
- The recent economic difficulties, which started in Asia but then moved to Latin America and Russia, induced downward revi-

sions of electricity consumption forecasts, particularly for Southeast Asian nations. In 1998 several Southeast Asian nations cancelled or postponed a number of electricity projects. The effects of the crisis were most immediately felt in Thailand, Indonesia, Malaysia, the Philippines and South Korea where project cancellations or delays were most evident;

- As a consequence of market liberalisation, electricity pools have emerged in many countries. Pools have in general improved the management of system capacity and reduced electricity prices. However, the likelihood of short-term price volatility has grown, with price spikes occurring during periods of heavy demand;
- Electricity trade accounted for a relatively small share of overall electricity supply. The strengthening of pool and system interconnections should increase such trade substantially in the short term. Such developments are underway in Central and South America, the Indian subcontinent, Europe, North America, parts of Asia and southern Africa;
- Privatisation and electricity reform measures continued apace in 1998. Central and South America led the developing world in the privatisation of electricity and the implementation of electricity reform. In 1998, Brazil followed the path, commenced first by Chile and later by Argentina, in selling off state-owned electricity assets to the public. Both South Korea and Thailand are undertaking substantial market reform of their electricity sectors. In Thailand the electricity sector is being deregulated to allow independent and small power producers to sell electricity to the Electricity Generating Authority of Thailand (EGAT). Thailand is also undertaking a partial privatisation of EGAT;
- The pace of foreign investment in developing nations' electricity sectors hinged strongly on the implementation of electricity reform and the application of transparent and consistent regulatory and investment policies. Economic growth in several developing countries was restrained by a shortage of electricity capacity. Facilitating the contract negotiation phase of electric power developments will be crucial to the successful realisation of new projects and their full economic growth potential.

Power production remained largely dominated by thermal production that reinforced its share in the last two years...

Thermal production continued to dominate total electricity generation, although its share decreased from 70% in 1980 to 64% in 1997. Nuclear's share doubled from 9% in 1980 to 17% in 1997. This growth occurred principally during the 1980's. After 1990, the expansion in nuclear production has slowed down considerably due to lack of investment mainly in Western Europe and North America, increases being mainly located in Asia (+50%) and in Japan (+58%). For the first time since 1980, nuclear production fell by 1% in 1998. This initiated a projected stabilisation of nuclear's contribution in the short to medium term - with decom-



missioning in industrialised countries being just compensated by new investments in developing countries. Since 1990, additional production has been covered by thermal plants (for 62%) with nuclear and hydro contributing equally to the rest. But in the last two years thermal units have covered more than 80% of additional production. Hydro power, depending on new investments and hydraulic conditions, grew steadily on average by 2.4% per year since 1980. The total installed capacity reached 3195 GWe in 1997, compared with 1973 GWe in 1980, or an average increase of about 2.9% per year since 1980. Thermal units, which represented 60% of additional capacity since 1980 (71% since 1990), grew by about 2.5% per year over this period. Since 1990 the expansion of nuclear capacity has slowed down, and hydro capacity expanded a little slower than thermal capacity.

Inputs for electricity generation increasingly dominated by solid fuels...

Solid fuels increasingly dominated inputs for electricity generation. While these represented 54% of total fuel inputs in 1980, they reached 59% in 1997. The consumption of solids was mainly located in NAFTA with 37% of world consumption, a constant share since 1980, and Asia that absorbed 30% of world consumption in 1997 against 10% in 1980. In these two regions consumption of solids increased substantially: 58% since 1980 in NAFTA and rose five-fold in Asia. The third region in importance was the European Union where consumption increased slowly during the 1980's but decreased more rapidly in the 1990's (with the exception of the 1998 rebound) due to the restructuring of coal industries and growing environmental concerns. It was the only part of the world, except for the CIS for other reasons, in which this downward trend was observed. Despite the growing consumption of developing regions, the OECD region still represented in 1997 54% of global solid fuels consumption for power generation. Oil

use has declined slowly since 1985 but rebounded by 4.2% in 1997. Consequently its market share was only 12% in 1997 against 19% in 1985 and 27% in 1980. The utilisation of gas has more than doubled since 1980 as power generation technologies have evolved to favour natural gas use. The main gas consumers are respectively: CIS (181 Mtoe or 32% of world gas consumption for power generation); NAFTA (140 Mtoe or 25%); and the European Union (71 Mtoe or 12%). Almost all regions of the world were showing increases in the use of natural gas to generate electricity.

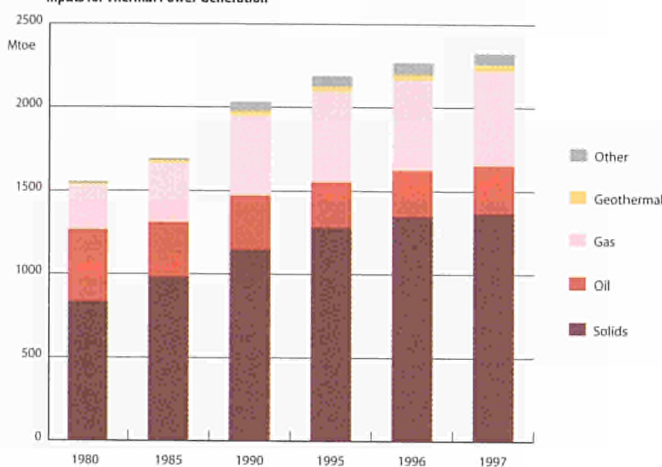
too low in Latin America to ensure profitability; and an urgent restructuring was needed in the CIS where utilisation rates fell below 45%.

COMPETITIVENESS

OECD continued to represent more than three-quarters of world GDP...

Economic growth is the main factor driving growth in energy demand, excluding variations associated with climatic conditions in industrialised regions. While the world population grew regularly by 1.6% per annum since 1980, world GDP increased by 2.5% per year on average. Economic activity was more sustained during the second part of the 1980's followed by a relative slow down, between 1990 and 1993, mainly in the OECD countries. Since 1994, world GDP accelerated to reach an average growth of 3.0% per year driven by the developing countries. In 1998 despite the economic slowdown in the South East Asia and later in Latin America and CIS, world GDP still increased by 2.1%. Asia is indisputably the main driver with an average growth rate of 7.0% per year since 1980 and still 6.8% since 1990 despite a limited growth of 1.4% in 1998. As a consequence, Asia doubled its share of world GDP to reach 10.6% in 1998. During the 1980's economic activity expanded at the same rate in the OECD and non-OECD regions. But since 1990 developing regions, driven by Asia, Latin America and the Middle East, have been developing more rapidly: 2.9% per year on average against 2.2% in the OECD region. Even so, in 1998 the OECD region still accounted for more than three-quarters of total world GDP.

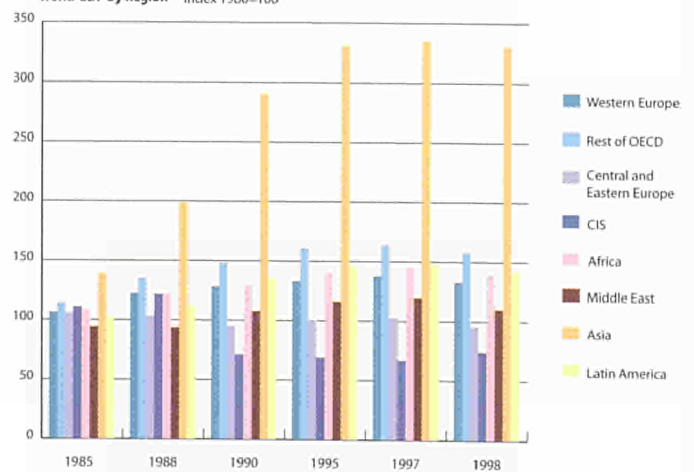
Inputs for Thermal Power Generation



Refinery capacities, after heavy restructuring, increased again all over the world since 1995...

Refinery capacities increased slowly by 0.7% per year on average since 1985 but in fact they remained relatively stable between 1985 and 1992, and increased by 1.6% per year on average since then to retrieve a level close to that of 1980. In the OECD region, in-depth restructuring led to a stabilisation of installed capacity between 1985 and 1995 but since then it has increased by 1.6% per year. At the same time the capacity utilisation rate increased steadily from 72% in 1985 to 93% in 1998. This has increased the profitability of the refinery sector and enabled further costly investment in conversion units to adapt production to changing oil product demand and to provide cleaner fuels. In the non-OECD region refinery capacity grew by about 13% since 1985, the main investment being located in the Middle East (+56%) to increase the value-added of crude production, Southeast Asia (+84%) and China (+133%) driven by buoyant internal demand. At the same time, the utilisation rate in the non-OECD region fell from 80% in 1985 to only 73% in 1998 with very varied experience by region. Although capacities were quite saturated in the Middle East and Asia, on the other hand utilisation rates remained

World GDP by Region Index 1980=100



World energy consumption per capita stable but Asia grew by 46% since 1980...

The two main energy indicators are energy consumption per capita and energy intensity. The stage of economic development and the standards of living in each region strongly condition the link between economic growth and energy demand. Advanced economies with high living standards tend to have relatively high energy use per capita, but they also tend to be economies where per capita energy use is relatively stable or changes very slowly. In this context, rising energy demand tends to track employment and population growth. In industrialised countries, use of modern appliances and personal transport is widespread. As a result, increments to personal income tend to result in spending on goods and services that are not very energy intensive. To the extent that spending is directed at energy-using goods, it essen-

tially involves purchases of new equipment to replace old capital stock. The new stock is often more efficient than the equipment it is replacing, so that the relation between income and energy demand is weaker. In developing countries, standards of living, while rising, tend to be low compared to those in more advanced economies. As a result, many energy-using devices are being widely adopted for the first time, causing energy use to track rising income levels more closely. Many areas in these countries are now gaining access to electricity for the first time. Those that have electricity are expanding the variety of appliances they use. At the same time, personal car ownership is becoming an important component of consumer demand in newly industrialising areas. Double-digit growth rates in car ownership are evident in many countries, particularly in Asia.

GROSS DOMESTIC PRODUCT PER CAPITA : TOTAL BY REGION

Thousand 1990 EUR / inhabitant	1980	1985	1990	1995	1996	1997	1998	85/80	90/85	96/90	97/96	98/97
	Annual % Change											
World	2.95	3.02	3.25	3.31	3.39	3.46	3.49	0.5%	1.5%	0.7%	2.3%	0.7%
Western Europe	12.25	13.02	14.88	15.58	15.79	16.17	16.59	1.2%	2.7%	1.0%	2.4%	2.6%
European Union	11.99	12.74	14.58	15.28	15.49	15.86	16.27	1.2%	2.7%	1.0%	2.4%	2.6%
EFTA	20.73	22.39	24.54	25.10	25.56	26.08	26.53	1.6%	1.8%	0.7%	2.0%	1.7%
Rest of OECD	11.51	12.42	13.80	14.38	14.86	15.33	15.47	1.5%	2.1%	1.2%	3.2%	0.9%
NAFTA	12.18	12.94	13.93	14.52	14.93	15.57	16.00	1.2%	1.5%	1.2%	4.3%	2.7%
OECD Pacific	13.18	14.97	18.04	19.10	19.96	20.19	19.70	2.6%	3.8%	1.7%	1.2%	-2.4%
Central and Eastern Europe	1.85	1.92	1.84	1.70	1.77	1.81	1.84	0.7%	-0.8%	-0.7%	2.2%	2.2%
CIS (1)	2.31	2.45	2.58	1.50	1.44	1.46	1.42	1.2%	1.0%	-9.3%	1.6%	-2.7%
Africa	0.67	0.63	0.61	0.58	0.59	0.59	0.60	-1.2%	-0.5%	-0.6%	0.4%	1.0%
Middle East	4.04	3.16	2.67	2.69	2.72	2.76	2.77	-4.8%	-3.3%	0.3%	1.7%	0.3%
Asia	0.28	0.35	0.46	0.63	0.66	0.69	0.69	4.8%	5.5%	6.1%	4.6%	-0.1%
Latin America	2.12	1.96	1.94	2.16	2.19	2.26	2.25	-1.6%	-0.2%	2.1%	3.1%	-0.3%

(1) Including Baltic countries for statistical reasons

GROSS INLAND ENERGY CONSUMPTION PER CAPITA : TOTAL BY REGION

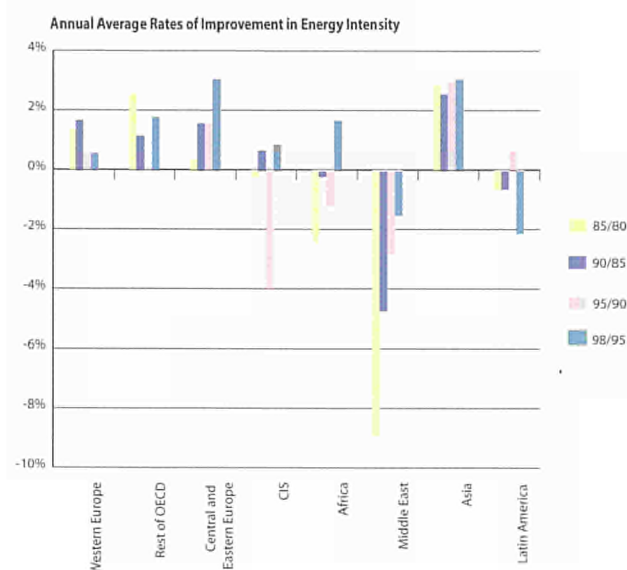
toe/inhabitant	1980	1985	1990	1995	1996	1997	1998	90/85	96/90	97/96	98/97
	Annual % Change										
World	1.63	1.61	1.65	1.62	1.65	1.65	1.62	0.4%	0.0%	0.0%	-1.5%
Western Europe	3.51	3.48	3.64	3.69	3.80	3.79	3.85	0.9%	0.7%	-0.4%	1.7%
European Union	3.50	3.46	3.62	3.67	3.79	3.77	3.83	0.9%	0.8%	-0.5%	1.6%
EFTA	3.84	4.12	4.33	4.36	4.35	4.50	4.63	1.0%	0.1%	3.5%	2.9%
Rest of OECD	5.15	4.87	5.09	5.28	5.37	5.43	5.37	0.9%	0.9%	1.1%	-1.1%
NAFTA	6.59	6.15	6.27	6.41	6.49	6.56	6.49	0.4%	0.6%	1.0%	-1.0%
OECD Pacific	3.20	3.24	3.75	4.13	4.25	4.31	4.24	3.0%	2.1%	1.3%	-1.6%
Central and Eastern Europe	3.01	3.06	2.71	2.31	2.43	2.36	2.27	-2.4%	-1.8%	-2.9%	-3.6%
CIS (1)	4.26	4.58	4.66	3.30	3.21	3.09	3.04	0.4%	-6.0%	-3.7%	-1.6%
Africa	0.61	0.65	0.64	0.64	0.64	0.64	0.63	-0.3%	-0.1%	1.0%	-1.3%
Middle East	1.45	1.73	1.83	2.13	2.20	2.27	2.30	1.2%	3.1%	3.4%	1.0%
Asia	0.50	0.54	0.62	0.72	0.75	0.75	0.73	2.7%	3.1%	0.8%	-3.5%
Latin America	1.00	0.94	0.96	1.03	1.08	1.12	1.15	0.4%	1.9%	3.6%	2.8%

(1) Including Baltic countries for statistical reasons

Comparing energy consumption per capita in 1998 across regions, it is clear that NAFTA showed by far the highest levels with 6.5 toe/inhabitant, although the inclusion of Mexico lowered this to some extent. At the other extreme, Africa and Asia have the lowest levels, about one-tenth of the NAFTA one, significantly below the world average. At a world level, energy consumption per capita has remained stable since 1980. The growth in both developing regions (mainly located in Asia and the Middle East) and the OECD region (mainly the OECD Pacific region) was compensated since 1988 by the slowdown in CIS (-38%) and CEEC (-27%). To appreciate future trends it must be stressed that Asia, which represented more than 50% of the world population in 1998, has seen its consumption per capita grow by 46% since 1980 but this has stabilised since 1995.

World energy intensity improved on average by 1.0% per year since 1980...

Total world **energy intensity** showed a slight but continuous downward trend by 1.0% a year since 1980 - a steady improvement over the last two decades. The limited decline in the early 1990's was compensated by spectacular improvements in 1997 and 1998, of 2.3% and 2.2% respectively. The OECD regions, which had by far the lowest energy intensity, improved their performance by 1.7% per year on average during the 1980's. But the gains have remained marginal since the beginning of the 1990's, reaching only 0.6% per year on average despite substantial improvements in 1997 and 1998: 1.9% and 1.6% respectively. Inside the OECD the best performances were achieved by NAFTA and the European Union whilst energy intensity increased in the OECD Pacific region since 1990. It should be observed that in the industrialised countries, major improvements of energy intensity were



in all cases associated with sustained economic growth as was the case in the last two years. On the other hand, the non-OECD part of the world was characterised by a stabilisation of its energy intensity during the 1980's, followed by a sustained reduction since then (-1.8% per annum on average since 1990). This is despite the marked increase in the CIS (+2.1% per year) and the Middle East (+2.4% per year) and stabilisation in Latin America. Asia demonstrated the best improvement since 1980, at about 2.9% per year, and intensity was falling regularly. In the case of the Middle East, GDP is directly dependent on oil market revenues. Fluctuations in export volumes and oil prices led to GDP growth of only 19% since 1980, the lowest growth by far (excluding in-depth restructuring of CIS and Central and Eastern Europe). As a result, observed increases in energy intensity resulted in fact from

ENERGY INTENSITY : TOTAL BY REGION

toe/1990 MEUR	1980	1985	1990	1995	1996	1997	1998	85/80	90/85	96/90	97/96	98/97
Annual % Change												
World	553	533	506	489	487	476	465	-0.8%	-1.0%	-0.6%	-2.3%	-2.2%
Western Europe	286	267	244	237	241	234	232	-1.4%	-1.7%	-0.2%	-2.6%	-0.9%
European Union	291	271	248	240	245	238	235	-1.4%	-1.8%	-0.2%	-2.8%	-1.0%
EFTA	185	184	177	174	170	173	175	-0.1%	-0.8%	-0.6%	1.4%	1.1%
Rest of OECD	447	392	369	367	361	354	347	-2.6%	-1.2%	-0.3%	-2.0%	-2.0%
NAFTA	541	476	450	441	435	421	406	-2.6%	-1.1%	-0.6%	-3.2%	-3.6%
OECD Pacific	242	216	208	216	213	213	215	-2.3%	-0.8%	0.4%	0.2%	0.9%
Mediterranean	440	430	444	449	456	447	442	-0.4%	0.6%	0.5%	-2.0%	-1.0%
Central and Eastern Europe	1625	1596	1470	1353	1374	1305	1231	-0.4%	-1.6%	-1.1%	-5.0%	-5.6%
CIS (1)	1846	1867	1807	2200	2234	2116	2139	0.2%	-0.7%	3.6%	-5.3%	1.1%
Africa	918	1036	1046	1112	1075	1082	1058	2.4%	0.2%	0.5%	0.6%	-2.3%
Middle East	358	548	688	791	809	823	828	8.9%	4.7%	2.7%	1.7%	0.6%
Asia	1777	1537	1346	1158	1130	1089	1053	-2.9%	-2.6%	-2.9%	-3.6%	-3.4%
Latin America	469	483	497	479	492	494	510	0.6%	0.6%	-0.2%	0.5%	3.1%

(1) Including Baltic countries for statistical reasons

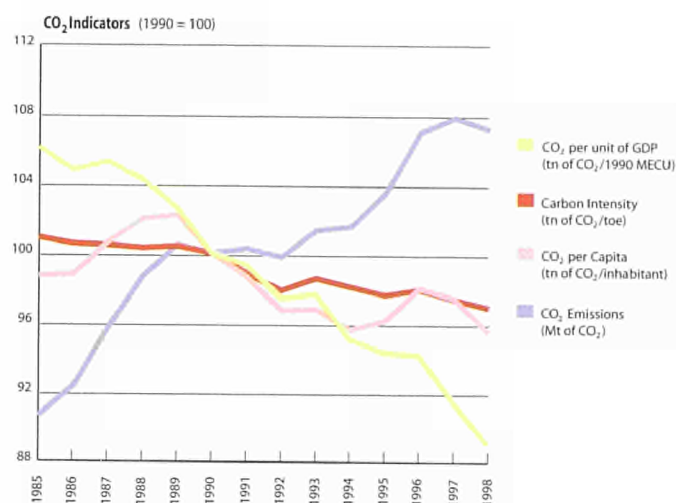
this particular evolution of GDP, which does not reflect less efficient use of energy by final consumers. In 1998, energy intensity was three times higher in the non-OECD region than in the OECD region, excluding the CIS and CEEC (where energy intensity was five times higher than the OECD level).

As regards energy intensity by sector at the world level, improvements occurred in all final sectors but at different rates. The major improvement was observed in industry with a reduction of 35% since 1980. The leading regions were NAFTA with a reduction by 4.0% per year on average, Central and Eastern Europe with -3.6% per year and Asia with -3.1% per year. The energy intensity of the tertiary-domestic sector improved about 1% per year on average since 1980. This is the result of contrasting trends: an evolution in all the OECD regions close to the world average with the exception of the OECD Pacific region where intensity remained stable since 1980; a marked decline (-57%) in Asia; a slow decline - less than 10% - in Latin America; moderate growth (+13%) in Africa; a significant increase (+60%) in CIS where energy consumption in the tertiary-domestic sector grew slowly to cover basic needs while GDP declined by 45% since 1990; and a massive jump (+260%) in the Middle East. The transport sector slowly but regularly reduced its energy intensity by 0.2% since 1985, demonstrating that the development of improved vehicles is partly able to offset rapid motorization in developing regions.

ENVIRONMENT

World CO₂ emissions grew by 7% since 1990 but European Union emissions stabilised...

CO₂ emission indicators are of prime importance in the post-Kyoto debate as the Kyoto Protocol adopted on 11 December 1997 may signal a significant change in the level of effort among industrialised countries to reduce greenhouse gas emissions. The



CO₂ EMISSIONS : TOTAL BY REGION (INCLUDING BUNKERS)

Mt of CO ₂	1980	1985	1990	1995	1996	1997	1998(2)	85/80	90/85	96/90	97/96	98/97
Annual % Change												
World	18166	18765	20752	21485	22206	22444	22584	0.7%	2.0%	1.1%	1.1%	0.6%
Western Europe	3504	3156	3262	3232	3322	3258	3325	-2.1%	0.7%	0.3%	-1.9%	2.1%
European Union	3431	3081	3185	3149	3236	3171	3234	-2.1%	0.7%	0.3%	-2.0%	2.0%
EFTA	73	75	77	83	86	87	91	0.6%	0.6%	1.7%	1.6%	4.4%
Rest of OECD	6713	6631	7240	7682	7934	8109	8181	-0.2%	1.8%	1.5%	2.2%	0.9%
NAFTA	5506	5392	5774	6071	6267	6427	6504	-0.4%	1.4%	1.4%	2.6%	1.2%
OECD Pacific	1136	1145	1337	1457	1497	1502	1495	0.2%	3.2%	1.9%	0.3%	-0.4%
Central and Eastern Europe	1081	1116	976	788	830	787	787	0.6%	-2.7%	-2.7%	-5.1%	0.0%
CIS (1)	3203	3357	3521	2395	2283	2213	2213	0.9%	1.0%	-7.0%	-3.1%	0.0%
Africa	430	495	572	633	645	653	653	2.9%	3.0%	2.0%	1.3%	0.0%
Middle East	385	545	659	866	912	947	947	7.2%	3.9%	5.6%	3.8%	0.0%
Asia	2288	2911	3904	5147	5498	5672	5672	4.9%	6.0%	5.9%	3.2%	0.0%
Latin America	562	553	618	742	782	806	806	-0.3%	2.2%	4.0%	3.0%	0.0%
of which (%)												
European Union	18.9	16.4	15.3	14.7	14.6	14.1	14.3	-2.8%	-1.3%	-0.9%	-3.1%	1.4%
OECD	55.8	51.7	50.0	50.1	49.9	49.8	50.1	-1.6%	-0.7%	0.0%	-0.2%	0.6%

(1) Including Baltic countries for statistical reasons

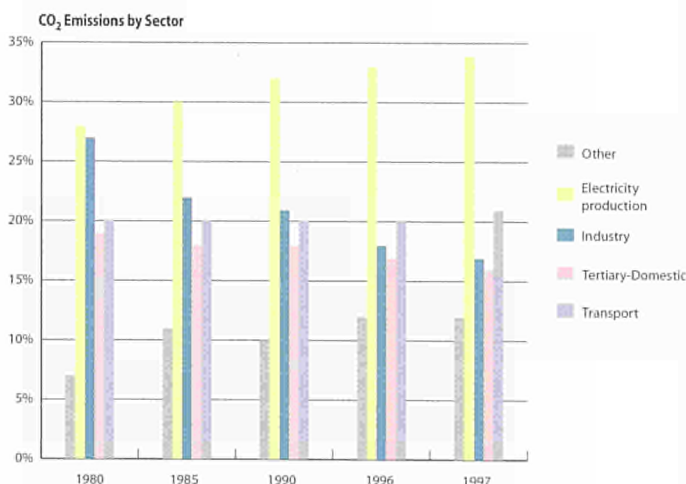
(2) estimated values for non-OECD regions

agreed objectives, if realised, will markedly reduce or change energy use among the signatory nations. Substantial shifts in the composition of energy supply away from high-carbon fuels, major reductions in energy intensity, or some combination of both, will have to be achieved in developed countries.

CO₂ emissions are given here on an indicative basis, and are calculated using common emission factors by energy aggregates across all countries in the world. Worldwide **emissions of CO₂** increased steadily by 1.4% per year during the 1980's and by 0.9% per year since then, leading to a global increase by 7% in 1998 compared to the 1990 level. Since 1990, CO₂ emissions have increased in almost all regions in the world, in some cases by about 5% per year (Asia and the Middle East), with the exception of former Centrally Planned Economies due to the drastic reduction of energy consumption observed, mainly in the CIS, since 1990. The European Union stabilised its emissions, benefiting from reduced coal use and energy efficiency improvements (as the climatic conditions of 1990 and 1998 were similar). Inside the OECD region the European Union was by far the best performer as CO₂ emissions increased by 12% in the OECD Pacific region, 13% in the NAFTA region and 18% in EFTA since 1990. In developing regions increases of CO₂ emissions since 1990 were much more substantial: 20% in Africa, 35% in Asia, 45% in Latin America and 50% in the Middle East. At the same time, CO₂ emissions per capita at the world level showed a reduction of 0.6% a year on average since 1990 (3.7 tons of CO₂ per capita in 1998 compared to 3.9 in 1980). Carbon intensity (tn of CO₂ emitted per toe of energy consumed) declined steadily, the main improvements being observed in the tertiary-domestic sector (-11% since 1990) and industry (-7%). Both were benefiting from the increasing contribution of electricity and the substitution of high CO₂ content fuels by natural gas.

The share of CO₂ emissions from power generation and transport reached 56% in 1997 against 48% in 1980...

Looking at world-wide CO₂ emissions by sector, the first conclusion is that the power generation sector remained by far the largest emitter. CO₂ emissions from the power sector grew by 2.2% on average since 1980, while thermal electricity production increased by 2.5% per year, to represent about 34% of total world emissions in 1998 against 28% in 1980. This is a consequence of rapid electrification in developing regions, a trend which will continue in the near future. The growing share of solid fuels for thermal power generation accentuated this trend. Within the final demand sectors, CO₂ emissions from transport have increased since 1980 at an average growth rate of 2.0% despite a relative stability between 1990 and 1994 resulting from the particular situation in the CIS and CEEC. Transport's share at the level of final



WORLD : CO₂ Emissions by sector

Mt of CO ₂	1980	1985	1990	1995	1996	1997	1998	85/80	90/85	95/90	96/95	97/96	97/90
Annual % Change													
Total	18166	18765	20752	21485	22206	22444	22584	0.7%	2.0%	0.7%	3.4%	1.1%	1.1%
Bunkers	339	294	366	393	397	465	na	-2.8%	4.5%	1.4%	1.0%	17.1%	3.5%
Transformation	6309	7471	8488	9320	9815	9969	na	3.4%	2.6%	1.9%	5.3%	1.6%	2.3%
Power Generation	5069	5519	6457	6936	7237	7390	na	1.7%	3.2%	1.4%	4.3%	2.1%	1.9%
Energy sector	1241	1951	2031	2384	2578	2579	na	9.5%	0.8%	3.3%	8.1%	0.0%	3.5%
Final Demand sectors	11517	11000	11898	11773	11995	12011	na	-0.9%	1.6%	-0.2%	1.9%	0.1%	0.1%
Industry	4727	4046	4249	3839	3899	3841	na	-3.1%	1.0%	-2.0%	1.6%	-1.5%	-1.4%
Transport	3480	3690	4080	4329	4463	4577	na	1.2%	2.0%	1.2%	3.1%	2.5%	1.7%
Domestic and Tertiary	3311	3264	3569	3604	3632	3593	na	-0.3%	1.8%	0.2%	0.8%	-1.1%	0.1%

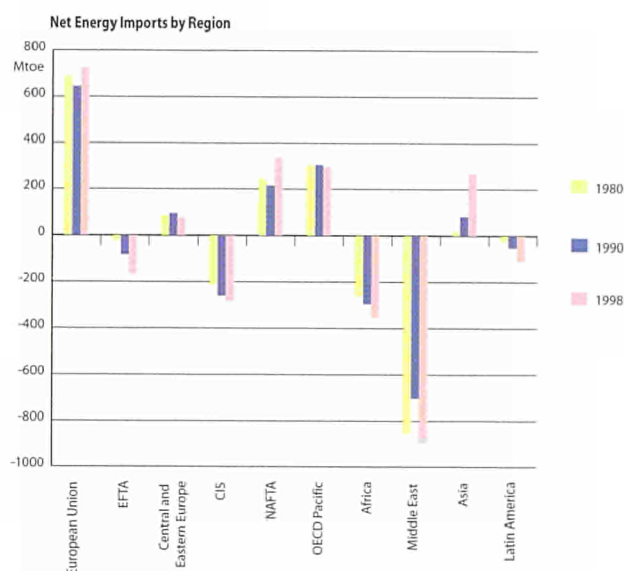
energy consumption increased from 30% in 1980 to 39% in 1997. The domestic and tertiary sectors showed a limited upward trend (+0.2% per year since 1980, excluding any correction for climatic conditions) due to the penetration of natural gas and distributed heat in heating markets in place of heating oil and solids. Industry experienced the greatest fall in CO₂ emissions between 1980 and 1997 (-0.7% per year) but a stabilisation of emissions has occurred since 1992 reflecting the increased energy consumption of this sector at the global level.

GLOBAL MARKETS

The OECD absorbed about 80% of world interregional exchanges of energy of which 81% were covered by oil...

World **energy trade** between the main regions considered in this study (net energy imports) shows that the European Union is by far the largest net importer with a steady annual growth of 2.5% since 1985, reaching a new peak of 723 Mtoe in 1998. NAFTA is the second ranking with a faster growth rate between 1985 and 1998 (+13% per year on average). OECD Pacific is also an important importer with a relatively stable level since 1980, except for the drop observed in the mid-1980's. As a consequence of these trends, the OECD absorbed about 80% of world net energy exchanges in 1998. Amongst the non-OECD regions, although Central and Eastern Europe stabilised their level of imports at about 65 Mtoe, mainly of oil and gas from CIS, Asia was continuously increasing its imports starting from a negligible level in 1980 to reach 270 Mtoe in 1998, 35 Mtoe below the peak reached in 1997. As a result of these recent trends, Asia will rapidly be-

come the second largest importer of energy amongst the main world's regions. The net exporters remained the Middle East (893 Mtoe in 1998), Africa (350 Mtoe), CIS (283 Mtoe) and EFTA (164 Mtoe), all four mainly exporters of hydrocarbons. Oil, both crude and oil products, accounted for 81% of interregional energy exchanges in 1998, natural gas for 12% and solids for 7%. Although OPEC continued to dominate the oil market, it must be stressed that Russia accounted for 42% of the trade in natural gas in 1998. Finally interregional exchanges of energy represented in 1998 only 17.5% of total world energy consumption, about the same level as in 1980.



NET ENERGY IMPORT : TOTAL BY REGION

Mtoe	1980	1985	1990	1995	1996	1997	1998	85/80	90/85	96/90	97/96	98/97
Annual % Change												
Western Europe	668.0	487.9	563.4	508.3	512.4	520.9	558.7	-6.1%	2.9%	-1.6%	1.7%	7.3%
European Union	688.4	526.3	643.7	651.2	678.9	692.6	722.9	-5.2%	4.1%	0.9%	2.0%	4.4%
EFTA	-21.4	-38.5	-80.4	-142.9	-166.6	-171.6	-164.2	12.4%	15.9%	12.9%	3.0%	-4.3%
Rest of OECD	565.9	343.2	550.2	606.7	646.2	679.1	679.7	-9.5%	9.9%	2.7%	5.1%	0.1%
NAFTA	246.0	68.9	215.6	249.8	274.1	307.4	338.8	-22.5%	25.6%	4.1%	12.1%	10.2%
OECD Pacific	305.7	257.1	306.8	319.5	330.6	328.4	296.9	-3.4%	3.6%	1.3%	-0.7%	-9.6%
Central and Eastern Europe	71.6	65.6	77.1	58.4	69.0	68.9	65.0	-1.7%	3.3%	-1.8%	-0.1%	-5.7%
CIS (1)	-212.2	-219.2	-260.0	-244.4	-276.4	-278.0	-283.4	0.6%	3.5%	1.0%	0.6%	1.9%
Africa	-259.7	-241.0	-294.9	-302.6	-330.7	-347.9	-349.9	-1.5%	4.1%	1.9%	5.2%	0.6%
Middle East	-855.1	-395.0	-701.9	-786.1	-788.1	-828.7	-893.4	-14.3%	12.2%	2.0%	5.2%	7.8%
Asia	18.4	0.0	85.3	216.5	256.9	304.0	269.9	-76.9%	489.3%	20.2%	18.3%	-11.2%
Latin America	-22.7	-38.6	-51.4	-106.8	-106.3	-118.2	-109.3	11.2%	5.9%	12.9%	11.2%	-7.5%
of which												
OECD	1233.9	831.1	1113.5	1115.0	1158.6	1200.1	1238.4	-7.6%	6.0%	0.7%	3.6%	3.2%

(1) Including Baltic countries for statistical reasons

WORLD : SUMMARY ENERGY BALANCE

Mtoe	1980	1985	1990	1996	1997	1998(3)	85/80	90/85	96/90	97/96	98/97
	Annual % Change										
Primary Production	7380	7798	8813	9522	9665	9731	1.1%	2.5%	1.3%	1.5%	0.7%
Solids	1806	2023	2189	2255	2272	2211	2.3%	1.6%	0.5%	0.7%	-2.6%
Oil	3162	2864	3218	3426	3528	3601	-2.0%	2.4%	1.0%	3.0%	2.1%
Natural gas	1245	1432	1709	1909	1917	1945	2.8%	3.6%	1.9%	0.4%	1.4%
Nuclear	187	387	519	618	613	623	15.6%	6.0%	3.0%	-0.8%	1.7%
Hydro & Wind	149	171	186	219	223	222	2.9%	1.7%	2.7%	1.6%	-0.4%
Geothermal	12	20	32	37	37	39	11.1%	9.7%	2.6%	0.7%	4.6%
Other renewable energy sources	819	901	960	1058	1075	1090	1.9%	1.3%	1.6%	1.7%	1.3%
Net Imports (1)	-12	19	-13	-5	14	-48	-	-	-15.6%	-	-
Solids	2	3	-1	-9	-2	-14	4.9%	-	40.3%	-78.1%	587.1%
Oil	-12	21	-8	9	20	-36	-	-	-	135.3%	-
Crude oil	21	70	50	62	78	na	27.7%	-6.4%	3.6%	25.4%	na
Oil products	-33	-49	-58	-53	-58	na	8.3%	3.4%	-1.4%	7.8%	na
Natural gas	-3	-5	-4	-4	-4	1	12.4%	-0.7%	-2.3%	2.3%	-
Electricity	1	0	0	0	0	1	-	-	-	-22.5%	-
Gross Inland Consumption	7192	7729	8605	9401	9529	9516	1.5%	2.2%	1.5%	1.4%	-0.1%
Solids	1789	2026	2161	2271	2270	2191	2.5%	1.3%	0.8%	-0.1%	-3.5%
Oil	2995	2797	3071	3306	3397	3418	-1.4%	1.9%	1.2%	2.8%	0.6%
Natural gas	1241	1426	1676	1893	1914	1933	2.8%	3.3%	2.0%	1.1%	1.0%
Other (2)	1167	1479	1697	1931	1948	1975	4.9%	2.8%	2.2%	0.8%	1.4%
Electricity Generation in Twh	8295	9813	11833	13666	13953	na	3.4%	3.8%	2.4%	2.1%	na
Nuclear	713	1492	2013	2418	2393	na	15.9%	6.2%	3.1%	-1.0%	na
Hydro & wind	1736	2004	2178	2561	2599	na	2.9%	1.7%	2.7%	1.5%	na
Thermal	5846	6318	7643	8687	8962	na	1.6%	3.9%	2.2%	3.2%	na
Generation Capacity in GWe	1973	2426	2757	3128	3195	na	4.2%	2.6%	2.1%	2.2%	na
Nuclear	142	253	330	355	360	na	12.2%	5.5%	1.2%	1.5%	na
Hydro & wind	466	564	647	731	742	na	3.9%	2.8%	2.1%	1.5%	na
Thermal	1365	1610	1781	2042	2093	na	3.4%	2.0%	2.3%	2.5%	na
Average Load Factor in %	48.0	46.2	49.0	49.9	49.8	na	-0.8%	1.2%	0.3%	-0.1%	na
Fuel Inputs for Thermal Power Generation	1555	1693	2032	2267	2325	na	1.7%	3.7%	1.8%	2.6%	na
Solids	837	982	1148	1347	1367	na	3.2%	3.2%	2.7%	1.5%	na
Oil	427	328	324	274	286	na	-5.1%	-0.2%	-2.7%	4.2%	na
Gas	270	351	475	544	569	na	5.4%	6.2%	2.3%	4.5%	na
Geothermal	11	19	31	36	36	na	11.3%	9.7%	2.5%	0.7%	na
Biomass	9	12	54	66	68	na	5.7%	34.5%	3.2%	3.0%	na
Average Thermal Efficiency in %	32.4	32.1	32.4	33.0	33.2	na	-0.2%	0.2%	0.3%	0.6%	na
Non-Energy Uses	344	358	430	514	540	na	0.8%	3.7%	3.0%	5.0%	na
Total Final Energy Demand	5167	5440	5896	6276	6293	na	1.0%	1.6%	1.0%	0.3%	na
Solids	800	864	866	748	722	na	1.5%	0.0%	-2.4%	-3.4%	na
Oil	2049	1988	2176	2321	2359	na	-0.6%	1.8%	1.1%	1.6%	na
Gas	803	846	938	1004	987	na	1.0%	2.1%	1.1%	-1.7%	na
Electricity	586	693	831	965	986	na	3.4%	3.7%	2.5%	2.2%	na
Heat	120	161	178	247	232	na	6.1%	2.1%	5.6%	-6.3%	na
Renewable energy sources	809	888	906	991	1007	na	1.9%	0.4%	1.5%	1.6%	na
CO₂ Emissions in Mt of CO₂	17827	18471	20386	21809	21980	21843	0.7%	2.0%	1.1%	0.8%	-0.6%
Indicators											
Population (Million)	4409	4798	5225	5703	5783	5864	1.7%	1.7%	1.5%	1.4%	1.4%
GDP (index 1985=100)	89.6	100.0	117.1	133.0	138.0	140.9	2.2%	3.2%	2.1%	3.8%	2.1%
Gross Inl Cons./GDP (toe/1985 MEUR)	553.4	532.6	506.3	486.9	475.6	465.4	-0.8%	-1.0%	-0.6%	-2.3%	-2.2%
Gross Inl Cons./Capita (toe/inhabitant)	1.63	1.61	1.65	1.65	1.65	1.62	-0.2%	0.4%	0.0%	0.0%	-1.5%
Electricity Generated/Capita (kWh/inhabitant)	1881	2045	2265	2396	2413	na	1.7%	2.1%	0.9%	0.7%	na
CO ₂ Emissions/Capita (t of CO ₂ /inhabitant)	4.04	3.85	3.90	3.82	3.80	3.72	-1.0%	0.3%	-0.3%	-0.6%	-2.0%

(1) corresponds to statistical errors

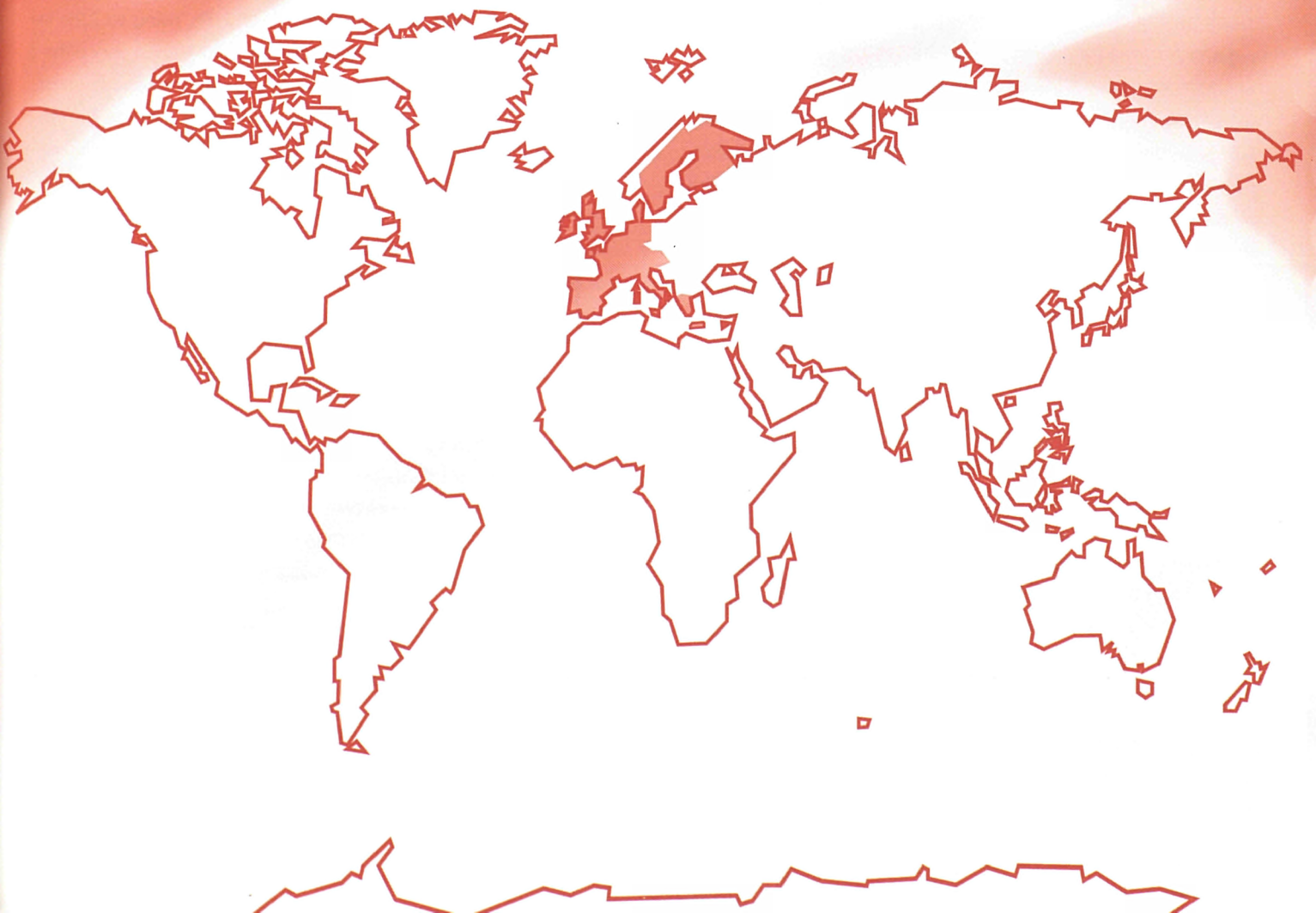
(2) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(3) Estimates

WORLD : MAIN INDICATORS

	1980	1985	1990	1996	1997	1998	85/80	90/85	96/90	97/96	98/97
	Annual % Change										
Gross Inland Consumption (Mtoe)	7191.6	7728.7	8605.2	9401.1	9528.6	9516.2	1.5%	2.2%	1.5%	1.4%	-0.1%
Power Generation	1532.2	1822.0	2184.5	2443.5	2505.2	na	3.5%	3.7%	1.9%	2.5%	na
Energy Branch	402.3	459.8	540.5	587.4	608.9	na	2.7%	3.3%	1.4%	3.7%	na
Final Energy Consumption	5137.3	5400.7	5850.4	6216.7	6231.2	na	1.0%	1.6%	1.0%	0.2%	na
Industry	1938.5	1929.1	2008.4	1946.0	1940.1	na	-0.1%	0.8%	-0.5%	-0.3%	na
Transport	1134.7	1214.3	1411.2	1592.8	1635.4	na	1.4%	3.1%	2.0%	2.7%	na
Tertiary-Domestic	2063.2	2257.3	2430.7	2677.9	2655.7	na	1.8%	1.5%	1.6%	-0.8%	na
Energy Intensity (toe/1990 MEUR)	553.4	532.6	506.3	486.9	475.6	465.4	-0.8%	-1.0%	-0.6%	-2.3%	-2.2%
Power Generation	117.9	125.6	128.5	126.6	125.1	na	1.3%	0.5%	-0.3%	-1.2%	na
Final Energy Consumption	395.3	372.2	344.2	322.0	311.0	na	-1.2%	-1.5%	-1.1%	-3.4%	na
Industry	149.2	132.9	118.2	100.8	96.8	na	-2.3%	-2.3%	-2.6%	-3.9%	na
Transport	87.3	83.7	83.0	82.5	81.6	na	-0.8%	-0.2%	-0.1%	-1.0%	na
Tertiary-Domestic	158.8	155.5	143.0	138.7	132.6	na	-0.4%	-1.7%	-0.5%	-4.4%	na
Energy per capita (Kgoe/inhabitant)	1631	1611	1647	1648	1648	1623	-0.2%	0.4%	0.0%	0.0%	-1.5%
Power Generation	347	380	418	428	433	na	1.8%	1.9%	0.4%	1.1%	na
Final Energy Consumption	1165	1126	1120	1090	1078	na	-0.7%	-0.1%	-0.4%	-1.1%	na
Industry	440	402	384	341	335	na	-1.8%	-0.9%	-2.0%	-1.7%	na
Transport	257	253	270	279	283	na	-0.3%	1.3%	0.6%	1.3%	na
Tertiary-Domestic	468	470	465	470	459	na	0.1%	-0.2%	0.2%	-2.2%	na
Electricity Share (%)											
Final Energy Consumption	11.4%	12.8%	14.2%	15.5%	15.8%	na	2.4%	2.1%	1.5%	2.0%	na
Industry	15.4%	17.3%	19.2%	21.2%	21.6%	na	2.4%	2.1%	1.6%	2.3%	na
Transport	1.2%	1.3%	1.3%	1.2%	1.2%	na	1.1%	-0.5%	-1.1%	-0.8%	na
Tertiary-Domestic	13.3%	15.2%	17.6%	20.0%	20.6%	na	2.7%	2.9%	2.1%	3.2%	na
Total Renewable consumption (Mtoe)	979.1	1092.0	1177.7	1313.5	1334.4	na	2.2%	1.5%	1.8%	1.6%	na
Hydro	148.6	171.0	185.5	217.6	220.7	na	2.8%	1.6%	2.7%	1.4%	na
Biomass	818.6	900.6	959.2	1056.8	1074.0	na	1.9%	1.3%	1.6%	1.6%	na
Other renewable energy source	11.9	20.5	32.9	39.1	39.7	na	11.5%	10.0%	2.9%	1.5%	na
Renewable Intensity (toe/1990 MEUR)	75.3	75.2	69.3	68.0	66.6	na	0.0%	-1.6%	-0.3%	-2.1%	na
Renewable per capita (kgoe/inhabitant)	222.1	227.6	225.4	230.3	230.8	na	0.5%	-0.2%	0.4%	0.2%	na
CO₂ Emissions (Mt of CO₂)	17827	18471	20386	21809	21980	21843	0.7%	2.0%	1.1%	0.8%	-0.6%
Power Generation	5069	5519	6457	7237	7390	na	1.7%	3.2%	1.9%	2.1%	na
Energy Branch	906	905	1057	1180	1233	na	0.0%	3.2%	1.8%	4.5%	na
Final Energy Consumption	11517	11611	12413	12535	12512	na	0.2%	1.3%	0.2%	-0.2%	na
Industry	4727	4536	4690	4260	4207	na	-0.8%	0.7%	-1.6%	-1.2%	na
Transport	3480	3665	4250	4781	4909	na	1.0%	3.0%	2.0%	2.7%	na
Tertiary-Domestic	3311	3410	3474	3495	3395	na	0.6%	0.4%	0.1%	-2.8%	na
Carbon (tn of CO₂/toe)	2.5	2.4	2.4	2.3	2.3	2.3	-0.7%	-0.2%	-0.3%	-0.6%	-0.5%
Power Generation	3.3	3.0	3.0	3.0	2.9	na	-1.7%	-0.5%	0.0%	-0.4%	na
Energy Branch	2.3	2.0	2.0	2.0	2.0	na	-2.7%	-0.1%	0.4%	0.8%	na
Final Energy Consumption	2.2	2.1	2.1	2.0	2.0	na	-0.8%	-0.3%	-0.8%	-0.4%	na
Industry	2.4	2.4	2.3	2.2	2.2	na	-0.7%	-0.1%	-1.1%	-0.9%	na
Transport	3.1	3.0	3.0	3.0	3.0	na	-0.3%	0.0%	-0.1%	0.0%	na
Tertiary-Domestic	1.6	1.5	1.4	1.3	1.3	na	-1.2%	-1.1%	-1.5%	-2.0%	na
CO₂ per capita (kg of CO₂/inhabitant)	4043	3850	3902	3824	3801	3725	-1.0%	0.3%	-0.3%	-0.6%	-2.0%
Final Energy Consumption	2612	2420	2376	2198	2164	na	-1.5%	-0.4%	-1.3%	-1.6%	na
Industry	1072	945	898	747	728	na	-2.5%	-1.0%	-3.0%	-2.6%	na
Transport	789	764	813	838	849	na	-0.6%	1.3%	0.5%	1.3%	na
Tertiary-Domestic	751	711	665	613	587	na	-1.1%	-1.3%	-1.4%	-4.2%	na
CO₂ per unit of GDP (tn of CO₂/1990 MEUR)	1372	1273	1199	1130	1097	1068	-1.5%	-1.2%	-1.0%	-2.9%	-2.6%
Power Generation	390	380	380	375	369	na	-0.5%	0.0%	-0.2%	-1.6%	na
Public Thermal Power Generation	368	357	356	345	336	na	-0.6%	0.0%	-0.5%	-2.5%	na
Autoprod. Thermal Power Generation	22	23	24	30	33	na	0.9%	0.4%	4.0%	9.5%	na
Energy Branch	70	62	62	61	62	na	-2.2%	0.0%	-0.3%	0.7%	na
Final Energy Consumption	886	800	730	649	625	na	-2.0%	-1.8%	-1.9%	-3.8%	na
Industry	364	313	276	221	210	na	-3.0%	-2.5%	-3.7%	-4.8%	na
Transport	268	253	250	248	245	na	-1.2%	-0.2%	-0.2%	-1.0%	na
Tertiary-Domestic	255	235	204	181	169	na	-1.6%	-2.8%	-2.0%	-6.4%	na





ENERGY OUTLOOK – Energy Demand: Recent evolution (1985-1998)

- GDP growth accelerated in 1998 to reach almost 3%...
- ... But final energy demand increased by only 1.6%, with similar climatic conditions to those in 1997
- With a stable 46% share of final energy demand since 1990, oil remained the largest energy source

INDUSTRY

- Stable industrial energy consumption reduced industrial energy intensity by 23% since 1985
- Gas and electricity together contributed 63% of total consumption in 1998 against 48% in 1985
- Improvements in energy intensity and sustained growth of industrial production are linked
- Throughout the European Union, the energy price decline accelerated in 1998

TRANSPORT

- Transport sector responsible for 78% of final energy demand increase since 1985, but only 54% since 1990
- Passenger traffic has grown more rapidly than economic growth since 1990 driven by leisure-time travel
- Goods transport demand accelerated since 1990 as a consequence of just-in-time industrial organisation
- Increasing energy and environmental impacts of road transport expected in the near future
- Equal diesel oil and gasoline shares in the total road fuel consumption in 1998
- Demand for air transport heavily influenced by the liberalisation of air markets
- Transport energy intensity stabilised since 1994
- Prices for transport fuel largely determined by the level of taxes

TERTIARY-DOMESTIC

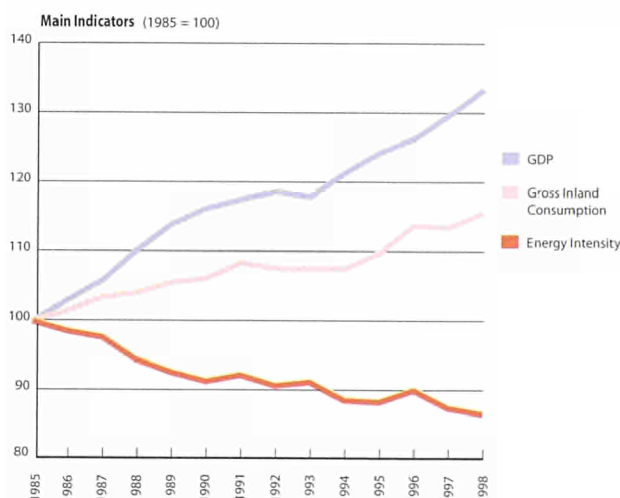
- Between 1990 and 1998, with similar climatic conditions, energy consumption increased by 12%
- Faced with moderate energy prices, heating use seems less efficient
- Energy intensity, corrected for climatic effects, declined by only 0.7% per year since 1985
- Energy prices for domestic consumers declined regularly

The European Union is one of the largest energy consuming regions in the world. In 1998 it consumed 1436 Mtoe, about 31% of total OECD primary energy consumption and about 15% of world consumption. Although examined as a whole region, the European Union is in fact marked by contrasts, ranging from countries with cold climates such as those in Scandinavia to those with milder climates in the Mediterranean. Similarly, there are substantial differences in national gross production and in income levels. All of these factors result in widely differing patterns of living standards and energy consumption.

GDP growth accelerated in 1998 to reach almost 3%...

The volume of energy consumed is largely a function, among other variables, of economic activity and climate. Despite year to year variations, GDP has increased substantially. During the 1980's, GDP grew on average by 2.3% per annum with a marked acceleration in the period 1986-1990 (3.1% per year). Since then, GDP growth has been marked by a slowdown to 0.5% between 1991 and 1992, followed by sustained recovery in 1994-95 (+2.7% per year on average). In 1996, economic growth showed a relative slowdown with an increase limited to 1.7%. But the economy

rebounded in 1997 with GDP growth of 2.6%, rising to 2.9% in 1998 and 2.0% in 1999. Over the period 1990-1998, a very differentiated evolution characterised economic growth amongst Member States. Sweden and Italy showed an average growth close to 1% per year whilst growth in six Member States including some major countries (France, Germany and the United Kingdom)



¹ To avoid a break in the time series, the analysis of the European Union includes all data regarding the former German Democratic Republic since 1985.

GROSS DOMESTIC PRODUCT (BILLIONS 1990 EUR)

	1980	1985	1990	1995	1996	1997	1998	80/85	90/85	95/90	96/95	97/96	98/97	98/90
	Annual % Change													
Austria	100.0	107.3	125.6	138.5	140.7	144.2	149.0	1.4%	3.2%	2.0%	1.6%	2.5%	3.3%	2.2%
Belgium	128.4	133.1	154.5	164.8	166.9	171.9	176.9	0.7%	3.0%	1.3%	1.3%	3.0%	2.9%	1.7%
Denmark	80.5	91.7	101.6	114.8	118.5	122.4	125.7	2.6%	2.1%	2.5%	3.2%	3.3%	2.7%	2.7%
Finland	78.1	89.9	106.2	103.3	107.0	113.4	119.4	2.8%	3.4%	-0.5%	3.6%	6.0%	5.3%	1.5%
France	758.3	811.0	940.0	987.1	1000.7	1022.7	1055.4	1.4%	3.0%	1.0%	1.4%	2.2%	3.2%	1.5%
Germany	1045.1	1124.0	1297.4	1405.4	1423.4	1454.7	1495.5	1.5%	2.9%	1.6%	1.3%	2.2%	2.8%	1.8%
Greece	55.6	59.5	65.3	69.4	71.1	73.3	76.0	1.3%	1.9%	1.2%	2.4%	3.2%	3.6%	1.9%
Ireland	24.2	27.4	35.9	48.3	52.2	57.8	64.7	2.5%	5.5%	6.1%	8.3%	10.6%	11.9%	7.7%
Italy	690.6	744.0	861.2	910.6	916.6	930.4	943.4	1.5%	3.0%	1.1%	0.7%	1.5%	1.4%	1.1%
Luxembourg	6.0	7.0	8.5	10.2	10.5	10.9	11.6	3.3%	3.9%	3.9%	2.6%	4.1%	6.1%	4.0%
Netherlands	180.3	192.0	222.5	247.0	254.7	264.0	273.7	1.3%	3.0%	2.1%	3.1%	3.6%	3.7%	2.6%
Portugal	39.8	41.6	54.3	59.1	60.8	63.1	65.6	0.9%	5.5%	1.7%	3.0%	3.7%	4.0%	2.4%
Spain	290.5	313.3	398.2	425.7	435.3	450.1	467.2	1.5%	4.9%	1.3%	2.3%	3.4%	3.8%	2.0%
Sweden	148.2	161.5	180.8	185.1	187.5	190.8	196.3	1.7%	2.3%	0.5%	1.3%	1.8%	2.9%	1.0%
United Kingdom	590.7	650.6	763.1	814.1	831.9	861.1	880.9	1.9%	3.2%	1.3%	2.2%	3.5%	2.3%	1.8%
EUROPEAN UNION	4216.2	4553.7	5315.0	5683.2	5777.8	5930.8	6101.3	1.6%	3.1%	1.3%	1.7%	2.6%	2.9%	1.7%

approximated to the European average of 1.7%; and the others grew more than 2% per year on average, Ireland achieving 7.7% growth. The major political events during this period have been the reunification of Germany in 1990 and the entry of three new member states in 1995: Austria, Finland and Sweden. Together these three countries contributed a little less than 8% of total EU GDP in 1998.

FINAL ENERGY CONSUMPTION

...But final energy demand increased by only 1.6%, with similar climatic conditions to those in 1997

1998, as was the case in 1997, is of particular interest as it presents climatic conditions, as measured by degree-days, close to those of 1990. Since 1985, annual degree-days have varied from 2136 to 2642, with a 1990 value close to the minimum and 11% below the long-term average value. In 1998, degree-days increased by 0.6% compared to 1997 but remained 7% below the long-term average. As a result, many comparisons, mainly regarding energy and environment indicators, can be made without having to correct substantially for climatic variations. In 1998, **final energy demand** in the European Union (946 Mtoe) increased by 1.6% as a response to the 2.9% growth of GDP. With the exception of solid fuels that declined by 8.8%, in line with the average reduction observed since 1990, all the other fuels experienced rising consumption: heat by 1.1%, oil products by 1.5%, electricity by 2.5%, natural gas by 2.8% and renewable energy sources by 3.3%. Since 1990, final energy demand has increased on average by 1.2% per year while GDP increased by 1.7% implying an elasticity of about two thirds. This performance resulted mainly from the stabilisa-

Main items

In 1998 the European Union had a combined population of some 380 m people, or about 6% of the world total. It is now the largest economic and political bloc in the world and the prospects are for continued expansion pending further negotiations and final political agreement with a large number of potential Accession States. The European Union includes many of the earliest industrialising countries which are now relatively mature economies. In recent years, the most significant structural changes have included the rapid growth of a wide range of service industries and the shift to less energy-intensive manufacturing. Rising personal incomes have underpinned high standards of living, associated with widespread ownership of domestic appliances and private cars. Space heating requirements, influenced by the varied climatic conditions in the European Union, are generally high and temperature dependent. These trends have shaped the broad evolution of energy demand and will continue to do so in future. They also explain significant substitution towards gas and electricity in final markets other than transport. The transport sector has experienced rapid growth and now accounts for a large proportion of total oil demand. Structural change, combined with saturation in some final markets, is leading to slower growth in energy use; but the European Union still accounts for some 15% of total world demand.

tion of final energy consumption in Germany since 1990 as a consequence of the improved energy efficiency in the new Länder. Excluding Germany, final energy consumption increased in the EU at the same rate as GDP.

With a stable 46% share of final energy demand since 1990, oil remained the largest energy source...

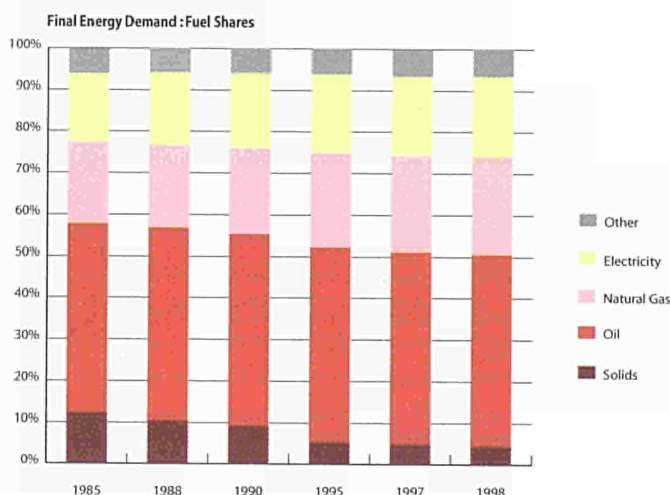
Oil remained the largest energy source with around 46% of total demand since 1990. But this apparent stability hides big structural changes in oil product consumption. Although demand for oil products increased as a whole by 1.2% on average since 1990, consumption of kerosene grew by 4.4% per year on average, diesel oil by 3.6%, LPG by 0.9% and heating gas oil by 0.6%. Gasoline consumption remained stable and residual fuel oil consumption declined by 4.8% per year on average. In 1998, oil product consumption increased by 6.5 Mtoe or 1.2% but transportation fuels increased by 9.6 Mtoe or 3%. Gas (23.6% share in 1998 against 21.6% in 1990 and 19.6% in 1985) grew by 2.8% per year on average since 1990 as it did in 1998. It gained market share in both industry (from 29.2% to 34.0%) and the tertiary-domestic sectors (from 28.4% to 34.7%), a similar evolution in both sectors. Electricity demand (19.2% share in 1998 against 18.1% in 1990 and 16.6% in 1985) increased by 1.9% a year since 1990, corresponding to an elasticity against GDP still higher than 1, but this ratio declined to reach only 0.69 in 1997 and 0.86 in 1998. At the same time, distributed heat demand, pushed by the development of combined heat and power in both industry and tertiary sectors, increased annually by 2.9% on average, with a major development between 1990 and 1996 but stabilisation since then. As a consequence, the contribution of distributed energy networks (electricity, natural gas and distributed heat) reached 45% of total final energy demand in 1998 (40.7% in 1990) and 65.7% excluding transport energy consumption (57.7% in 1990). Since 1990 the consumption of solid fuels has fallen by 47%, their share dropping from 9.3% to only 4.5%. By fuels, lignite consumption fell by 82%, steam coal consumption declined by 33% and coke by 30%. The declining contribution of solid fuels is linked to the steady conversion of the iron and steel sectors to electric arc furnaces and

the continuing closure of mines - limiting deliveries to their local mineworkers and industrial markets. This evolution was reinforced by the increasing standard of living in the new German Länder where historically the consumption of lignite by final consumers used to be significant, but it had become marginal by 1997. The contribution of renewable energy forms (biomass, wind, photovoltaics...) increased substantially with a major jump of 12% in 1997, followed by 3.3% growth in 1998; and their share was comparable with that of solid fuel in 1998.

INDUSTRY

Stable industrial energy consumption reduced industrial energy intensity by 23% since 1985...

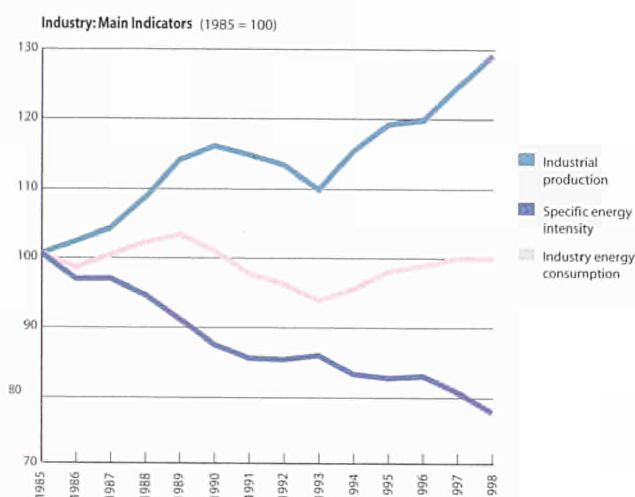
Masked by its apparent stability since 1985 **energy consumption in industry** has shown a contrasted evolution within three specific periods. Between 1985 and 1989 energy consumption increased slowly, the 12% increase of industrial production being compensated for by the energy savings generated by rational use of energy measures, dictated by high energy prices prevailing in 1985, and continued industrial restructuring. Between 1989 and 1993 energy consumption declined by 2.4% per year on average, influenced by saving measures and depressed industrial production that declined by about 4% in 4 years. Since 1994, energy consumption has grown at 1.1% per year on average while industrial production has increased by 2.9% on average. Consequently the specific energy intensity (or energy consumption per unit of industrial consumption) has improved by about 23% since 1985, of which 2.7% occurred in 1997 and 3.6% in 1998. The recent evolution shows that sustained industrial production favours additional intensity gains. This can be a consequence of new investment, higher capacity utilisation rates combined with the continued development of small to medium-sized enterprises dedicated to high value-added products (electronics, telecomms, bioengineering...). Analysis of the specific energy intensity ratio is complex: technological improvements have occurred, but at the same time as structural changes. The accelerated restructuring of European industry, which commenced after the second petroleum shock, was continued, inducing a further reduction of activity in energy-intensive sectors, such as iron and steel, chemicals and non-metallic minerals. In addition the last few years have been marked by the decline of manufacturing industries, including textiles, penalised by high labour costs. It is remarkable to observe that the improvement of energy efficiency accelerated in 1998 despite declining energy prices. This suggests strongly that energy efficiency has been effectively integrated into industrial management.



INDICES OF INDUSTRIAL PRODUCTION (1990=100) (1)

	1980	1985	1990	1995	1996	1997	1998	80/85	90/85	95/90	96/95	97/96	98/97	98/90
	Annual % Change													
Austria	75.9	82.3	100.0	112.3	112.9	119.8	123.8	1.6%	4.0%	2.3%	0.6%	6.1%	3.4%	2.7%
Belgium	81.5	84.9	100.0	101.0	101.9	106.6	112.2	0.8%	3.3%	0.2%	0.8%	4.7%	5.2%	1.4%
Denmark	76.4	92.5	100.0	115.8	117.7	123.9	126.6	3.9%	1.6%	3.0%	1.6%	5.3%	2.1%	3.0%
Finland	73.6	88.1	100.0	114.5	118.8	129.5	139.4	3.7%	2.6%	2.7%	3.8%	9.0%	7.6%	4.2%
France	89.3	87.1	100.0	99.7	99.6	103.6	108.2	-0.5%	2.8%	-0.1%	-0.1%	4.0%	4.5%	1.0%
Germany	82.5	85.5	100.0	95.9	96.5	99.9	104.4	0.7%	3.2%	-0.8%	0.6%	3.6%	4.5%	0.5%
Greece	90.9	97.2	100.0	97.4	98.4	100.1	108.4	1.4%	0.6%	-0.5%	1.0%	1.8%	8.3%	1.0%
Ireland	54.2	69.6	100.0	158.5	171.1	197.3	228.2	5.1%	7.5%	9.7%	8.0%	15.3%	15.7%	10.9%
Italy	87.5	84.8	100.0	107.9	105.8	109.9	111.0	-0.6%	3.3%	1.5%	-1.9%	3.8%	1.1%	1.3%
Luxembourg	69.9	84.9	100.0	101.3	100.8	107.7	112.4	4.0%	3.3%	0.3%	-0.4%	6.8%	4.4%	1.5%
Netherlands	85.3	90.8	100.0	108.3	112.4	115.5	116.7	1.3%	1.9%	1.6%	3.8%	2.7%	1.0%	1.9%
Portugal	62.5	73.9	100.0	99.7	105.0	107.9	113.5	3.4%	6.2%	-0.1%	5.3%	2.8%	5.2%	1.6%
Spain	82.9	86.0	100.0	103.3	102.2	109.3	115.2	0.7%	3.1%	0.6%	-1.0%	7.0%	5.3%	1.8%
Sweden	78.1	86.6	100.0	112.8	114.7	122.8	127.9	2.1%	2.9%	2.4%	1.7%	7.1%	4.1%	3.1%
United Kingdom	85.8	88.9	100.0	107.3	108.0	109.7	110.6	0.7%	2.4%	1.4%	0.6%	1.6%	0.9%	1.3%
EUROPEAN UNION	80.4	86.6	100.0	102.7	103.3	107.4	111.3	1.5%	2.9%	0.5%	0.5%	4.0%	3.7%	1.4%

(1) Excluding construction



The indices of industrial production reflect the 1993 recession with a slow-down of 3.2% in the European Union as a whole, followed by sustained recovery since then, particularly marked in 1997 (+4.0%) and 1998 (+3.7%). The period 1990-98 demonstrated an increase by about 1.4% per year on average, and 2.7% per year since 1995, but the trends vary significantly across the Member States: the highest growth was obtained by Ireland (+10.9% per year on average), followed by the Nordic countries (between 3% and 4.2%). Conversely industrial production growth was lower in the four main countries: Italy and the United Kingdom with 1.3% per year on average, France with 1.0% and Germany with 0.5% (which experienced the weakest growth due to reunification).

Gas and electricity together contributed 63% of total consumption in 1998 against 48% in 1985...

In terms of the **fuel mix**, significant changes have occurred since 1985 with the declining contribution of solids and oil products balanced by the increasing use of gas and electricity. Solids consumption declined both in the coke and steam coal markets. Consumption is increasingly concentrated in the iron and steel sector that now absorbs 67% of industrial solids consumption against 46% in 1985, despite the recent growth of electric arc furnaces. Steam coal consumption has decreased by 25% since 1985. Its use has been halved in the building material sector, where it competes with petroleum coke and industrial wastes, but has been multiplied by 6 in iron & steel that constituted its first market for direct injection in blast furnaces. Consequently coke use has decreased by about 42% since 1985, but has been stable since 1992. Lignite consumption, mainly located in Germany, has disappeared given mine closures. Oil consumption declined continuously, except during the recession period in the beginning of the 1990's, falling by 25% since 1985. The reduction of residual fuel oil, about 16 Mtoe since 1985, halving its consumption, exceeded the total reduction in industrial energy demand. This was partly compensated by an increase of petroleum coke consumption. Overall, other products, in particular LPG and gasoil, remained constant. Consequently, the share of heavy products (residual fuel oil and petroleum coke) has declined from 64% in 1985 to 57% in 1998. Gas and electricity, with an average growth rate of about 2.3% and 1.6% respectively per annum since 1985, largely dominated the industrial energy market. Since 1985, they have both increased their market share to reach 34% for natural gas and 29% for electricity. Their progression is partly related to the reduced share of

energy-intensive industries (iron & steel, chemicals, building materials...); this share declined from 56% in 1985 to 48% in 1998. In addition, excluding the climatic effect, gas consumption benefited from the significant improvements that occurred in all gas technologies (gas turbines, gas engines...) over the last few years, resulting in higher efficiencies and reduced environmental impacts. Electricity also benefited from the development of a large range of new electro-technologies ever more widely utilised in industrial applications. Growth of gas and electricity use will be reinforced in the near future by the progressive liberalisation of these two energy markets which will reinforce their competitiveness. Overall, the resulting share of each fuel changed over the period 1985-1998 as follows: solids from 24% to 13%, oil from 21% to 16%, gas from 25% to 34% and electricity from 23% to 29%.

Improvements in energy intensity and sustained growth of industrial production are linked...

Improvements in energy intensity on a Member State basis show large variations depending upon local situations: structure of

industrial production, objectives of energy policy, energy prices... Ireland's industrial energy intensity dropped by about 58% in the 1990-98 period at the same time as it saw the fastest growth in industrial production, more than a doubling, as a result of diversification towards high added-value industries. Sweden, Finland and Denmark, which experienced the most sustained increase in industrial production after Ireland with growth since 1990 of between 27% and 40%, are also amongst the best performers in terms of energy efficiency with improvements of between 11% and 17% over this period. This confirms the close relationship between improvements in energy intensity and sustained industrial production growth.

Major improvements were always associated with high economic growth that facilitated industrial diversification, revamping of processes, implementation of energy savings programmes... The performance of the five major Member States (France, Germany, Italy, Spain and the United Kingdom) was more mixed. Between 1985 and 1990, all of them registered a growth of industrial production of about 11%-18%

EUROPEAN UNION : INDUSTRY - FINAL ENERGY CONSUMPTION

Mtoe	1985	1988	1990	1996	1997	1998	90/85	96/90	97/96	98/97	98/90
Annual % Change											
Total consumption	264.1	268.5	265.2	259.6	262.6	262.5	0.1%	-0.4%	1.2%	-0.1%	-0.1%
Iron & Steel	61.0	58.0	55.7	52.1	54.7	52.8	-1.8%	-1.1%	5.2%	-3.6%	-0.7%
Chemicals	50.4	51.8	50.3	42.8	42.4	40.7	0.0%	-2.6%	-1.0%	-3.9%	-2.6%
Building Materials	35.0	35.5	35.8	32.5	32.1	31.4	0.4%	-1.6%	-1.2%	-2.2%	-1.6%
Other	117.7	123.2	123.4	132.2	133.4	137.5	1.0%	1.1%	0.9%	3.1%	1.4%
Solids	63.5	57.6	53.5	36.3	37.7	35.5	-3.4%	-6.2%	3.7%	-5.7%	-5.0%
Iron & Steel	29.1	26.2	25.7	22.8	24.9	23.8	-2.5%	-2.0%	9.2%	-4.4%	-1.0%
Chemicals	7.8	7.7	6.3	2.6	2.5	1.6	-4.4%	-13.9%	-1.4%	-35.3%	-15.5%
Building Materials	12.9	10.9	10.3	6.4	5.9	5.2	-4.4%	-7.6%	-8.4%	-12.4%	-8.3%
Other	13.6	12.8	11.2	4.6	4.4	5.0	-3.7%	-13.9%	-3.7%	13.3%	-9.7%
Oil	56.7	55.5	48.9	45.3	44.7	42.6	-2.9%	-1.3%	-1.3%	-4.6%	-1.7%
Iron & Steel	4.0	4.2	3.7	3.3	3.4	3.2	-1.4%	-1.8%	1.7%	-5.8%	-1.9%
Chemicals	12.1	11.9	10.3	6.7	6.8	5.3	-3.1%	-7.0%	1.9%	-22.8%	-8.1%
Building Materials	8.8	9.4	9.6	8.3	8.5	8.1	1.7%	-2.5%	3.4%	-5.5%	-2.1%
Other	31.7	29.9	25.2	27.0	26.0	26.1	-4.5%	1.2%	-3.9%	0.6%	0.4%
Gas	66.7	72.2	77.2	88.2	87.1	89.2	3.0%	2.3%	-1.3%	2.5%	1.8%
Iron & Steel	19.2	19.0	18.0	17.5	17.6	17.0	-1.3%	-0.5%	0.6%	-3.6%	-0.8%
Chemicals	15.0	15.7	16.8	18.7	17.8	18.3	2.3%	1.8%	-4.7%	2.6%	1.1%
Building Materials	8.7	10.0	10.8	12.3	12.1	12.6	4.3%	2.3%	-1.5%	3.6%	2.0%
Other	23.8	27.5	31.6	39.8	39.5	41.4	5.8%	3.9%	-0.6%	4.7%	3.4%
Electricity	61.9	67.3	69.3	71.7	74.3	76.0	2.3%	0.6%	3.5%	2.4%	1.2%
Iron & Steel	8.5	8.5	8.2	8.5	8.9	8.9	-0.8%	0.5%	5.0%	-0.3%	0.9%
Chemicals	14.6	15.6	16.1	14.2	14.6	14.9	1.9%	-2.1%	3.0%	2.1%	-0.9%
Building Materials	4.3	4.9	5.0	5.4	5.5	5.5	3.0%	1.3%	0.9%	1.3%	1.3%
Other	34.4	38.3	40.0	43.7	45.3	46.7	3.0%	1.5%	3.8%	3.1%	2.0%
Heat	3.3	3.7	3.8	4.1	4.2	3.9	3.1%	1.1%	2.1%	-6.6%	0.2%
Industrial Production Index (1990=100)	86.6	93.6	100.0	103.3	107.4	111.3	2.9%	0.5%	4.0%	3.7%	1.4%
Industrial Energy Intensity (1990=100)	115.0	108.2	100.0	94.8	92.2	88.9	-2.8%	-0.9%	-2.7%	-3.6%	-1.5%



INDUSTRIAL ENERGY CONSUMPTION

	1985	1988	1990	1996	1997	1998	90/85	96/90	97/96	98/97	98/90
	Annual % Change										
Austria											
Total Consumption (Mtoe)	5.8	5.7	5.8	6.0	7.1	7.0	-0.2%	0.7%	17.0%	-0.9%	2.4%
Share in European Union (%)	2.2%	2.1%	2.2%	2.3%	2.7%	2.7%	-0.3%	1.1%	15.6%	-0.8%	2.6%
Specific Industrial Energy Intensity (1990=100)	123.0	112.9	100.0	92.6	102.1	97.9	-4.1%	-1.3%	10.3%	-4.1%	-0.3%
Belgium											
Total Consumption (Mtoe)	10.6	11.1	11.5	11.5	12.5	13.1	1.5%	0.1%	8.2%	4.5%	1.6%
Share in European Union (%)	4.0%	4.1%	4.3%	4.4%	4.8%	5.0%	1.4%	0.5%	7.0%	4.6%	1.8%
Specific Industrial Energy Intensity (1990=100)	109.4	105.0	100.0	98.9	102.3	101.6	-1.8%	-0.2%	3.4%	-0.6%	0.2%
Denmark											
Total Consumption (Mtoe)	2.7	2.7	2.9	3.0	3.0	3.0	1.1%	0.9%	-1.1%	0.7%	0.6%
Share in European Union (%)	1.0%	1.0%	1.1%	1.2%	1.1%	1.2%	1.0%	1.3%	-2.2%	0.8%	0.8%
Specific Industrial Energy Intensity (1990=100)	102.4	98.1	100.0	89.7	84.2	83.1	-0.5%	-1.8%	-6.1%	-1.4%	-2.3%
Finland											
Total Consumption (Mtoe)	8.0	8.4	8.8	10.0	10.6	10.9	1.9%	2.1%	6.1%	3.0%	2.7%
Share in European Union (%)	3.0%	3.1%	3.3%	3.8%	4.0%	4.2%	1.8%	2.4%	4.9%	3.1%	2.8%
Specific Industrial Energy Intensity (1990=100)	103.3	97.5	100.0	95.1	92.6	88.6	-0.6%	-0.8%	-2.6%	-4.3%	-1.5%
France											
Total Consumption (Mtoe)	37.8	36.8	37.0	37.5	37.7	37.9	-0.4%	0.2%	0.5%	0.7%	0.3%
Share in European Union (%)	14.3%	13.7%	14.0%	14.4%	14.3%	14.5%	-0.5%	0.6%	-0.7%	0.8%	0.4%
Specific Industrial Energy Intensity (1990=100)	117.3	104.7	100.0	101.6	98.1	94.6	-3.1%	0.3%	-3.4%	-3.6%	-0.7%
Germany											
Total Consumption (Mtoe)	79.8	77.6	71.5	60.6	58.3	57.4	-2.2%	-2.7%	-3.8%	-1.5%	-2.7%
Share in European Union (%)	30.2%	28.9%	27.0%	23.4%	22.2%	21.9%	-2.2%	-2.4%	-4.9%	-1.5%	-2.6%
Specific Industrial Energy Intensity (1990=100)	130.4	120.0	100.0	87.9	81.6	76.9	-5.2%	-2.1%	-7.1%	-5.8%	-3.2%
Greece											
Total Consumption (Mtoe)	3.7	4.1	3.9	4.3	4.3	4.4	1.0%	1.5%	1.0%	1.9%	1.5%
Share in European Union (%)	1.4%	1.5%	1.5%	1.7%	1.7%	1.7%	1.0%	1.8%	-0.2%	1.9%	1.6%
Specific Industrial Energy Intensity (1990=100)	97.6	102.6	100.0	111.0	110.2	103.6	0.5%	1.8%	-0.8%	-5.9%	0.4%
Ireland											
Total Consumption (Mtoe)	1.8	1.8	2.0	1.8	1.9	1.9	2.2%	-1.6%	3.3%	3.1%	-0.4%
Share in European Union (%)	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	2.1%	-1.3%	2.1%	3.1%	-0.3%
Specific Industrial Energy Intensity (1990=100)	129.0	107.8	100.0	53.0	47.4	42.3	-5.0%	-10.0%	-10.4%	-10.9%	-10.2%
Italy											
Total Consumption (Mtoe)	31.5	35.1	36.9	36.5	37.4	36.6	3.2%	-0.2%	2.5%	-2.1%	-0.1%
Share in European Union (%)	11.9%	13.1%	13.9%	14.1%	14.3%	14.0%	3.1%	0.2%	1.3%	-2.1%	0.0%
Specific Industrial Energy Intensity (1990=100)	100.6	98.2	100.0	93.5	92.3	89.4	-0.1%	-1.1%	-1.3%	-3.1%	-1.4%
Luxembourg											
Total Consumption (Mtoe)	1.8	1.6	1.7	1.1	1.0	0.9	-0.6%	-6.5%	-10.3%	-16.3%	-8.3%
Share in European Union (%)	0.7%	0.6%	0.6%	0.4%	0.4%	0.3%	-0.7%	-6.2%	-11.4%	-16.3%	-8.2%
Specific Industrial Energy Intensity (1990=100)	121.5	101.7	100.0	66.3	55.7	44.6	-3.8%	-6.6%	-16.0%	-19.9%	-9.6%
Netherlands											
Total Consumption (Mtoe)	13.7	13.1	13.2	13.2	13.2	13.1	-0.7%	-0.1%	0.1%	-0.7%	-0.1%
Share in European Union (%)	5.2%	4.9%	5.0%	5.1%	5.0%	5.0%	-0.8%	0.3%	-1.0%	-0.7%	0.0%
Specific Industrial Energy Intensity (1990=100)	114.2	105.5	100.0	88.6	86.4	84.9	-2.6%	-2.0%	-2.5%	-1.7%	-2.0%
Portugal											
Total Consumption (Mtoe)	3.7	3.8	4.1	4.7	5.3	5.5	2.3%	2.2%	12.3%	3.9%	3.6%
Share in European Union (%)	1.4%	1.4%	1.6%	1.8%	2.0%	2.1%	2.3%	2.6%	11.0%	3.9%	3.8%
Specific Industrial Energy Intensity (1990=100)	120.5	107.6	100.0	108.8	118.8	117.3	-3.7%	1.4%	9.2%	-1.3%	2.0%
Spain											
Total Consumption (Mtoe)	18.8	19.4	19.8	19.7	21.6	22.0	1.0%	0.0%	9.6%	2.0%	1.4%
Share in European Union (%)	7.1%	7.2%	7.4%	7.6%	8.2%	8.4%	0.9%	0.3%	8.3%	2.0%	1.5%
Specific Industrial Energy Intensity (1990=100)	110.9	102.9	100.0	97.6	100.0	96.8	-2.0%	-0.4%	2.5%	-3.2%	-0.4%
Sweden											
Total Consumption (Mtoe)	11.9	11.8	11.8	12.4	12.6	12.7	-0.1%	0.8%	1.9%	0.3%	0.9%
Share in European Union (%)	4.5%	4.4%	4.5%	4.8%	4.8%	4.8%	-0.1%	1.2%	0.7%	0.4%	1.0%
Specific Industrial Energy Intensity (1990=100)	115.9	110.8	100.0	91.4	87.1	83.9	-2.9%	-1.5%	-4.8%	-3.7%	-2.2%
United Kingdom											
Total Consumption (Mtoe)	32.4	35.3	34.2	37.1	36.1	36.0	1.1%	1.3%	-2.7%	-0.3%	0.6%
Share in European Union (%)	12.3%	13.1%	12.9%	14.3%	13.7%	13.7%	1.0%	1.7%	-3.8%	-0.3%	0.8%
Specific Industrial Energy Intensity (1990=100)	106.4	105.5	100.0	100.3	96.1	95.0	-1.2%	0.1%	-4.2%	-1.2%	-0.6%
European Union											
Total Consumption (Mtoe)	264.14	268.54	265.24	259.58	262.64	262.50	0.1%	-0.4%	1.2%	-0.1%	-0.1%
Specific Industrial Energy Intensity (1990=100)	115.0	108.2	100.0	94.8	92.2	88.9	-2.8%	-0.9%	-2.7%	-3.6%	-1.5%

ENERGY PRICES TO INDUSTRIAL CONSUMERS IN CONSTANT 1990 EUR PER TOE (1)(2)

		1985	1988	1990	1995	1996	1997	1998	90/85	96/90	97/96	98/97	98/90
		Annual % Change											
Austria	Steam Coal	154.6	97.0	91.7	72.4	67.4	66.9	67.1	-9.9%	-5.0%	-0.7%	0.2%	-3.8%
	Heavy fuel oil 3.5% S	310.5	109.2	98.7	84.1	83.4	79.0	72.8	-20.5%	-2.8%	-5.3%	-7.9%	-3.7%
	Natural gas	269.3	133.2	122.7	102.4	105.5	114.8	108.5	-14.5%	-2.5%	8.7%	-5.5%	-1.5%
	Electricity	726.2	699.4	598.2	561.2	579.5	656.3	639.9	-3.8%	-0.5%	13.2%	-2.5%	0.8%
Belgium	Steam Coal	120.6	72.8	62.4	na	na	na	na	-12.3%	na	na	na	na
	Heavy fuel oil 3.5% S	270.5	85.1	102.6	98.7	105.4	106.3	87.9	-17.6%	0.4%	0.9%	-17.4%	-1.9%
	Natural gas	273.6	106.0	113.7	87.2	84.1	94.6	87.0	-16.1%	-4.9%	12.5%	-8.1%	-3.3%
	Electricity	775.2	582.4	584.7	487.2	482.1	461.6	452.2	-5.5%	-3.2%	-4.3%	-2.0%	-3.2%
Denmark	Steam Coal	191.4	127.3	134.9	78.5	na	na	na	-6.7%	na	na	na	na
	Heavy fuel oil 3.5% S	286.2	111.1	na	na	na	na	na	na	na	na	na	na
	Electricity	875.7	533.2	569.8	521.1	556.2	545.1	577.5	-8.2%	-0.4%	-2.0%	5.9%	0.2%
Finland	Steam Coal	128.7	75.5	78.7	107.5	103.4	128.0	127.7	-9.4%	4.7%	23.8%	-0.3%	6.2%
	Heavy fuel oil 3.5% S	345.5	132.1	144.9	na	na	na	na	-15.9%	na	na	na	na
	Natural gas	270.8	97.9	97.3	117.2	124.9	134.6	131.9	-18.5%	4.2%	7.8%	-2.0%	3.9%
	Electricity	765.6	621.7	578.4	561.9	584.0	564.7	555.2	-5.5%	0.2%	-3.3%	-1.7%	-0.5%
France	Steam Coal	144.6	111.2	106.1	97.8	95.9	95.0	96.4	-6.0%	-1.7%	-0.8%	1.5%	-1.2%
	Heavy fuel oil 3.5% S	288.2	98.7	110.2	96.3	100.1	98.4	79.6	-17.5%	-1.6%	-1.7%	-19.1%	-4.0%
	Natural gas	271.1	123.2	122.2	104.2	105.2	111.9	106.9	-14.7%	-2.5%	6.4%	-4.5%	-1.7%
	Electricity	599.3	517.2	516.5	452.5	428.1	415.3	398.7	-2.9%	-3.1%	-3.0%	-4.0%	-3.2%
Germany	Steam Coal (3)	209.0	211.2	202.8	189.7	68.0	67.5	na	-0.6%	-16.6%	-0.8%	na	na
	Heavy fuel oil 3.5% S	284.5	96.1	115.0	na	na	na	na	-16.6%	na	na	na	na
	Natural gas	284.0	127.8	147.7	123.8	124.7	133.0	na	-12.3%	-2.8%	6.6%	na	na
	Electricity	833.2	880.0	835.3	694.2	619.1	584.7	551.0	0.0%	-4.9%	-5.5%	-5.8%	-5.1%
Greece	Heavy fuel oil 3.5% S	284.9	169.2	129.3	na	na	na	na	-14.6%	na	na	na	na
	Electricity	775.4	657.6	593.3	431.0	396.0	388.1	368.5	-5.2%	-6.5%	-2.0%	-5.1%	-5.8%
Ireland	Heavy fuel oil 3.5% S	328.2	130.9	129.9	129.7	226.2	148.7	127.3	-16.9%	9.7%	-34.3%	-14.4%	-0.3%
	Natural gas	389.0	280.4	260.8	228.5	224.8	221.5	216.7	-7.7%	-2.4%	-1.4%	-2.2%	-1.9%
	Electricity	965.7	700.3	619.5	547.3	543.5	542.1	530.4	-8.5%	-2.2%	-0.3%	-2.2%	-1.9%
Italy	Steam Coal	131.9	74.6	65.8	68.5	60.7	63.0	54.5	-13.0%	-1.3%	3.8%	-13.6%	-2.3%
	Heavy fuel oil 3.5% S	303.0	88.3	150.9	149.0	149.4	143.3	126.5	-13.0%	-0.2%	-4.1%	-11.7%	-2.2%
	Natural gas	271.7	86.9	123.7	145.6	151.1	158.4	141.7	-14.6%	3.4%	4.8%	-10.6%	1.7%
	Electricity	1183.0	863.3	893.9	903.5	900.6	903.6	911.0	-5.4%	0.1%	0.3%	0.8%	0.2%
Luxembourg	Heavy fuel oil 3.5% S	287.6	93.4	106.7	na	na	na	na	-18.0%	na	na	na	na
	Electricity	739.6	708.0	na	na	na	na	na	na	na	na	na	na
Netherlands	Steam Coal	129.1	65.0	70.6	na	na	na	na	-11.4%	na	na	na	na
	Heavy fuel oil 3.5% S	275.3	119.8	147.5	119.1	120.0	na	na	-11.7%	-3.4%	na	na	na
	Natural gas	234.9	97.9	98.6	89.6	87.9	93.1	86.1	-15.9%	-1.9%	5.9%	-7.6%	-1.7%
	Electricity	690.4	451.0	479.3	522.5	515.2	513.3	507.4	-7.0%	1.2%	-0.4%	-1.2%	0.7%
Portugal	Heavy fuel oil 3.5% S	294.9	163.2	147.8	105.5	110.3	114.4	97.9	-12.9%	-4.8%	3.7%	-14.5%	-5.0%
	Electricity	1050.7	1115.4	1059.7	830.9	762.9	740.8	712.0	0.2%	-5.3%	-2.9%	-3.9%	-4.8%
Spain	Heavy fuel oil 3.5% S	365.8	130.8	119.9	139.4	152.2	151.9	112.7	-20.0%	4.1%	-0.2%	-25.8%	-0.8%
	Natural gas	359.5	155.7	129.0	119.2	124.1	129.8	115.0	-18.5%	-0.6%	4.6%	-11.4%	-1.4%
	Electricity	969.3	1015.6	892.7	705.6	681.0	624.6	571.1	-1.6%	-4.4%	-8.3%	-8.6%	-5.4%
Sweden	Steam Coal	145.6	107.6	98.2	na	na	na	na	-7.6%	na	na	na	na
	Electricity	503.6	465.5	456.2	354.3	377.8	325.8	na	-2.0%	-3.1%	-13.8%	na	na
United Kingdom	Steam Coal	151.3	113.2	99.5	70.2	65.1	61.4	60.6	-8.1%	-6.8%	-5.8%	-1.2%	-6.0%
	Heavy fuel oil 3.5% S	293.4	109.6	108.1	107.2	114.9	106.3	88.0	-18.1%	1.0%	-7.5%	-17.2%	-2.5%
	Natural gas	212.3	152.2	124.9	95.5	68.2	69.8	71.2	-10.1%	-9.6%	2.3%	2.0%	-6.8%
	Electricity	777.3	711.0	648.1	597.9	563.5	515.0	494.2	-3.6%	-2.3%	-8.6%	-4.0%	-3.3%
European Union	Steam Coal (3)	158.2	133.8	123.8	115.4	73.7	73.1	72.5	-4.8%	-8.3%	-0.9%	-0.8%	-6.5%
	Heavy fuel oil 3.5% S	304.6	108.6	123.2	120.4	127.2	122.7	102.0	-16.6%	0.5%	-3.6%	-16.9%	-2.3%
	Natural gas	262.6	121.0	127.6	116.2	112.6	118.9	111.2	-13.4%	-2.1%	5.6%	-6.5%	-1.7%
	Electricity	739.1	669.2	642.1	567.8	537.5	515.3	497.5	-2.8%	-2.9%	-4.1%	-3.5%	-3.1%

(1) Excluding Refundable VAT

(2) Estimates marked in bold

(3) marked by the suppression of the kohlpfennig in Germany in 1996



accompanied by a reduction in energy intensity ranging from 1% in Italy to 23% in Germany. Since 1990, the evolution has been even more varied. The changes in industrial production ranged from a limited 4% increase in Germany, deeply influenced between 1990 and 1996 by the industrial restructuring in the new Länder, to an increase of about 10% in France, Italy, and the United Kingdom and of 15% in Spain. At the same time, the range for energy intensity varied from -23% in Germany to -3% in Spain. If we exclude Germany, where energy intensity gains are mainly due to the restructuring and the closing of old industries in the new Länder, intensity improvements (of about 3% to 10%) were limited in other Member States and occurred principally in the last two years except in Spain. The share of total industrial energy demand of these five Member States declined slowly, but still represented just fewer than three-quarters of the European Union's total consumption. The spectacular improvement which occurred in Luxembourg was largely the result of the conversion of the steel industry to electric arc furnaces. Since 1990, energy intensity has increased in only three countries: Belgium (+0.2% per year on average), Greece (+0.4%) and Portugal (+2.0%).

The improvement of energy intensity at the European level (-1.5% per year on average since 1990) has been driven by the gains observed in Germany (-3.2%), Denmark (-2.3%), Sweden (-2.2%) and Netherlands (-2.0%). This corresponds to those countries very active in implementing more sustainable development and where specific attention, often through policy measures, has been given to the reduction of industrial energy consumption. This suggests that a co-ordinated policy at the European level could help other Member States to continue to improve the energy performance of industry even if major progress has already occurred since the early 1980's.

Throughout the European Union, the energy price decline accelerated in 1998...

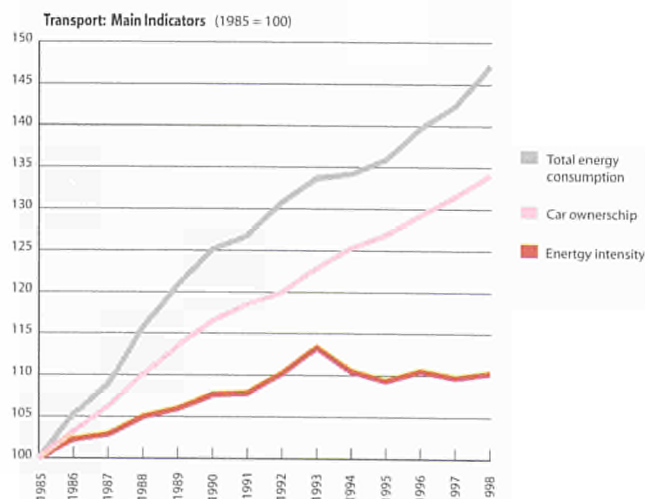
The average **prices of energy for industrial consumers** (1990 EUR per toe) over the 1990-1998 period show an average yearly decrease of 6.5% for steam coal, largely influenced by the ending of the kohlpfennig in Germany in 1996; 2.3% for heavy fuel oil; 1.7% for natural gas; and 3.1% for electricity based on the weighted average at the European level. This evolution was deeply influenced by the reduction of prices observed in 1998 for heavy fuel oil (-16.9%) and natural gas (-6.5%) resulting from depressed crude oil prices on the international market. Despite its increasing competitiveness versus natural gas, heavy fuel oil was continuing to lose market share vis-à-vis its main competitor. The sustained and continuous decline of electricity prices also favoured electricity uses, increasing the competitiveness of many electro-technologies. Between Member States, the prices for the different

energy sources show important variations in both value and trends depending on supply conditions, market mechanisms and taxation. The ranges between the extreme prices remained considerable: from 73 EUR/toe (Austria) to 127 EUR/toe (Ireland) for heavy fuel oil; from 71 EUR/toe (the United Kingdom) to 216 ECU/toe (Ireland) for natural gas; and from 368 EUR/toe (Greece) to 911 EUR/toe (Italy) for electricity. It must be stressed that liberalisation of the electricity and gas markets in the United Kingdom resulted in impressive price reductions both for gas and electricity: 25% for gas in only three years and 17% for electricity. In the same way, progressive liberalisation of gas and electricity at the EU level will certainly increase their competitiveness and consequently their market shares in the near future.

TRANSPORT

Transport sector responsible for 78% of final energy demand increase since 1985, but only 54% since 1990...

Energy consumption in transport grew between 1985 and 1998 at an average annual rate of 3.0% but, in the period 1990-98, the growth remained limited to 2.1% per year despite jumps of 2.8% in 1996 and 3.4% in 1998. This must be compared to the 4.6% average growth registered during the second part of the 1980's. In 1998, total energy demand in the transport sector (excluding marine bunkers) reached 299 Mtoe or 31.6% of total final energy demand compared with only 24.6% in 1985. These trends underline the predominant contribution of the transport sector in the growth of total EU final energy demand. Between 1985 and 1998 the increase of energy consumption for transport, about 96 Mtoe, represented



EUROPEAN UNION : TRANSPORT - FINAL ENERGY CONSUMPTION

Mtoe	1985	1988	1990	1996	1997	1998	90/85	96/90	97/96	98/97	98/90
Annual % Change											
Total consumption	202.80	234.74	253.85	283.38	288.77	298.64	4.6%	1.9%	1.9%	3.4%	2.1%
Solids	0.18	0.04	0.03	0.01	0.01	0.00	-28.8%	-12.3%	-55.4%	-69.9%	-29.5%
Oil	199.00	230.85	249.60	278.25	283.58	293.53	4.6%	1.8%	1.9%	3.5%	2.0%
of which:											
Road	170.18	197.26	212.26	234.29	238.28	245.65	4.5%	1.7%	1.7%	3.1%	1.8%
Motor Gasoline	105.38	116.75	121.79	122.54	122.02	122.63	2.9%	0.1%	-0.4%	0.5%	0.1%
Diesel Oil	62.48	77.96	87.78	108.93	113.36	120.11	7.0%	3.7%	4.1%	5.9%	4.0%
Air	21.09	25.43	27.81	34.37	36.06	38.91	5.7%	3.6%	4.9%	7.9%	4.3%
Jet Fuel	20.98	25.29	27.69	34.25	35.96	38.79	5.7%	3.6%	5.0%	7.9%	4.3%
Gas	0.24	0.22	0.21	0.29	0.30	0.31	-2.9%	5.7%	3.1%	4.8%	5.2%
Electricity	3.39	3.63	4.00	4.83	4.89	4.79	3.4%	3.2%	1.1%	-1.9%	-4.0%
Transport Energy Intensity (toe/1990 MEUR)	44.37	46.59	47.76	49.05	48.69	48.95	1.5%	0.4%	-0.7%	0.5%	-62.4%
Transport Energy Intensity (1990=100)	92.91	97.54	100.00	102.69	101.94	102.48	1.5%	0.4%	-0.7%	0.5%	0.3%
Nb. of Vehicles (millions)	135.23	146.55	157.32	184.07	187.37	188.37	3.1%	2.7%	1.8%	0.5%	2.3%
Specific Consumption in Road Traffic (toe/vehicle)	1.26	1.35	1.35	1.27	1.27	1.30	1.4%	-1.0%	-0.1%	2.5%	-0.4%

78% of the total increase in final energy demand. But, between 1990 and 1997, transport contributed only 54% of the total increase of final energy demand, the rest being absorbed by the tertiary-domestic sector. It is particularly difficult to interpret the recent trends in the transport sector. Since 1993 energy demand has grown more slowly than before and the energy intensity, measured against the GDP, has diminished a little.

Passenger traffic has grown more rapidly than economic growth since 1990 driven by leisure-time travel...

The volume of passenger traffic in the European Union has grown more rapidly than economic growth since the beginning of the 80's. During the 1980's passenger traffic increased on average by 3.1% per year against 2.3% GDP growth. Between 1990 and 1998 this growth has been reduced to 1.9% per year on average compared with economic growth of 1.6%. This evolution has been relatively uniform across most of the European countries. Southern countries (Portugal, Greece, Italy and Spain) showed above-average growth in passenger traffic volume; while in Germany, Austria and United Kingdom growth was significantly below average. The rise in overall European passenger traffic volume reached 15% since 1990 for all transportation modes considered together. But the relative proportion of rail (6.1% in 1997) and bus traffic (8.7%) has declined continuously in favour of air traffic (5.1%) while passenger cars stabilised at 79.1%. The volume of work-related traffic (journeys between home and workplace, university or school as well as business trips) has remained very constant. By contrast, leisure-time travel (attending leisure-time events, weekend excursions, holiday trips...) has risen significantly in just a few years.

Globally passenger transport reached 4,772 billion passenger-kilometres in 1998, or 12,730 passenger-kilometres per person, equivalent to 35 passenger-kilometres per person per day.

Although improvements in the fuel efficiency of vehicles have been made in recent years, this has been more than outweighed by the fact that Europeans now have more and larger cars, with bigger engines. The growth of urban residential areas, with their associated services (out-of-town shopping centres are a good example), has encouraged more frequent and longer trips by car. This has led to the decline of less oil-dependent, less polluting modes of transport, such as buses, trains and trams. The overall effect on the quality of life in urban areas has been negative. Many European cities now recognise the need to revive their urban transport systems to provide effective alternatives to private car use.

Goods transport demand accelerated since 1990 as a consequence of just-in-time industrial organisation...

Goods transport evolved differently from passenger traffic. During the 1980's, goods traffic increased on average by 1.9% per year with a major expansion of road traffic that reached 4.0% per year on average. Since 1990, as a consequence of just-in-time industrial organisation to reduce stocks and working capital, goods transport has increased by 2.9% per year on average with an acceleration in 1997 (+5.0%) and 1998 (+4.0%). Road transport grew by 35% between 1990 and 1998 followed by sea (intra EU) with a 27% increase and inland waterways with a 12% increase. At the same time the contribution of rail declined by 6%. In 1998, the

respective shares by mode were 43.7% for road transport (40.7% in 1990), 40.6% for sea (40.1%), 8.6% for rail (11.1%) and 4.2% for inland waterways (4.7%). In 1998, goods transport demand was 2,870 billion ton-kilometres or 7,655 ton-kilometres per person corresponding to 21 ton-kilometres per person per day.

Increasing energy and environmental impacts of road transport expected in the near future...

Within the transport sector, road transport is by far the largest energy user, accounting for about 82% of total energy demand in 1998 against 84% in 1985. The energy and environmental impacts of road transport are increasing because the expected growth in traffic volumes is likely to more than offset the expected energy efficiency improvements in vehicle performance. Also, the rate of car ownership is steadily increasing with the number of cars in the European Union having risen by about 3.3% per year on average since 1980, but by only 1.8% since 1990. In addition, larger cars (over 1500cc) have increased their share of new registrations at the expense of smaller cars. In 1998, marked differences in car ownership rates still existed between countries: Greece had the lowest ownership with 254 passenger cars per 1000 inhabitants and Luxembourg the highest with 572. The European average reached 451 cars per 1000 inhabitants, a 14.8% increase since 1990. Variations in income levels and fuel prices, and different tax regimes for the purchase, ownership and use of cars, are part of the explanation for these differences. The goods vehicle fleet was increasing still more rapidly: about 50% during the 1980's and about 23% between 1990 and 1998, with substantial differences between member States.

Equal diesel oil and gasoline shares in the total road fuel consumption in 1998...

The share of diesel in total road fuel consumption has increased continuously since 1980, growing from 36.7% to reach 48.9% in 1998 and was then in position to become the more consumed fuel. This evolution is the result of two main phenomena: the increasing volume of goods transported by road and the progressive dieselisation of the car fleet. As mentioned earlier, the number of goods vehicles, consuming most of the diesel increased by 23% since 1990. In addition, although the utilisation rate (ton-kilometres per vehicle) of the goods vehicle fleet remained stable during the 1980's, it has increased by 11% since 1990. On the other hand, the share of diesel cars increased regularly to reach 16.5% in the European Union as a whole in 1995 with a wide spread between countries: from only 1% in Greece to 34% in Belgium. This share continued to increase significantly in the last three years.

Demand for air transport heavily influenced by the liberalisation of air markets...

The demand for aviation fuel grew on average by 4.8% per annum since 1985, and by 7.8% in 1998, as a result of rising real incomes leading to increased leisure air travel, combined with the recent liberalisation of air markets that induced spectacular reductions in fares. This trend was initiated by low-cost airlines and followed by the major companies. Since the market opened, output has risen significantly in terms of passengers and passenger-kilometres (+53% since 1990!). Airline income has increased, the number of domestic and cross-border routes operated has expanded by more than 11% in 5 years, and the number of flights has grown by around 30% during the same period. The market shares of the traditional carriers have decreased, particularly in their domestic markets, from 75% to 62%, and the number and proportion of routes experiencing effective competition has expanded.

Transport energy intensity stabilised since 1994...

Transport energy intensity grew continuously by 1.5% between 1985 and 1993 but has declined since then by 0.6% per year on average. In fact it declined by 2.6% in 1994 and has remained stable since then. This stabilisation constitutes a significant modification of the historical trend and needs further explanation. Unfortunately, without statistical disaggregation between private and freight transport, it is not currently possible to analyse in detail the determinants of this new trend. Many factors already described above have contributed to this evolution: the slow-down of the growth of passenger traffic associated with a stabilisation of the road contribution; technological improvements in the car fleet; the accelerated contribution of road vehicles for goods transportation compensated by better utilisation of these goods vehicles; and also technological improvement to increase efficiencies and reduce emissions. This short-term evolution was confirmed in ten Member States, with reductions ranging from 1% in Greece to 10% in Austria since 1993. Two countries have a stable intensity: Netherlands and Luxembourg; and only Italy, Portugal and Spain still show increases in transport energy intensity.

Prices for transport fuel largely determined by the level of taxes...

Transport fuel prices have increased regularly between 1990 and 1997 by a yearly average of about 1%. This growth accelerated in 1996 and 1997 as a consequence of higher crude oil prices, even though the share of raw materials in final prices declined continuously given tax increases. For this reason depressed crude oil prices in 1998 had a limited impact on final prices of gasoline and

ENERGY PRICES OF TRANSPORT FUELS IN CONSTANT 1990 EUR PER TOE (1)

	1985	1988	1990	1995	1996	1997	1998	90/85	96/90	97/96	98/97	98/90
	Annual % Change											
Austria												
Premium leaded gasoline	1258.7	900.6	978.6	na	na	na	na	-4.9%	na	na	na	na
Premium Unleaded gasoline (95)	na	870.4	940.6	915.5	909.8	929.9	869.1	na	-0.6%	2.2%	-6.5%	-1.0%
Diesel	831.1	584.8	600.9	509.5	533.4	543.3	494.8	-6.3%	-2.0%	1.8%	-8.9%	-2.4%
Belgium												
Premium leaded gasoline	1278.8	899.2	1038.4	1025.3	1102.9	1168.0	1098.2	-4.1%	1.0%	5.9%	-6.0%	0.7%
Premium Unleaded gasoline (95)	na	na	975.1	923.4	1016.5	1079.3	1009.5	na	0.7%	6.2%	-6.5%	0.4%
Diesel	637.6	387.0	499.1	502.5	531.2	532.7	482.1	-4.8%	1.0%	0.3%	-9.5%	-0.4%
Denmark												
Premium leaded gasoline	1298.8	1226.0	1096.9	964.7	na	na	na	-3.3%	na	na	na	na
Premium Unleaded gasoline (98)	na	na	1022.0	959.8	1023.9	1032.4	979.6	na	0.0%	0.8%	-5.1%	-0.5%
Diesel	522.6	277.6	289.4	450.9	476.6	518.1	539.1	-11.2%	8.7%	8.7%	4.0%	8.1%
Finland												
Premium leaded gasoline	1390.2	1070.6	1179.1	na	na	na	na	-3.2%	na	na	na	na
Premium Unleaded gasoline (95)	na	na	1087.8	1225.9	1374.0	1365.6	1356.6	na	4.0%	-0.6%	-0.7%	2.8%
Diesel	881.8	793.4	921.4	637.4	675.5	676.7	667.2	0.9%	-5.0%	0.2%	-1.4%	-4.0%
France												
Premium leaded gasoline	1291.6	1023.7	1059.7	1042.8	1080.1	1106.8	1074.3	-3.9%	0.3%	2.5%	-2.9%	0.2%
Premium Unleaded gasoline (95)	na	na	1035.3	999.7	1038.6	1063.4	1030.4	na	0.1%	2.4%	-3.1%	-0.1%
Diesel	802.7	540.1	521.0	502.0	542.9	555.2	524.3	-8.3%	0.7%	2.3%	-5.6%	0.1%
Germany												
Premium leaded gasoline	1066.5	746.9	885.9	1001.2	1026.8	na	na	-3.6%	2.5%	na	na	na
Premium Unleaded gasoline (95)	na	713.3	817.5	917.7	943.4	957.8	904.1	na	2.4%	1.5%	-5.6%	1.3%
Diesel	739.4	478.0	512.6	489.0	523.5	524.0	473.5	-7.1%	0.3%	0.1%	-9.7%	-1.0%
Greece												
Premium leaded gasoline	1038.6	718.0	783.2	724.7	717.9	708.4	653.8	-5.5%	-1.4%	-1.3%	-7.7%	-2.2%
Premium Unleaded gasoline (95)	na	774.0	738.9	675.4	669.2	662.7	609.6	na	-1.6%	-1.0%	-8.0%	-2.4%
Diesel	472.2	289.4	290.7	368.9	381.3	371.1	331.7	-9.2%	4.6%	-2.7%	-10.6%	1.7%
Ireland												
Premium leaded gasoline	1395.7	1116.4	1125.7	957.0	997.6	1021.5	1034.5	-4.2%	-2.0%	2.4%	1.3%	-1.1%
Premium Unleaded gasoline (95)	na	na	1086.4	888.2	899.9	921.3	880.3	na	-3.1%	2.4%	-4.5%	-2.6%
Diesel	833.5	686.1	680.4	612.1	792.7	744.0	602.5	-4.0%	2.6%	-6.1%	-19.0%	-1.5%
Electricity												
Italy												
Premium leaded gasoline	1653.8	1461.4	1400.5	1362.4	1348.9	1345.2	1280.9	-3.3%	-0.6%	-0.3%	-4.8%	-1.1%
Premium Unleaded gasoline (95)	na	na	1382.4	1281.3	1280.2	1282.1	1212.7	na	-1.3%	0.2%	-5.4%	-1.6%
Diesel	656.5	558.8	670.3	723.8	741.8	730.1	680.2	0.4%	1.7%	-1.6%	-6.8%	0.2%
Luxembourg												
Premium leaded gasoline	961.4	735.4	740.1	789.6	809.8	835.4	783.8	-5.1%	1.5%	3.2%	-6.2%	0.7%
Premium Unleaded gasoline (95)	na	na	705.0	698.8	720.6	744.1	694.7	na	0.4%	3.3%	-6.6%	-0.2%
Diesel	585.4	355.1	374.6	430.2	458.5	466.5	427.0	-8.5%	3.4%	1.7%	-8.5%	1.6%
Netherlands												
Premium leaded gasoline	1259.4	1063.4	1126.4	1118.6	1137.8	na	na	-2.2%	0.2%	na	na	na
Premium Unleaded gasoline (95)	1219.6	1025.9	1077.6	1026.4	1057.6	1106.7	1077.4	-2.4%	-0.3%	4.6%	-2.6%	0.0%
Diesel	593.7	392.7	500.5	616.5	659.4	573.8	538.0	-3.4%	4.7%	-13.0%	-6.2%	0.9%
Portugal												
Premium leaded gasoline	1467.5	1196.6	1077.2	869.8	875.8	894.0	869.6	-6.0%	-3.4%	2.1%	-2.7%	-2.6%
Premium Unleaded gasoline (95)	na	1196.6	1032.0	858.7	856.6	867.4	838.6	na	-3.1%	1.3%	-3.3%	-2.6%
Diesel	762.9	615.2	586.2	477.7	478.4	449.1	427.9	-5.1%	-3.3%	-6.1%	-4.7%	-3.9%
Spain												
Premium leaded gasoline	1349.6	918.9	877.6	930.8	935.3	940.0	894.9	-8.2%	1.1%	0.5%	-4.8%	0.2%
Premium Unleaded gasoline (95)	na	na	na	881.0	884.2	907.6	848.4	na	na	2.6%	-6.5%	na
Diesel	789.3	535.1	517.8	511.5	544.5	550.3	511.5	-8.1%	0.8%	1.1%	-7.0%	-0.2%
Sweden												
Premium leaded gasoline	1149.5	958.8	1179.5	1173.4	1212.6	1263.4	1243.4	0.5%	0.5%	4.2%	-1.6%	0.7%
Premium Unleaded gasoline (95)	na	na	na	1116.3	1162.1	1209.8	1188.1	na	na	4.1%	-1.8%	na
Diesel	664.6	498.7	634.2	662.6	690.6	689.9	652.6	-0.9%	1.4%	-0.1%	-5.4%	0.4%
United Kingdom												
Premium leaded gasoline	1166.8	896.2	911.6	1025.6	1033.0	1092.5	1117.7	-4.8%	2.1%	5.8%	2.3%	2.6%
Premium Unleaded gasoline (95)	na	na	852.8	924.2	947.5	1004.7	1018.6	na	1.8%	6.0%	1.4%	2.2%
Diesel	834.8	599.2	603.8	670.5	695.6	730.7	739.7	-6.3%	2.4%	5.0%	1.2%	2.6%
European Union												
Premium leaded gasoline	1244.7	956.0	1008.4	1061.9	1078.8	1123.4	1098.2	-4.1%	1.1%	4.1%	-2.2%	1.1%
Premium Unleaded gasoline (95)	1219.6	769.4	960.9	989.7	1012.2	1037.7	999.5	-4.7%	0.9%	2.5%	-3.7%	0.5%
Diesel	735.4	514.4	555.5	558.2	590.8	593.7	558.4	-5.5%	1.0%	0.5%	-6.0%	0.1%

(1) Excluding refundable VAT only for Diesel

diesel which diminished by 3.7% and 6% respectively. Between 1990 and 1997 the share of tax in diesel prices increased from 52% to 65% for the European Union as a whole. For unleaded gasoline, taxes rose from 65% of the final price in 1990 to 76% in 1998. In addition, the relative prices of gasoline versus diesel differed greatly between countries, largely explaining the differences in the dieselisation rate of the car fleets. In 1998, leaded gasoline prices ranged between 654 (Greece) and 1281 EUR/toe (Italy); unleaded gasoline between 610 (Greece) and 1357 EUR/toe (Finland); and diesel prices ranged between 332 (Greece) and 740 EUR/toe (the United Kingdom). The differences between leaded and unleaded gasoline in the same country ranged, in 1998, between 154 (Ireland) and 31 (Portugal) EUR/toe, with an average difference of 99 EUR/toe. This differential has increased year by year to favour the use of unleaded gasoline. Comparing unleaded gasoline and diesel, the difference in price ranged between 689 (Finland) and 268 (Luxembourg) EUR/toe, with an average value of 441 EUR/toe across all the Member States.

DOMESTIC AND TERTIARY

Between 1990 and 1998, with similar climatic conditions, energy consumption increased by 12%...

In 1998, the domestic and tertiary sectors represented around 41% of final energy demand, almost the same proportion as in 1985 with warmer climatic conditions. **Energy consumption in the domestic and tertiary sectors** increased by 0.6% annually on

average since 1985, but by 1.4% since 1990 which experienced similar climatic conditions. It increased given the continual increase of specific uses (electrical appliances, IT and cooking) and living standards (central heating and house size). Over the last 20 years, energy efficiency technologies have been penetrating slowly into the building sector, and the potential still remains enormous. Construction technologies, design techniques, materials and equipment have evolved rapidly in Europe, allowing plenty of scope for incorporating energy efficiency features into new buildings. However, because only a tiny percentage of Europe's buildings is replaced each year, it is essential that these technologies are also retrofitted to existing buildings. In fact, renovation offers some of the best opportunities for the rapid diffusion of energy efficiency technologies. Such a policy needs to be implemented to curb further growth in energy consumption, which has increased by 12% overall since 1990. Available statistics indicate that the energy consumption of the domestic sector increased by 9.8% since 1990 while tertiary consumption grew by 15.7%.

Faced with moderate energy prices, heating use seems less efficient...

In terms of **fuel mix**, solid fuel consumption has dropped by 82% since 1985, and now represents less than 2% of total energy demand in these sectors. Oil demand fell throughout the 1980's. But since 1990 it has experienced wide fluctuations related to weather conditions, and still represented 26% of total demand in 1998 against 34% in 1985 with a level of consumption similar to that in 1990. Gas and electricity slowly increased their market share to reach 35% and 26% of total energy demand respectively

EUROPEAN UNION : DOMESTIC AND TERTIARY - FINAL ENERGY CONSUMPTION

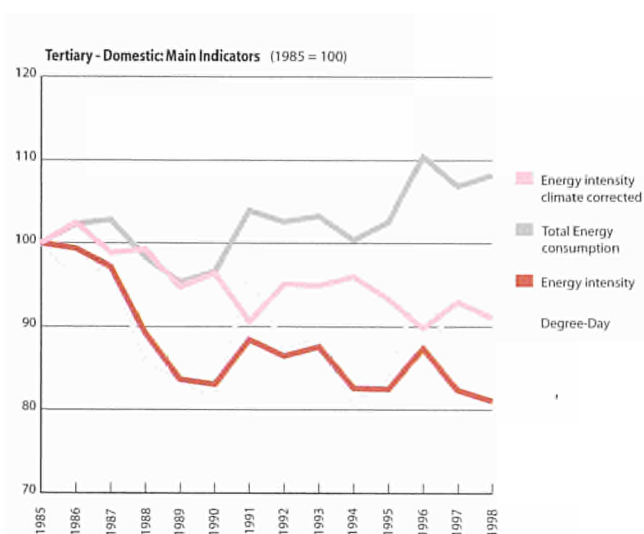
Mtoe	1985	1988	1990	1996	1997	1998	90/85	96/90	97/96	98/97	98/90
Annual % Change											
Total consumption	355.03	349.22	343.15	392.23	379.61	384.37	-0.7%	2.3%	-3.2%	1.3%	1.4%
Solids	37.78	31.53	26.61	9.96	8.74	6.79	-6.8%	-15.1%	-12.2%	-22.4%	-15.7%
Oil	117.90	108.38	98.32	106.56	101.24	99.88	-3.6%	1.4%	-5.0%	-1.3%	0.2%
of which:											
Gas Oil	95.36	88.56	79.54	87.15	83.43	82.59	-3.6%	1.5%	-4.3%	-1.0%	0.5%
Gas	94.44	97.19	100.87	139.19	129.32	133.27	1.3%	5.5%	-7.1%	3.1%	3.5%
Electricity	71.06	78.07	82.68	97.29	97.90	100.60	3.1%	2.7%	0.6%	2.8%	2.5%
of which :											
Residential	40.50	42.61	44.62	52.66	52.15	53.34	2.0%	2.8%	-1.0%	2.3%	2.3%
Commercial & Public Services	28.09	32.92	35.37	41.62	41.78	43.21	4.7%	2.8%	0.4%	3.4%	2.5%
Heat	12.64	12.77	12.57	16.61	16.35	16.86	-0.1%	4.8%	-1.6%	3.1%	3.7%
Renewable (1)	21.22	21.29	22.11	22.63	26.06	26.97	0.8%	0.4%	15.2%	3.5%	2.5%
Total consumption per Capita (toe/inhabitant)	0.99	0.97	0.95	1.06	1.02	1.03	-0.8%	1.8%	-3.5%	1.0%	1.0%
Absolute Degree Days (Eur12)	2642	2268	2141	2537	2226	2240	-4.1%	2.9%	-12.3%	0.6%	0.6%
Difference to Average in %	9.8%	-5.8%	-11.0%	5.4%	-7.5%	-6.9%	-	-	-	-	-

(1) Geothermal heat, solar heat, biomass

in 1998 (27% and 20% respectively in 1985). Since 1990, gas consumption has increased by 3.5% per year on average, gaining substantial market share in the heating market to the detriment of heating gas oil and solid fuels. The growth of gas use in the domestic market has been 3.0% per year on average since 1990, and 5.7% in the tertiary market. Although this corresponds to increasing market shares combined with growing square metres, in particular in services, consumer behaviour faced with moderate energy prices must also be a factor. The relatively low energy prices since the early 1980's have modified the behaviour of building owners vis-à-vis investment regarding energy savings, insulation and heating controls, as it reduced the vigilance of building occupants over the control of temperature. Electricity demand grew during the second part of the 80's at the same rate as GDP; but since 1990 it has grown 50% faster than GDP. Between 1985 and 1990, electricity demand from services increased by 26% compared with 10% for the domestic sector; but growth rates have been more similar in these two sub-sectors since 1990, around 2.5% per year on average. Distributed heat has progressively increased its market share, now representing more than 4% of total energy demand. The renewable energy contribution has remained almost stable since 1985, at around 6%, but with some increase in the last three years. The jump registered in 1997, mainly located in Italy and Germany, still requires statistical confirmation.

Energy intensity, corrected for climatic effects, declined by only 0.7% per year since 1985...

Measuring **energy intensity** evolution in the domestic and tertiary sectors is a very difficult task as the classical intensity indicator, related to GDP, aggregates GDP-sensitive commercial activities (tertiary sector) and non-commercial activities (domestic sector). Additionally the impact of climatic conditions may largely swamp the evolution of economic conditions. The classical ratio of energy consumption to GDP has demonstrated an overall improvement of about 19% since 1985. But, at the same time, more favourable climatic conditions in 1997 versus 1985 reduced heating requirements by an estimated 15%. Correcting total energy demand to take into account standard climatic conditions³, it appears that the revised calculated energy intensity has only declined by 9% since 1985. This limited reduction, about 0.7% per year on average considering climate corrected energy consumption, suggests that increased standards of living, reduced price incentives for energy savings and temperature control, and the growth of the services sector have partly offset all the technological and other efficiency improvements introduced since 1985.



The total consumption per capita, which has increased by 1.1% per year on average since 1990, seems to confirm this impression.

Energy prices for domestic consumers declined regularly...

Average **energy prices for the tertiary-domestic sector** showed a general decrease since 1990 in the European Union as a whole, but at contrasting rates depending on the fuels. The decrease remains limited for electricity: -1.4% per year for the European Union as a whole with extremes ranging from +2.8% in Sweden to -4.8% in Greece, and a general increase in all Scandinavian countries. The most important price decrease concerns heating oil: -3.1% per year on average across the European Union with extremes between -5.6% in Austria and +0.7% in Italy. 1998 was of particular importance for this evolution as heating oil prices declined on average by 14.1% in Europe as a whole, mainly reflecting lower prices on the international oil market as the tax component was less important than for transportation fuels. The price of natural gas varied more smoothly with an average decline between 1990 and 1998 limited to 0.6% with extremes of between -2.2% in the United Kingdom and +4.0% in Finland.

Heating oil prices in 1998 showed large variations amongst Member States: 165 EUR/toe in the United Kingdom compared to 790 EUR/toe in Italy, with a European average price of 294 EUR/toe. Natural gas prices ranged between 161 EUR/toe in Finland and 571 EUR/toe in Italy, with a European average price of 315 EUR/toe. The minimum price for electricity was 731 EUR/toe in Greece and the maximum price was 1803 EUR/toe in Denmark, with a European average of 1081 ECU/toe.

³ Estimation made considering that for the European Union as a whole about 70% of tertiary domestic energy consumption is directly related to weather. SOEC is analysing the possibilities of weather corrections for energy statistics. Our estimates stick only to qualitative statements.

ENERGY PRICES TO DOMESTIC CONSUMERS IN CONSTANT 1990 EUR PER TOE (1)

		1985	1988	1990	1995	1996	1997	1998	90/85	96/90	97/96	98/97	98/90
		Annual % Change											
Austria	Steam Coal	572.0	448.9	417.6	353.5	359.2	361.5	357.1	-6.1%	-2.5%	0.6%	-1.2%	-1.9%
	Heating Oil	660.3	357.0	413.9	310.8	342.0	309.5	261.0	-8.9%	-3.1%	-9.5%	-15.7%	-5.6%
	Natural gas	597.5	333.1	308.5	273.7	287.3	300.9	291.4	-12.4%	-1.2%	4.7%	-3.2%	-0.7%
	Electricity	1569.0	1526.7	1425.4	1326.8	1383.7	1373.8	1368.6	-1.9%	-0.5%	-0.7%	-0.4%	-0.5%
Belgium	Steam Coal	395.2	383.7	338.6	318.1	311.1	305.8	303.5	-3.0%	-1.4%	-1.7%	-0.8%	-1.4%
	Heating Oil	522.2	203.9	244.6	176.8	217.5	223.5	174.8	-14.1%	-1.9%	2.7%	-21.8%	-4.1%
	Natural gas	516.2	326.4	327.4	300.2	286.4	297.7	296.7	-8.7%	-2.2%	3.9%	-0.3%	-1.2%
	Electricity	1832.2	1594.8	1560.2	1454.7	1407.4	1403.7	1391.4	-3.2%	-1.7%	-0.3%	-0.9%	-1.4%
Denmark	Steam Coal	385.1	412.5	439.2	432.5	447.3	469.8	522.9	2.7%	0.3%	5.0%	11.3%	2.2%
	Heating Oil	686.4	647.3	657.5	563.8	594.7	601.9	565.0	-0.9%	-1.7%	1.2%	-6.1%	-1.9%
	Natural gas	609.6	576.2	529.9	447.5	484.7	495.2	469.3	-2.8%	-1.5%	2.2%	-5.2%	-1.5%
	Electricity	1635.3	1502.9	1506.0	1569.9	1642.1	1659.4	1803.2	-1.6%	1.5%	1.1%	8.7%	2.3%
Finland	Heating Oil	531.1	258.3	336.9	316.7	358.2	392.2	336.3	-8.7%	1.0%	9.5%	-14.2%	0.0%
	Natural gas	270.8	116.6	117.3	142.9	152.3	159.6	160.9	-15.4%	4.5%	4.8%	0.8%	4.0%
	Electricity	988.3	973.3	941.7	1016.2	1080.9	1094.3	1083.8	-1.0%	2.3%	1.2%	-1.0%	1.8%
France	Steam Coal	654.1	640.3	467.0	441.5	437.4	436.3	434.1	-6.5%	-1.1%	-0.2%	-0.5%	-0.9%
	Heating Oil	608.7	339.2	380.1	311.7	335.1	347.5	296.1	-9.0%	-2.1%	3.7%	-14.8%	-3.1%
	Natural gas	565.5	398.9	373.7	323.8	305.7	312.5	319.6	-8.0%	-3.3%	2.2%	2.3%	-1.9%
	Electricity	1527.9	1401.4	1374.3	1253.5	1238.8	1141.8	1101.9	-2.1%	-1.7%	-7.8%	-3.5%	-2.7%
Germany	Steam Coal	583.2	571.3	543.6	na	na	na	na	-1.4%	na	na	na	na
	Heating Oil	496.6	198.2	281.4	203.0	239.1	239.0	194.5	-10.7%	-2.7%	0.0%	-18.6%	-4.5%
	Natural gas (2)	460.6	287.8	312.3	285.1	271.6	291.8	283.3	-7.5%	-2.3%	7.4%	-2.9%	-1.2%
	Electricity	1460.2	1557.2	1500.0	1411.7	1296.9	1297.7	1300.7	0.5%	-2.4%	0.1%	0.2%	-1.8%
Greece	Heating Oil	489.3	317.9	324.2	356.8	410.9	399.0	295.5	-7.9%	4.0%	-2.9%	-25.9%	-1.2%
	Electricity	1103.5	1087.8	1081.6	792.5	763.8	737.2	730.7	-0.4%	-5.6%	-3.5%	-0.9%	-4.8%
Ireland	Steam Coal	300.8	259.9	274.3	na	na	na	na	-1.8%	na	na	na	na
	Heating Oil	543.6	393.9	395.9	332.0	361.6	353.0	324.1	-6.1%	-1.5%	-2.4%	-8.2%	-2.5%
	Natural gas	620.2	407.9	379.3	340.0	334.4	329.6	322.5	-9.4%	-2.1%	-1.4%	-2.2%	-2.0%
	Electricity	1493.0	1312.7	1202.6	1102.6	1109.4	1118.0	1098.9	-4.2%	-1.3%	0.8%	-1.7%	-1.1%
Italy	Heating Oil	714.7	589.4	745.2	820.2	838.1	837.7	790.3	0.8%	2.0%	0.0%	-5.7%	0.7%
	Natural gas	529.5	426.3	505.6	559.3	559.9	576.7	571.0	-0.9%	1.7%	3.0%	-1.0%	1.5%
	Electricity	1692.4	1430.1	1435.7	1649.7	1577.9	1530.2	1531.5	-3.2%	1.6%	-3.0%	0.1%	0.8%
Luxembourg	Steam Coal	409.4	419.7	392.2	366.3	361.2	355.8	357.1	-0.9%	-1.4%	-1.5%	0.4%	-1.2%
	Heating Oil	471.8	231.8	254.7	191.1	219.3	228.4	185.1	-11.6%	-2.5%	4.2%	-19.0%	-3.9%
	Natural gas	355.3	186.1	194.5	180.6	200.4	212.0	197.2	-11.3%	0.5%	5.8%	-7.0%	0.2%
	Electricity	1189.1	1163.6	1134.8	1029.4	1036.2	1029.2	1024.3	-0.9%	-1.5%	-0.7%	-0.5%	-1.3%
Netherlands	Heating Oil	523.2	296.4	353.4	236.6	280.2	339.4	313.5	-7.5%	-3.8%	21.1%	-7.6%	-1.5%
	Natural gas	366.7	248.9	264.2	217.4	225.3	252.5	249.9	-6.3%	-2.6%	12.1%	-1.0%	-0.7%
	Electricity	1522.3	1093.7	1072.8	945.4	1066.8	1057.2	1040.6	-6.8%	-0.1%	-0.9%	-1.6%	-0.4%
Portugal	Heating Oil	762.9	638.9	608.7	501.5	502.3	na	na	-4.4%	-3.1%	na	na	na
	Electricity	1431.7	1455.7	1346.8	1233.1	1195.6	1186.5	1171.3	-1.2%	-2.0%	-0.8%	-1.3%	-1.7%
Spain	Heating Oil	576.3	352.1	364.1	291.9	319.5	334.2	286.8	-8.8%	-2.2%	4.6%	-14.2%	-2.9%
	Natural gas	745.3	496.1	482.4	456.8	451.1	456.6	445.2	-8.3%	-1.1%	1.2%	-2.5%	-1.0%
	Electricity	1794.7	1739.1	1739.9	1700.0	1626.9	1583.5	1495.1	-0.6%	-1.1%	-2.7%	-5.6%	-1.9%
Sweden	Heating Oil	587.7	382.5	559.3	501.9	556.6	576.5	531.3	-1.0%	-0.1%	3.6%	-7.8%	-0.6%
	Electricity (2)	708.4	689.1	804.1	849.9	922.6	964.9	1000.4	2.6%	2.3%	4.6%	3.7%	2.8%
United Kingdom	Steam Coal	313.7	289.4	264.7	262.5	266.6	260.7	255.0	-3.3%	0.1%	-2.2%	-2.2%	-0.5%
	Heating Oil	492.7	219.9	250.7	201.0	233.8	211.9	165.3	-12.6%	-1.2%	-9.4%	-22.0%	-5.1%
	Natural gas	305.6	274.8	259.5	247.0	241.5	231.7	216.5	-3.2%	-1.2%	-4.0%	-6.6%	-2.2%
	Electricity	1165.9	1105.0	1086.1	1110.5	1081.3	996.2	919.1	-1.4%	-0.1%	-7.9%	-7.7%	-2.1%
European Union	Steam Coal	396.6	370.3	333.0	304.5	314.7	307.1	296.9	-3.4%	-0.9%	-2.4%	-3.3%	-1.4%
	Heating Oil	559.3	309.5	379.6	311.7	339.1	342.4	294.0	-7.5%	-1.9%	1.0%	-14.1%	-3.1%
	Natural gas	425.7	317.0	330.5	315.6	306.4	319.3	314.6	-4.9%	-1.3%	4.2%	-1.5%	-0.6%
	Electricity	1287.0	1231.2	1211.0	1180.6	1140.8	1104.7	1081.0	-1.2%	-1.0%	-3.2%	-2.1%	-1.4%

(1) Including all taxes

(2) 1998 estimates



ENERGY OUTLOOK – Energy supply: Main evolution (1985-1998)**POWER GENERATION**

- Electricity demand continued to grow in line with GDP...
- ...But presented very large variations at Member State level
- Electricity significantly increased its market shares both in industrial and tertiary-domestic markets
- Both nuclear capacity and generation declined for the first time in 1998
- Since 1990 combined cycle units accounted for about one third of new investment
- Combined heat and power reinforced its contribution mainly in Northern Europe
- Cogeneration identified as a priority measure by the European Commission
- All fossil fuels contributed to increased production in 1998, in response to lower nuclear output
- Liberalisation of the electricity market becoming a reality throughout the European Union

REFINERY SECTOR

- Crude distillation capacity fluctuated since 1994 at around 640 million tons/year
- The Auto Oil Programme, a common framework to reflect on EU energy policies in the oil sector

GROSS INLAND CONSUMPTION

- Gross inland consumption increase since 1990 limited to 60% of GDP growth
- Increasing demand met equally by oil and gas in 1998
- Marked differences between Member States can be explained
- Power generation absorbed 70% of solid consumption in 1998...
- Motor fuels and petrochemical feedstock accounted for 62% of total oil consumption in 1998
- Natural gas, the emerging fuel of the 1990's, met 75% of incremental total gross inland consumption
- Biomass contribution increased by 3.5% per year since 1990

INDIGENOUS PRODUCTION

- Indigenous production peaked at 764 Mtoe in 1996 and declined since, especially solid fuels
- Increasing contribution of renewable energy reached about 6% of gross inland consumption
- Ambitious objective set for renewables in the European Union for the near future

ELECTRICITY SECTOR

Electricity demand continued to grow in line with GDP at the EU level...

Electricity consumption since 1985 has shown an average increase of 2.2% per year, but the more recent trends clearly indicated a progressive slowdown, 1.9% per year since 1990, even though growth reached 2.5% in 1998. During the second part of the 1980's, electricity growth still reached 2.7% per year on average but this expansion was related to an average GDP growth of about 3.1% per year. In the beginning of the 90's, a slower growth (1.2% per year between 1990 and 1994) was registered due to the economic slow-down of 1992-93. In 1995 and 1996, sustained by economic activity and colder weather conditions, electricity demand growth reached respectively 3.5% and 2.6%. In 1997, higher economic activity attenuated by warmer weather conditions limited the growth to 1.6%. In 1998, bullish GDP and constant climatic conditions raised electricity growth to 2.5%. Consequently the average growth of electricity demand since 1990 reached 1.9% per year, compared to GDP growth of 1.7% per year. The electricity growth was largely driven by the tertiary sector. In the period 1985-90, electricity demand from the services sector grew by 4.7% per year on average followed by industry

with 2.3% and the domestic sector with 2.0%. The pattern changed perceptibly during the 1990's. Demand growth rates from tertiary and domestic sectors were closer at 2.5% and 2.3% respectively, whereas industrial consumption grew by only 1.2% per year on average. In 1998, with similar climatic conditions to those in 1997, industrial demand grew by 2.4%, domestic demand by 2.3% and services by 3.4%.

But presented very large variations at Member State level

Additionally, large variations exist between Member States even though electricity demand growth was slowing down in all of them with the exception of Ireland, given the impressive acceleration of GDP growth there, and of Luxembourg due to the electrification of the iron-steel industry, the principal industrial activity of the country. Over the period 1990-97, electricity demand growth rates ranged from 0.3% per year on average in Sweden and 0.5% in Germany to 4.6% in Portugal and 5.1% in Ireland. Ten Member States were well above the European average growth rate of 1.9% per year. By country, the short-term elasticity (1990-98) versus GDP presented extremes ranging from 0.3 in Germany to 2.1 in Greece. Seven countries were below the European average: Germany (0.31), Sweden (0.32), Denmark (0.41), Ireland (0.67), Austria (0.71), Luxembourg (0.80) and the United Kingdom (0.98).

Main items

Energy production in the European Union was equivalent to 52% of total requirements in 1998. Indigenous coal production has declined steadily given high costs, cuts in state aids and increased competition from lower-cost imports. Conversely, oil and gas production has increased rapidly over the past 20 years. Whilst North Sea oil output is now reaching a peak, with much smaller fields being discovered, the competitiveness of this offshore production has generally been maintained - despite occasionally weaker international oil prices - as a result of considerable technological change. Gas production has proved much more buoyant and has partly satisfied the rapid increase in gas demand, particularly in power generation. In recent years, new additions to nuclear capacity have slowed because of public opposition and completion of reactor construction programmes. Despite this, nuclear output has risen given the substantial improvements in nuclear plant operating performance. Of the renewable sources, the scope for further large-scale hydro production is constrained by geographical factors; biomass use is already significant in some countries; but other sources, such as wind, are now growing quickly - although from a low base. As for the future, it is expected that coal output will continue to fall, and - on the basis of present trends - that oil, gas and nuclear output will also decline progressively over the next 5-15 years, leading to a marked increase in import dependence. If new nuclear investment proves financially or politically unattractive, then the only significant indigenous resource in the longer term will be renewable sources. This explains the rise in support for these technologies, matched by growing market and policy interest in their more rapid deployment.

All these Member States have a ratio below 1. Although the Netherlands (1.12) was still close to the European average (1.10), other countries were well above: France (1.70), Spain (1.75), Belgium and Finland (1.81), Italy (1.92), Portugal (1.94) and Greece (2.13). Electricity consumption varied from 3,937 kWh per inhabitant in Portugal to 16,671 kWh per inhabitant in Sweden. The lowest per capita consumption occurred in southern countries (Portugal, Greece, Spain and Italy), all below 5,500 kWh per inhabitant. The other Member States ranged between 5,500 kWh and 8,300 kWh with the exception of three countries where it was virtually double this maximum. The highest consumption per capita was in the two northern countries, Sweden and Finland, ranging from 15,400 to 16,700 kWh per inhabitant. In these two countries electrical heating based on low-cost electricity generated by hydro covered a large part of heating requirements. The last exception was Luxembourg, where the recent installation of electric arc furnaces boosted consumption.

ELECTRICITY : FINAL DEMAND GROWTH RATE

Annual Average Growth Rate	1985-1990	1990-1998
Austria	3.1%	1.5%
Belgium	3.7%	3.1%
Denmark	2.9%	1.1%
Finland	4.0%	2.7%
France	3.6%	2.5%
Germany	1.0%	0.5%
Greece	3.6%	4.1%
Ireland	4.0%	5.1%
Italy	4.3%	2.2%
Luxembourg	1.7%	3.2%
Netherlands	3.7%	2.9%
Portugal	6.2%	4.6%
Spain	4.1%	3.5%
Sweden	1.2%	0.3%
United Kingdom	2.5%	1.8%
European Union	2.7%	1.9%

Electricity significantly increased its market shares both in industrial and tertiary-domestic markets...

The share of electricity in final demand increased significantly in all sectors. In industry it grew at the European level from 23.4% in 1985 to 26.1% in 1990 and 29.0% in 1998. In fact electricity gained substantial market share during the 1980's as a result of the restructuring and modernisation of industrial processes. It progressed more slowly during the 1990's but it accelerated again after 1995 as electricity's competitiveness increased and new electricity-based technologies penetrated all markets. The highest shares occurred in the Nordic countries, Sweden (37%) and Finland (32%), where electricity prices are relatively low thanks to the major contribution of hydro and liberalised market structures. Germany, France and Ireland and Luxembourg followed these; they are also characterised by the biggest increase of industrial electricity share over the last 15 years. Countries with higher prices such as Austria, Portugal and Spain are well below the

ELECTRICITY : CONSUMPTION PER INHABITANT

Kwh/inhabitant	1985	1990	1998	Annual Average Growth Rate	
				85-90	90-98
Austria	5687	6517	7088	2.8%	1.1%
Belgium	5809	6733	8293	3.0%	2.6%
Denmark	5769	6377	6934	2.0%	1.1%
Finland	11096	13036	15418	3.3%	2.1%
France	5805	6604	7693	2.6%	1.9%
Germany	6741	6923	6779	0.5%	-0.3%
Greece	2866	3514	4555	4.2%	3.3%
Ireland	3414	4140	5708	3.9%	4.1%
Italy	3699	4434	5217	3.7%	2.1%
Luxembourg	12203	13842	15742	2.6%	1.6%
Netherlands	4696	5419	6552	2.9%	2.4%
Portugal	2132	2883	3937	6.2%	4.0%
Spain	3287	3894	5061	3.5%	3.3%
Sweden	16241	16908	16671	0.8%	-0.2%
United Kingdom	5258	5748	6268	1.8%	1.1%
European Union	5386	5988	6676	2.1%	1.4%



ELECTRICITY SHARE IN FINAL CONSUMPTION

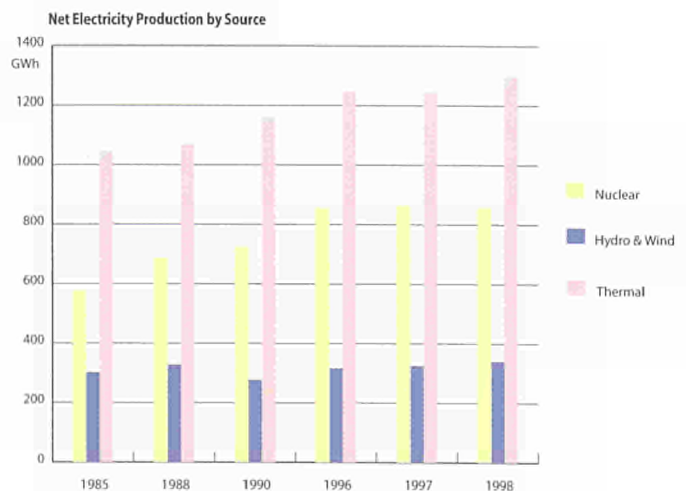
	Industry			Tertiary-Domestic		
	1985	1990	1998	1985	1990	1998
Austria	22.5%	27.1%	24.0%	19.1%	21.9%	24.2%
Belgium	20.8%	22.9%	24.6%	14.9%	19.3%	20.5%
Denmark	23.7%	26.1%	28.3%	18.7%	25.1%	25.5%
Finland	29.2%	31.6%	32.1%	25.2%	28.6%	32.2%
France	22.9%	26.6%	29.9%	21.3%	26.9%	30.2%
Germany	21.8%	25.0%	31.2%	16.9%	20.0%	20.5%
Greece	25.3%	26.5%	25.1%	26.8%	29.2%	34.8%
Ireland	17.4%	19.4%	31.8%	19.3%	20.4%	22.6%
Italy	25.3%	25.8%	29.8%	17.5%	20.8%	22.4%
Luxembourg	12.2%	13.1%	32.9%	17.8%	21.1%	21.6%
Netherlands	17.7%	21.6%	25.8%	13.8%	17.3%	19.8%
Portugal	21.1%	25.4%	22.7%	21.8%	28.3%	36.8%
Spain	25.9%	27.5%	27.9%	27.4%	35.0%	41.6%
Sweden	35.5%	39.2%	36.9%	41.5%	48.3%	43.4%
United Kingdom	23.4%	25.3%	25.4%	22.0%	25.6%	27.6%
European Union	23.4%	26.1%	29.0%	20.0%	24.1%	26.2%

European average and experienced very limited gains since 1985, and even some decline since 1990 in the case of Austria and Portugal. Surprisingly the electricity share remained stable in the United Kingdom despite the significant reduction of prices resulting from electricity market liberalisation. In the tertiary-domestic sector the share of electricity increased on average from 20.0% in 1985 to 24.1% in 1990 and 26.2% in 1998. The sustained development of services throughout the European Union together with electricity-related applications such as air conditioning, lighting, IT equipment..., were the major reasons for this increase. The gap between the minimum share (19.8% in Netherlands) and the maximum (43.4% in Sweden) is more important than in industry for a number of reasons related to varied climatic conditions and gas availability between Member States. In southern Europe (Spain, Portugal and Greece), as energy demand for heating is limited, the weight of electrical appliances increased proportionally more rapidly and explained penetration rates of between 34% and 41%. Additionally, electrically-based air conditioning has recently expanded rapidly given increasing incomes and higher living standards. In mid Europe, the increasing energy demand for heating induced a share between 19.8% and 27.6%, depending on the contribution of electricity to heating requirements. On the other hand, the major contribution of electric heating in France, Finland and Sweden was responsible for the 30.2% to 43.4% share observed in 1998.

Both nuclear capacity and generation declined for the first time in 1998...

In 1997 electricity generation in the European Union reached 2490 TWh, an average growth of 1.8% per year since 1990. Net imports (13.1 TWh) continued to grow in 1998; the 1998 level corresponded to the average value of the last eight years. Despite a limited increase in generating capacity since 1990, coming partly

from capacity extension in existing units when replacing steam generators, nuclear production showed the fastest growth (1.8% per year on average since 1990). Its contribution reached 34% of total electricity production in 1998 compared to only 30% in 1985. The utilisation factor of nuclear units has been increasing continuously over the past ten years to reach about 80% on average at the European level. But 1997 will probably correspond to the historical maximum contribution of nuclear in the European Union in the foreseeable future. In 1998, for the first time since nuclear power was exploited in the EU, both installed capacity and generation fell - by respectively 0.7% and 1.4%. Possible expansion of nuclear capacity is now limited to France and Finland (but without any specific projects at present), with a de facto moratorium on new ordering in all other EU countries. Additionally a progressive phase-out of the nuclear contribution was decided in Germany in early 2000. Consequently it will be difficult for nuclear to continue to cover 40% of total EU incremental electricity production as it has since 1990. Hydro and wind power together increased their output by 2.6% per year on average since 1990 to generate 13.6% of the total in 1998. Since 1990, wind production has risen 15 fold but its contribution only represented 0.5% of total production even though some European countries are amongst the largest world contributors: Germany and Denmark, for example. But recent growth of wind generated electricity has been remarkable: 19% in 1996, 51% in 1997 and 64% in 1998, demonstrating that wind power has become a mature technology. Over the last two years hydro output also increased substantially - by 2.6% in 1997 and 3.2% in 1998 - but without any new capacity commissioning. Thermal electricity production showed a slower annual growth of 1.4% on average since 1990 but with a jump by 4.8% in 1998 to compensate for the contraction of nuclear generation. Thermal generation represented 52% of total electricity generation in 1998 against 54% in 1990. Until 1997 nuclear accounted for most (about 52%) of the incremental production followed by thermal



(about 30%) and hydro (about 18%). The pattern was very different in 1998, with thermal generation contributing 80% of incremental generation and renewables 20%. In the near future, as the prospects both for new nuclear capacity and for hydro are strongly limited, incremental generation requirements will necessarily be mainly covered by thermal units with all the energy and environmental impacts that this implies.

Since 1990 combined cycle units accounted for about one third of new investment...

In 1998, the installed capacity for electricity generation was about 561 GWe, of which 56% was thermal capacity, the remainder comprising almost equally nuclear power stations, and hydro and wind power stations. Since 1990, after allowing for closure of older plants, installed capacity has increased by 38 GWe, 60% of this being added in the last three years. Over the same period new capacity, excluding repowering and conversion of existing units, was about 98 GWe, of which: 12 GWe of nuclear units, 34 GWe of combined cycle units, 32 GWe of steam turbine units, 15 GWe of gas turbines, 4.5 GWe of internal combustion engines mainly based on natural gas, 5 GWe for hydro power and 5.8 GWe for wind power. About 50% of combined cycle capacity is located in the United Kingdom (15.2 GWe installed by end 1998) but this technology is also expanding in many other Member States: the Netherlands (5.0 GWe), Italy (4.5 GWe), Belgium (2.0 GWe), Germany (1.7 GWe), Spain (1.5 GWe) and Austria (1 GWe). In addition, the progressive deregulation of electricity markets will favour the use of gas in power generation, especially in combined cycle units, as smaller companies entering the market favour plants with shorter lead times, lower capital costs and higher efficiency leading to lower fuel costs.

Combined heat and power reinforced its contribution mainly in Northern Europe...

The last decade was also marked by the development of combined heat and power generation. In 1997, about 11% of total electricity production was generated in combined heat and power units. The major absolute contributors in the European Union, from Eurelectric statistics, were Germany (about 60 TWh cogenerated), the Netherlands (41 TWh), Italy (40 TWh), Finland (25 TWh), Denmark (25 TWh) and the United Kingdom (20 TWh). Compared with the total electricity production, the European leaders are Denmark (61% of electricity cogenerated) followed by the Netherlands (45%), Finland (36%), Portugal (32%) and Austria (25%). Cogeneration was sustained by district heating networks, industrial on-site combined heat and power production, and

more recently by the rapid expansion of cogeneration in buildings. The installed capacity in 1997 can be estimated at about 60 GWe or 19% of total thermal capacity in the European Union. The expected growth by 2000, of about 15 GWe, will assist in improving the overall efficiency of the electricity sector and limiting CO₂ emissions. Capacity extensions are mainly expected in France (3.6 GWe), Italy (3.0 GWe), the Netherlands (1.7 GWe), Spain (1.6 GWe) and the United Kingdom (1.0 GWe).

Cogeneration identified as a priority measure by the European Commission...

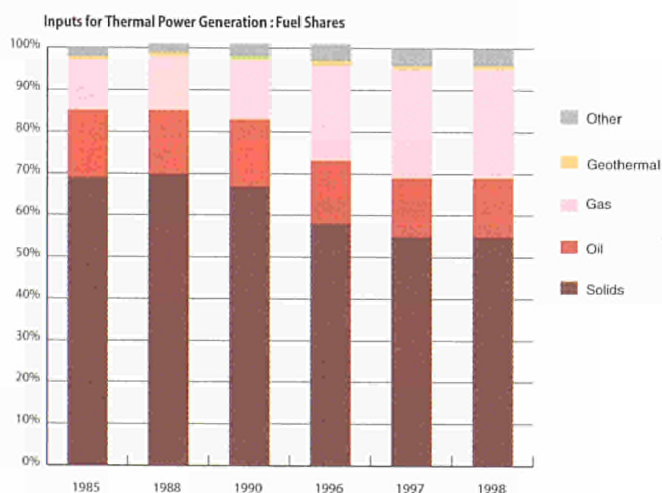
The Commission took an important initiative in the field of cogeneration in its Communication on the promotion of CHP, issued on 15 October 1997. Cogeneration has been identified as a high priority measure to reduce CO₂ emissions and the Commission has proposed a doubling of its contribution to total electricity production by 2010. It has a key role in ensuring the development of the internal market for energy, European Union competitiveness and sustainable development through the most efficient use of fossil fuels. The European Parliament now has the opportunity to work for the adoption of cogeneration-friendly legislation and initiatives to expand this potential.

All fossil fuels contributed to increased production in 1998, in response to lower nuclear output...

As regards the fuel mix in thermal power stations, solid fuels remain the major contributor (55% of total energy consumed in 1998 from 67% in 1990) even though their share decreased slightly by 2.0% a year on average since 1990, with a maximum reduction of 7.1% in 1997. But this trend was stopped in 1998 as solid fuel consumption increased by 4.1%, available capacity being used to satisfy part of the increasing demand in the absence of any increased nuclear production. The expected decline of the nuclear contribution will certainly impact increasingly on solid fuel consumption in the near future. Oil consumption, slowly increasing over the period 1990-95, declined by 4.5% in 1996 and by 7.7% in 1997 but increased significantly in 1998 as heavy fuel oil prices fell by about 15% on average in the European Union. Nevertheless, oil's contribution declined from 15.8% in 1990 to 13.8% in 1998. Italy accounted for 56% of total EU oil consumption for power generation in 1998 (50% in 1990). The growth of gas consumption has been very spectacular since 1990. Its share in fuel inputs almost doubled in eight years, growing from 13.5% in 1990 to 26.4% in 1998. Gas consumption grew by 4.0% per year on average between 1985 and 1990 and by 9.3% since 1990 even though growth was limited to 5.6% in 1998. Between 1990 and



1997 the overall fuel input in thermal power stations has remained quite stable, meaning that about 33 Mtoe of solid fuels have been substituted by gas since 1990. But in 1998 all the fossil fuels contributed to the increasing production from thermal stations: 55% of this being covered by solid fuels, 36% by gas and 7% by oil products. Although the share of other sources (mainly urban and industrial waste) remained small (about 4% of total input in 1998), their consumption, constant over the period 1985-90, increased sharply between 1992 and 1997 due to the development of incinerators in some Member States; but stabilised in 1998. Replacement of old-fashioned units and the development of new technologies such as combined cycles, supercritical units and gas turbines, underpinned a continuous improvement of thermal efficiency in the power sector. This average efficiency, 39.4% in 1998, has increased by 0.8% per year on average since 1990. This improvement accelerated in 1996 and 1997 reaching respectively 1.2% and 2.3% as a consequence of the commissioning of many combined cycle plants. However, the higher contribution of older power stations in 1998 contributed to the stabilisation of this indicator.



Liberalisation of the electricity market becoming a reality throughout the European Union...

The opening of European electricity markets through the EU Directive in February 1999 was the first stage of a three-part process to liberalisation, with competition being extended to at least 28% of the market in 2000 and 33% by 2003. The first stage corresponds to an average consumption threshold of 40 GWh, falling to 20 GWh by the second stage and 9 GWh by 2003. Led by

the United Kingdom, several European countries have opened their markets more quickly than required, introducing important electricity reforms. To varying degrees these reforms have reduced government oversight and increased the role of market forces in balancing electricity supply and demand. The United Kingdom first began to privatise its electricity industry in 1990 and completed the final phase of privatisation in 1996. Behind the United Kingdom's effort at electricity reform was the belief that the industry could be made more competitive through deregulation and privatisation.

The Directive introduces full competition in generation, with any producer able to build new plants and generate anywhere in the European Union from February 1999. There are two options for constructing new generation capacity: an authorisation system or a tendering system. Under the authorisation approach, any company may build a generation facility providing that it complies with the host state's planning and energy supply criteria. This system has been more popular and is more transparent than the tendering system, whereby an independent organisation compiles an inventory and the capacity is allocated by a tendering process. The Directive allows three alternative methods of access to transmission and distribution lines: regulated third party access; negotiated third party access; or the single buyer model. Most countries have opted for regulated or negotiated third party access. With regulated third party access, published tariffs are fixed and applied to all network users. This is the most transparent system and thus the one that will be most effective in stimulating competition.

In the EU, the transmission network was largely owned by vertically integrated electricity companies that generate, transport and sell electricity. These companies own an 'essential' service, the transport network, which, under the new rules, they must offer on equal terms to their own company and to competitors. However, there is in reality a risk that such companies will be tempted to discriminate in favour of their own group companies when granting access to the network. To prevent such discrimination, the Directive requires Member States to take three basic measures ensuring: (i) management unbundling of the transmission system operator; (ii) accounting separation of transmission and distribution activities from other parts of the company; and (iii) that appropriate mechanisms are established to prevent confidential information being passed by the transmission system operator to other parts of its company.

REFINERY SECTOR

Crude distillation capacity fluctuated since 1994 at around 640 million tons/year...

Total crude oil distillation capacity as reported by Member States for 1998 was 642 million ton/year. Since 1994 European capacity has fluctuated around 640 million ton/year. Since 1994 distillation capacity has increased in Spain (3.1 million ton/year), France (3.1), Denmark (2.7) and Greece (1.0) but has declined in Germany (-3.2), Italy (-2.5) and Finland (-1.0). In 1998, the utilisation rate continued to increase to reach 97% (91% in 1996) and followed the more or less steady rise in utilisation observed since 1985 when it was only 69%. This increase reflects the programme of crude distillation capacity reductions undertaken by many refiners over the period, but also better economic conditions, notably increasing margins, moderate crude prices and increasing consumption of oil products. Conversion capacity amounted to 207 million ton per year in 1997, expressed in terms of catalytic cracking equivalent, up 42% compared to 1985. Since 1995, in the European Union as a whole, visbreaking and thermal cracking unit capacity fell respectively by 8% and 11%. On the other hand, hydrocracking capacity increased by 25% in the last three years. Total conversion capacity accounted for about 32% of distillation capacity. This strong growth in conversion capacity since 1985 reflected the industry's expectations at the time concerning future gasoline demand growth and an increasingly heavy crude supply slate. These expectations were justified up until the early 1990s when gasoline growth flattened and the crude slate started to lighten.

The Auto Oil Programme, a common framework to reflect on EU energy policies in the oil sector....

The Auto Oil Programme was established in 1993 to establish a set of Air Quality Standards, derived from the World Health Organisation, and examine a range of possible methods to find the most cost effective way of achieving the required improvements in air quality. The parties in this research were the Commission, the Refining Industry via their trade organisation Europa, and the Car Industry, via their trade organisation ACEA. The Auto Oil Programme was designed to provide policy-makers with an objective assessment of the most effective measures to reduce emissions from the road transport sector. Two Directives resulting from the programme went into effect in late 1999. The first stated that the sale of leaded gasoline in the European Union should be phased out. The second defined stricter specifications for motor fuels: gasoline should have a sulphur content of not more than 150 milligrams per kilogram, a maximum benzene content of 1%, and a limit for aromatics of 42% by volume of vapour; and diesel should have a sulphur content of not more than 350 milligrams per kilogram.

The European Union is now planning the second phase of its Auto Oil Programme, to make the fuel specifications more stringent and reduce vehicle emissions even further. In particular the European motor industry has committed to reduce CO₂ emissions from new vehicles by 25% by 2008. There is considerable interest in developing technologies to improve the fuel efficiency of the European automotive fleet, such as direct injection gasoline engines, fuel cells, and hybrid vehicles powered with batteries and conventional engines.

GROSS INLAND CONSUMPTION

Gross inland consumption increase since 1990 limited to 60% of GDP growth...

The gross inland energy consumption of the European Union (1436 Mtoe in 1998) increased slightly by 1.1% over the period 1990-97, notwithstanding a relative stabilisation between 1990-94 as a consequence of the economic recession in 1992-93. Driven by final demand that increased by 1.6% in 1998, gross inland energy consumption grew by 1.9%. Compared to 1995 (which had the same climatic conditions) by 1998 demand had increased by 5.3%. This comparison can be extended to the year 1990, 5% warmer than the years 1995 and 1998. Over the period 1990-98 gross inland consumption increased rather more slowly than GDP, presenting an implicit elasticity of about 0.6.

Increasing demand met equally by oil and gas in 1998...

The pattern of energy consumption, which changed slowly over the period 1985-90, has been significantly modified since then. Since 1990 solid fuels have experienced a continuous decrease by about 3.7% per year on average, resulting from a 38 Mtoe fall in

GROSS INLAND CONSUMPTION GROWTH IN 1999

	Solid Fuels	Oil Products	Natural Gas	Total
Austria	1.0%	0.2%	2.0%	1.2%
Belgium	-11.5%	-6.9%	10.9%	-1.6%
Denmark	-17.7%	0.2%	8.8%	-2.2%
Finland	38.9%	2.4%	1.3%	6.2%
France	2.2%	2.1%	2.0%	2.6%
Germany	-4.1%	-3.5%	8.9%	0.0%
Greece	4.9%	-0.9%	66.0%	2.8%
Ireland	23.1%	17.3%	4.9%	15.4%
Italy	0.3%	-4.4%	6.2%	-0.2%
Luxembourg	-0.8%	8.6%	4.0%	6.3%
Netherlands	-17.4%	1.1%	-1.2%	-2.0%
Portugal	22.8%	2.6%	179.5%	8.7%
Spain	19.0%	4.1%	13.6%	6.2%
Sweden	-4.1%	-2.0%	0.1%	-1.2%
United Kingdom	-7.9%	-6.4%	6.0%	-1.8%
European Union	-2.0%	-1.6%	6.3%	0.9%



consumption by final users, a 27 Mtoe reduction by power generation and a 14 Mtoe reduction by the energy branch. But, as discussed before, in 1998 increasing demand from power generation largely offset the reduced consumption by final users. Consequently, solid fuels consumption declined by only 0.3% in 1998. Their share in gross inland consumption was therefore reduced from 25.5% in 1985 to 22.8% in 1990 and only 15.5% in 1998. Oil products, driven by increasing consumption for transportation, showed an average yearly increase of 1.2% since 1990, signifying a stabilisation of their share at about 42%. Sustained by the growing demand for motor fuels and the newly stabilised consumption by other sectors facilitated by lower oil prices, oil consumption grew by 2.3% in 1998, the highest growth rate since 1990. The growth of natural gas consumption, excluding climatic variations, increased on average by 4.5% per year since 1990. Consequently its share grew to 22.0% in 1998 against only 16.9% in 1990. The other sources of energy, including nuclear, hydro, wind, net imports of electricity and other energy sources, increased steadily from 17.3% of total gross inland consumption in 1985 to 18.7% in 1990 and 20.6% in 1998. Until 1997 the major increases from these non-fossil sources were in nuclear energy and, more recently, wind power and biomass use. In 1998, the limited gains registered by non-nuclear sources only compensated the first decline in the nuclear contribution.

Marked differences between Member States can be explained...

When looking at their energy consumption over the period 1990-97, a large majority of Member States presented a yearly average growth of between 1.5% and 2.4%. The fast growers in primary energy demand - with annual rates above 2.4% over the period - are Spain (2.7%), Ireland (3.1%) and Portugal (3.9%). But this observation must be correlated with the fact that GDP growth was higher in these countries than the European average, especially in the case of Ireland. Those with very modest growth, below 1.5%, are limited to the United Kingdom (1.1%), Sweden (0.3%), Germany (-0.4%) and Luxembourg (-1.0%). The last two reduced their consumption for specific reasons. The German situation is relatively atypical with a continuous slow decrease of about 0.2% in gross inland consumption since 1985 as a result of the restructuring of the economy with the reunification of the new Länder and a continuous effort to promote the rational use of energy. The case of Luxembourg was more typical as it benefited from the conversion of its main industry, iron and steel, to a less energy consuming process - the electric arc furnace - combined with the fact that the major part of its electricity has been imported.

Power generation absorbed 70% of solid consumption in 1998...

The **use of solid fuels** decreased in most Member States and sectors over the period 1990-97. The slow-down was particularly

noticeable in Germany and the United Kingdom. Both are historically identified as mining countries and absorbed about 67% of total European consumption in 1985 and still 65% in 1990. The in-depth restructuring of the mining industry has reduced market protection in these countries and opened the door for competition with gas and oil products. As a consequence, the reduction of consumption has reached 35% in these three countries since 1990 and, in 1997 their share was limited to 57% of total European consumption. On the contrary, since 1990, coal consumption has slightly increased in the Netherlands (+0.2% per year on average), Finland (+0.9%), Greece (+1.6%) and Portugal (+2.6%) with growth mainly located in the power sector. In 1998, increasing consumption occurred in Belgium (+0.9%), the Netherlands (+1.4%), the United Kingdom (+3.6%), Greece (+3.8%), Italy (+4.4%) and France (+25.5%). Across the European Union, the consumption of solid fuels is increasingly concentrated in power generation whose share increased from 54% in 1985 to 60% in 1990 and to about 70% in 1998.

Motor fuels and petrochemical feedstock accounted for 62% of total oil consumption in 1998...

Total oil demand has steadily increased by 1.2% yearly since 1990, the same growth as between 1985 and 1990. The consumption growth between 1990-98 reached 44 Mtoe in the transport sector of a total of about 56 Mtoe, excluding statistical differences, and 13 Mtoe for non-energy uses. Together these two demands, associated with specific markets, represented more than the total overall increase. Other changes were more marginal with the energy branch (+5 Mtoe) compensating for the limited reduction which occurred in the power generation sector (-3 Mtoe) and the more marked decline in industry (-6 Mtoe) while consumption by the tertiary-domestic sector remained flat. Consequently, consumption of heating gas oil remained quite stable over the period 1990-98. Although demand for LPG and gasoline remained stable since 1990, kerosene increased by 12 Mtoe, naphtha by 8 Mtoe, diesel oil by 32 Mtoe and heating oil by 5 Mtoe whilst residual fuel oil declined by 12 Mtoe. This means that the European oil market is becoming increasingly captive, with specific markets (transport and petrochemicals) accounting for 62% of total oil demand in 1998.

Natural gas, the emerging fuel of the 1990's, met 75% of incremental total gross inland consumption...

Primary consumption of natural gas increased by about 4.5% per year since 1990, demonstrating continuous growth. Increases were spectacular in the three main markets: the power sector (+104% or +38 Mtoe), the tertiary-domestic market (+32% or +32 Mtoe) and industry (+16% or +12 Mtoe). Since 1990 natural gas demand grew the fastest among the primary fossil fuels and in all





Member States, except Ireland where oil products came first. It even grew faster than non-fossil fuels (nuclear+hydro+renewables) in all countries with the exceptions of Ireland, Italy and the Netherlands. In 1998, the fastest growth occurred in countries where the natural gas market was already mature: Belgium (+10.7%), Denmark (+9.4%), Italy (+7.7%) and France (+6.6%). Well-developed infrastructures provide natural gas the opportunity to compete in all markets and to take advantage of competitive prices.

Biomass contribution increased by 3.5% per year since 1990...

Other fuels increased regularly by 2.1% per year since 1990 against a 3.1% growth between 1985 and 1990. Before 1990, the major growth was provided by nuclear supported by a rapid rise of installed capacity. Since 1990, increasing capacity utilisation rates of existing units have compensated for limited new nuclear investment. But, in 1998, the first reduction of nuclear capacity at the EU level caused a probably definitive modification of this historic trend. Although the contribution of hydro increased slowly over this period depending on rainfall, other renewable energy sources have increased substantially since 1990. This can be considered a result of the Altener Programme, introduced by the Commission to promote all forms of renewable energy. The major growth, 3.5% per year on average over the period 1990-98, concerned biomass, the two main markets for which (power generation and direct use in tertiary-domestic sector) are increasing.

INDIGENOUS PRODUCTION

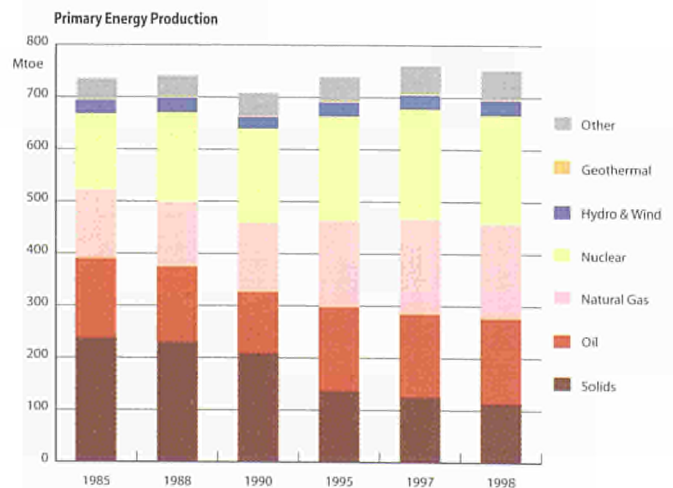
Indigenous production peaked at 764 Mtoe in 1996 and declined since then under the pressure of solid fuels...

Domestic production of primary energy in the European Union as a whole declined by 1.1% in 1998, continuing the trend begun in 1997 after the peak registered in 1996. After a continuous decrease between 1986 and 1992, production rebounded sharply with an accelerating growth rate: 2.1% in 1994, 2.5% in 1995 and 3.7% in 1996. In 1998 four countries contributed 78% of total primary production: the United Kingdom with 36%, Germany with 18%, France with 16% and Netherlands with 8%.

Solid fuels output declined faster and faster with a reduction of about 45% since 1990. The production both of steam coal and lignite fell at similar rates since 1990, by 44% and 47% respectively. Major producers were Germany (56% of the European production in 1998) and the United Kingdom (23%), followed by much smaller producers: Spain, Greece and France.

Oil production, marked by a significant decline between 1985 and 1990, showed an annual increase of 6.4% between 1990 and 1995 (driven by the application of more efficient and economical methods for offshore exploitation) and reached a new peak in 1995. In 1996 and 1997 production remained stable but then reached a new peak in 1998. Despite a period of low oil prices, reduced costs have made small field development profitable. The use of floating platforms, instead of fixed steel ones, is an example of this cost reduction exercise. Consequently, satellite developments from existing fields have been a significant contributor to enlarged European production in the North Sea. At the same time, a declining minimum size of reserves necessary for fields to be developed has been observed. Whereas fields once required at least 100 million barrels of reserves to be developed, now fields with reserves of as little as 10 million barrels are being exploited. Virtually all the production was located in the North Sea where the two main producers operated: the United Kingdom (83% of European Union production) and Denmark (7%).

Natural gas and **nuclear** energy became the main energy sources in Europe (24.0% and 27.8% of total primary production respectively), with a continuous increase of 4.0% and 1.8% per year respectively over the period 1990-98. The recent increase in natural gas production was impressive, with a rise of 4.4% in 1995 and 13.2% in 1996. This trend was mainly sustained by the United Kingdom, the largest European gas producer in 1996, which has doubled its production since 1990; and by the Netherlands, which played the role of swing producer with its major Groningen gas field, characterised by very low production costs. In 1997 and 1998, confronted with declining European demand due to warmer weather conditions, the Netherlands played this swing role by reducing gas production by about 11% and 5% respectively. The Netherlands reduced its inland deliveries by 5.7% and 1.1%. But it reduced export deliveries to other European countries



by 18.3% and 10.1% respectively. The two main producers were the United Kingdom (44% of total European production) and the Netherlands (32%). Italy and Germany each contributed 9% of EU production in 1998, having stabilised their production since 1990. For its part, nuclear also performed well until 1997. The near term perspective for nuclear are not so optimistic, with the first decline in capacity and output observed in 1998, which is likely to be continued given the forthcoming plant closure programmes.

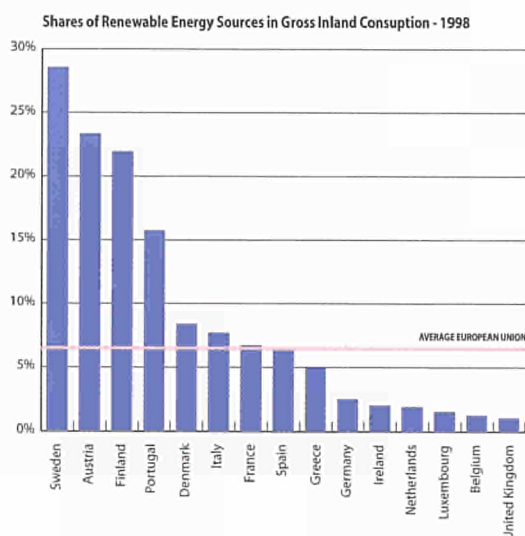
Increasing contribution of renewable energy reached about 6% of gross inland consumption...

In 1998, considering the spectacular 11% jump observed in 1997 (related to some statistical series disruptions regarding biomass production in Italy), the contribution of **renewable energy** sources represented 11.3% of total EU primary energy production and 5.9% of gross inland consumption respectively. Hydroelectricity and wind energy output both increased regularly since 1990 but in particular over the last two years, representing 3.6% of primary production in 1998 against 3.2% in 1990. Geothermal energy remained marginal but the prospects for the near future were favourable with Italian production expected to almost double. Finally, biomass - use of which grew both for power generation mainly in the northern countries and for direct use mainly in the domestic sector - showed an acceleration in output since 1990 to reach 7.3% of total primary production in 1998. The situation varies widely between Member States. Renewable energy sources are mainly used in Sweden, Austria, Finland and Portugal with a national share of gross inland consumption ranging between 16.7% and 27.3%. They are also used significantly in

Denmark, Italy, France, Spain and Greece, with a share of between 5% and 8%. Their use remained almost negligible in the other Member States.

Ambitious objective set for renewables in the European Union for the near future...

Current trends show that considerable progress in renewable energy technologies has been achieved in recent years. Costs are rapidly falling and many renewables, under the right conditions, have reached or are approaching economic viability. The first signs of large-scale implementation are also appearing for wind energy and solar thermal collectors. Some technologies - in particular biomass, small hydro and wind- are currently fairly competitive and economically viable compared with other decentralised applications that are becoming more strategic in the context of a liberalised energy market. As a first step towards a strategy for renewable energy, the Commission adopted a White Paper for a Community Strategy and Action Plan (Com (97) 599 final). This strategy and action plan are directed towards the goal of achieving a 12% penetration of renewables in the European Union by 2010, an ambitious but perhaps realistic approach. This overall target of doubling the share of renewables could be an important route for attaining CO₂ emissions reduction, decreasing energy dependence, developing national industries and creating jobs. Following the White Paper, the Commission adopted a draft directive on promoting electricity produced from renewable energies in Spring 2000 (COM (2000) 279 final). Current indications suggest that the proposal would go forward swiftly in the Council and the Parliament.



RENEWABLE ENERGY SOURCES IN 1998

Ktoe	Hydro	Wind	Solar	Geoth	Biomass	Other	Total	Contribution of Renewable
Production = Gross Inland Consumption								
Austria	3192	4	55	7	3508	0	6765	23.7%
Belgium	33	1	1	2	623	119	779	1.4%
Denmark	2	239	7	1	1519	0	1768	8.2%
Finland	1294	2	0	0	5951	164	7411	22.8%
France	5388	4	17	117	11364	0	16890	6.9%
Germany	1511	395	80	10	6506	0	8501	2.5%
Greece	320	6	119	3	908	0	1355	5.3%
Ireland	79	15	0	0	166	0	259	2.1%
Italy	3544	20	9	2801	6904	55	13334	7.9%
Luxembourg	10	1	0	0	40	0	50	1.5%
Netherlands	9	55	6	0	1384	0	1454	1.9%
Portugal	1116	8	16	45	2406	0	3591	16.9%
Spain	2924	185	26	7	3860	0	7001	6.6%
Sweden	6391	27	5	0	7311	0	13734	27.3%
United Kingdom	449	76	7	1	1730	0	2263	1.0%
European Union	26263	1037	348	2993	54176	338	85155	6.0%
Inputs to Power Generation Production								
Austria	3192	4	0	0	772	0	3967	51.3%
Belgium	33	1	0	0	367	119	521	2.8%
Denmark	2	239	0	0	992	0	1233	12.2%
Finland	1294	2	0	0	1430	164	2889	20.0%
France	5388	4	0	0	1899	0	7291	6.7%
Germany	1511	395	0	0	1758	0	3664	3.0%
Greece	320	6	0	0	0	0	326	3.4%
Ireland	79	15	0	0	30	0	124	2.8%
Italy	3544	20	0	2588	541	55	6748	14.3%
Luxembourg	10	1	0	0	24	0	35	33.7%
Netherlands	9	55	0	0	1097	0	1161	6.3%
Portugal	1116	8	0	45	153	0	1322	23.2%
Spain	2924	185	0	0	595	0	3703	9.7%
Sweden	6391	27	0	0	2015	0	8433	31.1%
United Kingdom	449	76	0	0	1020	0	1546	2.1%
European Union	26263	1037	0	2633	12693	338	42964	10.2%
Final Energy Consumption								
Austria	0	0	55	7	2736	0	2797	12.2%
Belgium	0	0	1	2	255	0	258	0.7%
Denmark	0	0	7	1	527	0	535	3.5%
Finland	0	0	0	0	4521	0	4521	19.7%
France	0	0	17	117	9464	0	9599	6.5%
Germany	0	0	80	10	4748	0	4837	2.2%
Greece	0	0	119	3	908	0	1029	6.0%
Ireland	0	0	0	0	135	0	136	1.6%
Italy	0	0	9	213	6363	0	6585	5.4%
Luxembourg	0	0	0	0	15	0	15	0.5%
Netherlands	0	0	6	0	287	0	293	0.6%
Portugal	0	0	16	0	2252	0	2269	15.2%
Spain	0	0	26	7	3265	0	3298	4.9%
Sweden	0	0	5	0	5296	0	5301	15.9%
United Kingdom	0	0	7	1	709	0	717	0.5%
European Union	0	0	348	360	41483	0	42191	4.5%

COMPETITIVENESS: Main evolution (1985-1998)

- Energy intensity improved by 0.7% per year between 1990 and 1997, with similar weather conditions
- Major gains originated from industry, power generation and services...
- ...but individual activities (heating, transport...) did not contribute to the overall improvement
- Large variations between Member States for various reasons
- Energy consumption per capita continued to increase by 0.7% per year since 1990
- European energy prices penalised competitiveness compared to the United States

COMPETITIVENESS

Energy intensity improved by 0.7% per year between 1990 and 1998, with similar weather conditions...

The European Union continuously improved its overall energy intensity (as measured by energy use per unit of GDP) over the period 1985-1998 (-1.8% per year between 1985 and 1990 and -0.7% annually between 1990 and 1998). As already mentioned, the comparison between 1990, 1997 and 1998 is of particular interest as these three years were characterised by similar weather conditions. On the contrary, the degree-days were 32% higher in 1985 than in 1990, meaning that the energy intensity improvement over this period was heavily influenced by the significant reduction of heating requirements in 1990 compared to 1985. This energy intensity indicator is the result of different developments in the main consuming sectors, including power generation.

Major gains originated from industry, power generation and services...

Intensity improvements in industry since 1990 (-1.8% per year on average) and power generation (-0.6% per year on average) were the main drivers in reducing the overall energy intensity. The performance of industry is particularly surprising as it had already made major contributions during the 1980's as a result of the restructuring from energy-intensive industry to small and medium companies characterised by higher added-value and less energy content. This phenomenon has continued in the present decade but to a lesser extent. But faced with a competitive global economy, industrialists were optimising processes and consequently reducing their specific energy consumption, even in the context of lower energy prices. Technological improvements are increasingly becoming the driving force for energy savings in industry. These observations were of particular interest in explaining the improvement of 2.8% reached in 1998 in the absence of

Main items

Energy costs within the European Union are high compared with those faced by most of its international trading competitors. The liberalisation of electricity and gas markets is intended to exert downward pressure on prices, as is increasing use of imported coal. Most oil is consumed in the transport sector in which taxes and excise duties account for a growing proportion of final product prices, especially for road transport fuels. Energy intensity continues to decline, though at a somewhat lower rate over recent years in some sectors given reduced market incentives and lower levels of investment. The scope for energy efficiency improvements remains large and will be propelled by technological change and the steady replacement of existing, less-efficient, energy-using equipment.

any variation of climatic conditions compared to 1997. This also applies to the power sector which, despite a continuous increase in its output, succeeded in improving its energy intensity since 1990 thanks to spectacular efficiency gains. These are linked to the technological improvement of conventional units (supercritical units...), the emergence of combined cycle units and continuous development of combined heat and power production that permitted an increase in the average thermal efficiency from 36.9% in 1990 to 39.4% in 1998. It must be stressed that the major intensity improvements have occurred in relatively centralised sectors where competitiveness was playing a major role.

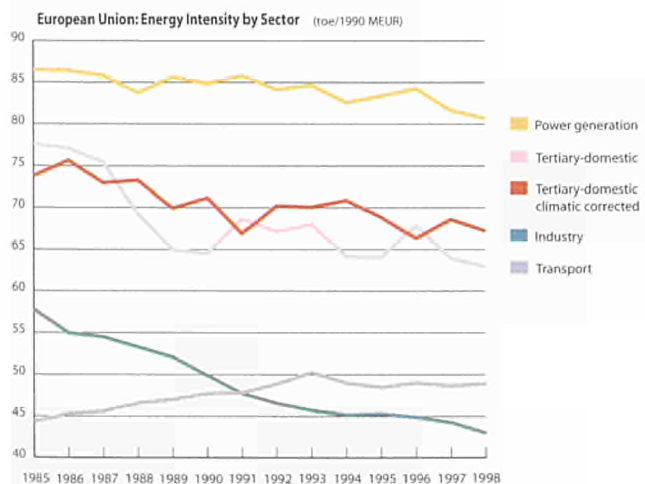
...but individual activities (heating, transport...) did not contribute to the overall improvement

On the other hand, the energy intensity of the tertiary-domestic sector decreased slowly (-0.3% per year on average) between 1990 and 1998. This means that the increasing commercial and services floor area and the growing number of households (as the





average family size was declining), combined with the reduction of incentives to use energy rationally, together offset much of the gains provided by technological improvements (computer optimised building services, high efficiency boilers, improved characteristics of new buildings, reduction in the specific consumption of all electrical appliances...). In many cases, returns on energy savings investment became too low, in a context of low energy prices, to incentivise decisions by a large number of individual consumers. Nevertheless, since 1995, energy intensity improved by 0.6% per year on average but with significant variations in sub-sectors: -1% per year for services, -0.5% for domestic and stability for agriculture. Since 1990, only services were improving their intensity (-0.6% per year on average, as in power generation), with the domestic sector remaining stable and agriculture increasing by 0.8% per year. This is of particular interest, indicating that all the economic sectors, with the exception of agriculture, remained concerned by energy management. On the contrary, the behaviour of individual consumers demonstrated a free-and-easy attitude given lower energy prices. The conclusion is quite similar for the transport sector. Although energy intensity still increased by 0.3% per year on average in the period 1990-98, the first signs of stabilisation appeared in 1993. Energy intensity declined by 2.5% in 1994 and has remained stable since then. This occurred despite an increase in goods transport (about 2.9% per year on average with a marked acceleration in the last two years). This coincided with a stabilisation of the road contribution and, on the other hand, a growth of passenger traffic (about 1.9% per year on average). The number of passenger cars also continued to grow but the average mileage per vehicle diminished proportionally. In the absence of statistical information by use (goods transport vs. passenger transport), the improvement can be associated in a first approximation to the improved efficiency of new vehicles, in particular passenger cars, and better management of traffic flows.



This apparent structural modification will require more in-depth analysis to understand fully the future contribution of transport to final energy consumption and, in particular, its possible impact on CO₂ emissions.

Large variations between Member States for various reasons...

Between 1990 and 1998, which have the advantage of offering comparable climatic conditions at the European level, (very warm weather), seven Member States, four of which are located in the extreme south of Europe (Greece, Portugal, Spain and Italy), showed increasing energy intensity. For these southern countries this evolution is the result of higher economic growth mainly based on strong industrialisation and improved living standards. In the case of Belgium and France it is associated with poor performance in all sectors. For Denmark it is related to the exceptional level of electricity imports in 1990 due to unexpected availability of hydropower in northern countries and consequently this value is not really pertinent. At the same time, other Member States improved their energy intensity. Luxembourg, helped by the conversion of its steel industry to electric arc furnaces, Ireland sustained by a strong industrial growth oriented to high added value industries, and Germany assisted by the restructuring of the new Länder, are the best performers in both the short and long term.

Energy consumption per capita continued to increase by 0.7% per year since 1990...

Considering the differences in living standards and space heating requirements (where geography is the key element), Portugal had the lowest **energy consumption per capita** in 1998 with 2.29 toe/inhabitant; while Finland had the highest with 6.44 toe/inhabitant, or about three times as much. This was excluding Luxembourg whose value is not representative due to the weight of the iron and steel industry in this small country and the importance of motor fuel purchases by drivers from neighbouring Member States. Over the period 1990-98, energy consumption per capita was increasing in all Member States, with the exception of Germany and Luxembourg. The European average growth reached 0.7% per year. Portugal has been increasing its per capita consumption three times faster than Finland. This illustrates the differences between an economy still under development and a much more mature economy.

Oil consumption per capita is characterised by a convergence between all the Member States, except Belgium and Luxembourg, to the European average (1.6 toe per capita) which increased by 0.8% per year since 1985. This resulted from the progressive concentration of oil consumption on its captive markets: motor fuels



MAIN INDICATORS

	1985	1988	1990	1996	1997	1998	90/85	96/90	97/96	98/97	98/90
	Annual % Change										
Austria											
Gross Inl. Cons./GDP (toe/1990 MEUR)	220.5	209.7	204.3	199.3	197.6	195.0	-1.5%	-0.4%	-0.8%	-1.3%	-0.6%
Gross Inl. Cons./Capita (Kgoe/inhabitant)	3122.8	3174.2	3319.0	3479.4	3531.5	3596.6	1.2%	0.8%	1.5%	1.8%	1.0%
Electricity Generated/Capita (Kwh/inhabitant)	5913.9	6478.8	6576.6	6802.6	7041.6	7108.0	2.1%	0.6%	3.5%	0.9%	1.0%
Belgium											
Gross Inl. Cons./GDP (toe/1990 MEUR)	329.5	315.2	305.9	323.4	320.4	317.6	-1.5%	0.9%	-0.9%	-0.9%	0.5%
Gross Inl. Cons./Capita (Kgoe/inhabitant)	4447.3	4607.5	4741.9	5314.2	5410.6	5505.8	1.3%	1.9%	1.8%	1.8%	1.9%
Electricity Generated/Capita (Kwh/inhabitant)	5813.5	6598.6	7106.5	7496.0	7747.4	8157.0	4.1%	0.9%	3.4%	5.3%	1.7%
Denmark											
Gross Inl. Cons./GDP (toe/1990 MEUR)	213.8	188.1	179.2	196.1	176.4	168.2	-3.5%	1.5%	-10.0%	-4.7%	-0.8%
Gross Inl. Cons./Capita (Kgoe/inhabitant)	3833.8	3670.8	3541.7	4415.9	4086.6	3987.6	-1.6%	3.7%	-7.5%	-2.4%	1.5%
Electricity Generated/Capita (Kwh/inhabitant)	5679.6	5450.8	5010.4	10178.0	8383.6	7748.0	-2.5%	12.5%	-17.6%	-7.6%	5.6%
Finland											
Gross Inl. Cons./GDP (toe/1990 MEUR)	298.2	282.2	268.1	289.2	286.7	278.0	-2.1%	1.3%	-0.9%	-3.0%	0.5%
Gross Inl. Cons./Capita (Kgoe/inhabitant)	5465.4	5730.7	5708.2	6036.4	6325.8	6440.8	0.9%	0.9%	4.8%	1.8%	1.5%
Electricity Generated/Capita (Kwh/inhabitant)	10139.7	10893.9	10903.0	13534.7	13456.2	13613.5	1.5%	3.7%	-0.6%	1.2%	2.8%
France											
Gross Inl. Cons./GDP (toe/1990 MEUR)	249.6	236.2	237.4	248.8	237.7	238.7	-1.0%	0.8%	-4.4%	0.4%	0.1%
Gross Inl. Cons./Capita (Kgoe/inhabitant)	3661.5	3725.3	3933.9	4265.4	4148.6	4280.8	1.4%	1.4%	-2.7%	3.2%	1.1%
Electricity Generated/Capita (Kwh/inhabitant)	6226.7	6982.7	7404.2	8776.3	8593.1	8670.6	3.5%	2.9%	-2.1%	0.9%	2.0%
Germany											
Gross Inl. Cons./GDP (toe/1990 MEUR)	315.3	294.5	272.9	244.3	236.6	229.5	-2.8%	-1.8%	-3.2%	-3.0%	-2.1%
Gross Inl. Cons./Capita (Kgoe/inhabitant)	4630.4	4648.0	4460.6	4246.2	4194.3	4183.8	-0.7%	-0.8%	-1.2%	-0.3%	-0.8%
Electricity Generated/Capita (Kwh/inhabitant)	6706.5	7014.7	6913.5	6775.5	6721.0	6786.4	0.6%	-0.3%	-0.8%	1.0%	-0.2%
Greece											
Gross Inl. Cons./GDP (toe/1990 MEUR)	308.4	321.0	340.9	357.5	349.2	353.8	2.0%	0.8%	-2.3%	1.3%	0.5%
Gross Inl. Cons./Capita (Kgoe/inhabitant)	1845.9	2009.0	2189.3	2425.8	2439.1	2556.5	3.5%	1.7%	0.6%	4.8%	2.0%
Electricity Generated/Capita (Kwh/inhabitant)	2791.8	3327.6	3444.2	4061.5	4143.2	4402.6	4.3%	2.8%	2.0%	6.3%	3.1%
Ireland											
Gross Inl. Cons./GDP (toe/1990 MEUR)	322.4	304.9	284.2	223.8	212.0	201.7	-2.5%	-3.9%	-5.3%	-4.9%	-4.2%
Gross Inl. Cons./Capita (Kgoe/inhabitant)	2494.6	2697.6	2906.7	3223.7	3346.7	3506.6	3.1%	1.7%	3.8%	4.8%	2.4%
Electricity Generated/Capita (Kwh/inhabitant)	3414.1	3745.9	4139.5	5288.8	5452.0	5686.8	3.9%	4.2%	3.1%	4.3%	4.0%
Italy											
Gross Inl. Cons./GDP (toe/1990 MEUR)	182.9	179.5	179.7	177.2	180.6	182.9	-0.3%	-0.2%	1.9%	1.3%	0.2%
Gross Inl. Cons./Capita (Kgoe/inhabitant)	2404.0	2596.4	2729.1	2830.2	2922.1	2996.8	2.6%	0.6%	3.2%	2.6%	1.2%
Electricity Generated/Capita (Kwh/inhabitant)	3281.4	3594.0	3823.3	4257.1	4371.5	4510.3	3.1%	1.8%	2.7%	3.2%	2.1%
Luxembourg											
Gross Inl. Cons./GDP (toe/1990 MEUR)	448.1	395.8	419.7	323.8	306.5	282.8	-1.3%	-4.2%	-5.3%	-7.7%	-4.8%
Gross Inl. Cons./Capita (Kgoe/inhabitant)	8548.5	8466.8	9300.5	8184.2	7960.2	7662.8	1.7%	-2.1%	-2.7%	-3.7%	-2.4%
Electricity Generated/Capita (Kwh/inhabitant)	2560.2	3572.9	3610.7	3144.7	2992.3	3057.2	7.1%	-2.3%	-4.8%	2.2%	-2.1%
Netherlands											
Gross Inl. Cons./GDP (toe/1990 MEUR)	320.6	317.6	300.1	298.8	283.3	272.8	-1.3%	-0.1%	-5.2%	-3.7%	-1.2%
Gross Inl. Cons./Capita (Kgoe/inhabitant)	4246.8	4393.9	4466.7	4899.7	4790.2	4755.1	1.0%	1.6%	-2.2%	-0.7%	0.8%
Electricity Generated/Capita (Kwh/inhabitant)	4342.1	4715.3	4803.8	5492.9	5550.3	5800.4	2.0%	2.3%	1.0%	4.5%	2.4%
Portugal											
Gross Inl. Cons./GDP (toe/1990 MEUR)	297.2	298.5	310.3	328.5	337.6	347.8	0.9%	1.0%	2.8%	3.0%	1.4%
Gross Inl. Cons./Capita (Kgoe/inhabitant)	1234.2	1482.5	1703.2	2012.8	2141.1	2288.8	6.7%	2.8%	6.4%	6.9%	3.8%
Electricity Generated/Capita (Kwh/inhabitant)	1908.3	2255.7	2879.5	3476.6	3438.8	3910.0	8.6%	3.2%	-1.1%	13.7%	3.9%
Spain											
Gross Inl. Cons./GDP (toe/1990 MEUR)	235.9	226.9	223.7	231.8	235.8	236.9	-1.1%	0.6%	1.7%	0.5%	0.7%
Gross Inl. Cons./Capita (Kgoe/inhabitant)	1923.8	2150.9	2292.9	2569.5	2698.5	2811.0	3.6%	1.9%	5.0%	4.2%	2.6%
Electricity Generated/Capita (Kwh/inhabitant)	3314.4	3605.1	3905.0	4424.1	4837.2	4974.2	3.3%	2.1%	9.3%	2.8%	3.1%
Sweden											
Gross Inl. Cons./GDP (toe/1990 MEUR)	290.6	281.8	259.6	276.0	263.9	245.2	-2.2%	1.0%	-4.4%	-7.1%	-0.7%
Gross Inl. Cons./Capita (Kgoe/inhabitant)	5621.6	5821.5	5484.8	5851.3	5691.4	5439.0	-0.5%	1.1%	-2.7%	-4.4%	-0.1%
Electricity Generated/Capita (Kwh/inhabitant)	16421.4	17331.0	17114.7	15904.0	16882.0	17879.0	0.8%	-1.2%	6.1%	5.9%	0.5%
United Kingdom											
Gross Inl. Cons./GDP (toe/1990 MEUR)	313.1	283.5	276.3	274.2	258.7	261.7	-2.5%	-0.1%	-5.7%	1.2%	-0.7%
Gross Inl. Cons./Capita (Kgoe/inhabitant)	3593.5	3689.4	3663.2	3885.7	3781.4	3898.2	0.4%	1.0%	-2.7%	3.1%	0.8%
Electricity Generated/Capita (Kwh/inhabitant)	5257.7	5389.9	5540.5	5916.6	5862.2	6057.8	1.1%	1.1%	-0.9%	3.3%	1.1%
European Union											
Gross Inl. Cons./GDP (toe/1990 MEUR)	271.5	256.4	248.0	244.5	237.7	235.3	-1.8%	-0.2%	-2.8%	-1.0%	-0.7%
Gross Inl. Cons./Capita (Kgoe/inhabitant)	3458.1	3574.3	3616.1	3786.8	3768.2	3829.5	0.9%	0.8%	-0.5%	1.6%	0.7%
Electricity Generated/Capita (Kwh/inhabitant)	5342.8	5737.6	5914.0	6459.9	6485.9	6641.0	2.1%	1.5%	0.4%	2.4%	1.5%



and petrochemicals. Per capita gas consumption has been increasing significantly in all Member States driven by demand from power generation, industry and the tertiary-domestic sectors. Between 1990 and 1998 this per capita consumption increased by 38% at the European level. It compensated the 24% decline in per capita solid consumption since 1990.

European energy prices penalised competitiveness compared to the United States...

As already mentioned, the average prices of energy for industry since 1985 show an average yearly decrease of 5.8% for steam coal, 8.1% for heavy oil, 6.4% for natural gas and 3.0% for electricity using a weighted average at the European level. In addition very large variations exist between Member States as a result of differences in taxation regimes, excise duties and VAT. Compared with the prices of the main competitors inside the OECD, the United States and Japan, it is clear that US prices are well below Europe's. Japanese prices are comparable to those in the EU for heavy fuel oil but twice those for gas and electricity. If the European average for heavy fuel oil equalled 100 in 1997, the US value was 64 (an accentuation of the difference since 1990), and

the Japanese 94, closer to the European average. For natural gas, the respective ratios were 73 for the United States, stable compared to 1996, and 235 for Japan, or a substantial increase. Finally, for electricity the ratios were 64 for the United States, stable from 1996 as a result of the progressive liberalisation in these two regions, and 199 for Japan - a substantial increase compared to 1996. As a first approximation, it can be considered that the US figures reflect low prices observed in liberalised and competitive markets, especially for gas and electricity. Additionally, tax levels are also considerably lower in the US - the opposite of the Japanese situation.

INDUSTRIAL CONSUMERS - ENERGY PRICES COMPARISON (1)

	1985	1988	1990	1996	1997	1998	90/85	96/90	97/96	98/97	98/90
EUR90/toe											
								Annual % Change			
Heavy fuel oil											
France	288.2	98.7	110.2	100.1	98.4	79.6	-17.5%	-1.6%	-1.7%	-19.1%	-4.0%
Germany	284.5	96.1	115.0	na	na	na	-16.6%	na	na	na	na
Italy	303.0	88.3	150.9	149.4	143.3	126.5	-13.0%	-0.2%	-4.1%	-11.7%	-2.2%
United Kingdom	293.4	109.6	108.1	114.9	106.3	88.0	-18.1%	1.0%	-7.5%	-17.2%	-2.5%
European Union average	304.6	108.6	123.2	127.2	122.7	102.0	-16.6%	0.5%	-3.6%	-16.9%	-2.3%
Natural gas											
France	271.1	123.2	122.2	105.2	111.9	106.9	-14.7%	-2.5%	6.4%	-4.5%	-1.7%
Germany	284.0	127.8	147.7	124.7	133.0	na	-12.3%	-2.8%	6.6%	na	na
Italy	271.7	86.9	123.7	151.1	158.4	141.7	-14.6%	3.4%	4.8%	-10.6%	1.7%
United Kingdom	212.3	152.2	124.9	68.2	69.8	71.2	-10.1%	-9.6%	2.3%	2.0%	-6.8%
European Union average	262.6	121.0	127.6	112.6	118.9	106.2	-13.4%	-2.1%	5.6%	-10.7%	-2.3%
Electricity											
France	599.3	517.2	516.5	428.1	415.3	398.7	-2.9%	-3.1%	-3.0%	-4.0%	-3.2%
Germany	833.2	880.0	835.3	619.1	584.7	551.0	0.0%	-4.9%	-5.5%	-5.8%	-5.1%
Italy	1183.0	863.3	893.9	900.6	903.6	911.0	-5.4%	0.1%	0.3%	0.8%	0.2%
United Kingdom	777.3	711.0	648.1	563.5	515.0	494.2	-3.6%	-2.3%	-8.6%	-4.0%	-3.3%
European Union average	739.1	669.2	642.1	537.5	515.3	530.2	-2.8%	-2.9%	-4.1%	2.9%	-2.4%

(1) Excluding Refundable VAT

ENVIRONMENT: Main evolution (1985-1998)

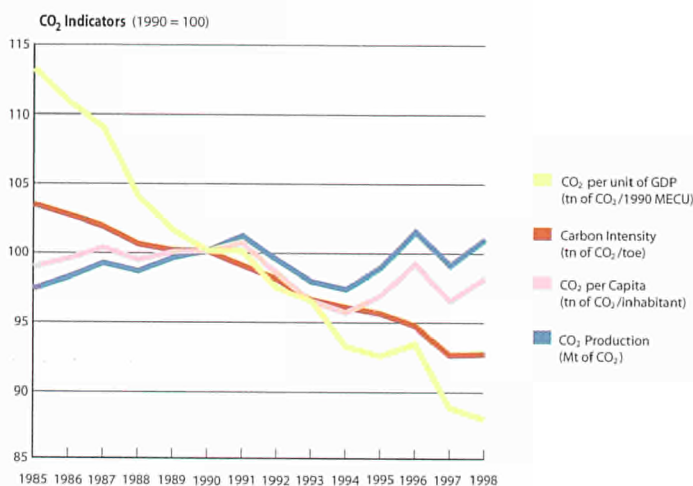
- In 1998 CO₂ emissions in the European Union were 1% above the 1990 level
- Climatic conditions were not uniform across the European Union
- Power generation mainly responsible for incremental emissions in 1998
- Transport, in place to become the first contributor, accounted for 28% of total CO₂ emissions 1998
- SO₂ and NO_x emissions are declining substantially

ENVIRONMENT

In 1998 CO₂ emissions in the European Union were 1% above the 1990 level...

CO₂ emissions indicators are of foremost importance in the current political debate. To facilitate international comparisons, the calculation of total emissions was done on an indicative basis, using common emissions factors by energy aggregate. This could explain some limited differences, below 0.1%, with the latest figures from the European Statistical Office (Eurostat). In general terms, the CO₂ emissions in the European Union increased by 1.9% in 1998 to reach a level 1% above the 1990 level. In the period 1990-98, excluding weather variations, CO₂ emissions increased by 0.1% per year on average. Since 1990 per capita CO₂ emissions showed a reduction of 0.2% per year on average to about 8.3 tons. The CO₂ emitted per unit of GDP demonstrated a more sustained reduction as it declined by about 1.6% per year on average since 1990. These trends were favoured by the fact that the carbon intensity (ton of CO₂/toe) also declined by about 1.0% per year on average since 1990 thanks to conversion from oil and solid fuels to natural gas and increasing consumption of CO₂-free energies (nuclear, wind, biomass...).

By country, Germany ranks first in terms of CO₂ emissions in spite of an average yearly decline of 1.7% between 1990 and 1998. Its share of total European CO₂ emissions reached 27% in 1998 (34%



Main items

Environmental impacts arising from energy production, transportation and use include land use, noise, visual impacts, radioactivity, water pollution and a range of gaseous emissions. Over the past decade, the European Union has made substantial progress in reducing particulates, lead use in petrol, and the precursors of acid rain (such as sulphur dioxide). But, especially since the Kyoto Protocol of late 1997, greater focus has been placed on the basket of greenhouse gases – particularly CO₂. The main routes to reduce CO₂ emissions are: energy efficiency; switching to less carbon-intensive fossil fuels, especially natural gas; and increasing use of carbon-free energy, such as nuclear and renewables. Integration of environmental considerations into energy policy is another important ongoing political process. Although the issue has been on the agenda for a long time, the Cardiff European Council of 1998 provided it with further momentum.

in 1985 and 31% in 1990). The second Member State by far remained the United Kingdom with a yearly reduction of 0.5% per year on average and its share declined slowly to reach 17% in 1998. Italy comes third with a share of about 13% but a yearly increase of 0.6% on average since 1990; and France fourth with a share of 12% and a yearly growth of 0.9%. These four Member States together accounted for 69% of total European CO₂ emissions in 1998 against 75% in 1985.

Climatic conditions were not uniform across the European Union...

The short-term evolution of CO₂ emissions clearly illustrates their sensitivity to climatic conditions. 1994, similar to 1990, was the warmest of the last 15 years with weather conditions 13.4% warmer than the 25-year average. In 1998, degree-days (indicators of heating requirements), were only 4% higher than the values registered in 1990 and 1994. By comparison, in 1996 degree days were 18% higher and in 1985 23% higher. It is worth repeating that weather variations were not uniform across the European Union. For example, 1990 and 1998 - whilst apparently similar at the European level - presented large variations across Europe with central countries characterised by weather 10% colder in 1998 than in 1990 and, conversely, southern countries having warmer weather conditions.



CO₂ EMISSIONS (1) (TRADITIONAL CALCULATION - INLAND EMISSIONS)

	1985	1988	1990	1996	1997	1998	1985	1988	1990	1996	1997	1998
	Million tonnes of CO ₂						Annual % Change					
Austria	51.0	50.7	55.0	58.6	60.1	59.8	1.7%	1.7%	1.8%	1.9%	2.0%	1.9%
Belgium	98.8	101.7	104.5	116.5	115.7	119.5	3.3%	3.4%	3.4%	3.7%	3.8%	3.9%
Denmark	60.9	56.3	52.7	73.9	64.0	59.8	2.0%	1.9%	1.7%	2.4%	2.1%	1.9%
Finland	46.8	50.1	51.6	60.0	58.7	54.7	1.6%	1.7%	1.7%	1.9%	1.9%	1.8%
France	360.0	338.5	352.4	360.7	358.1	379.1	12.0%	11.2%	11.5%	11.6%	11.8%	12.2%
Germany	997.1	982.0	947.4	869.9	827.1	827.7	33.3%	32.4%	30.8%	27.9%	27.2%	26.7%
Greece	56.7	65.5	70.9	81.7	78.7	85.8	1.9%	2.2%	2.3%	2.6%	2.6%	2.8%
Ireland	26.1	29.2	29.8	34.9	36.2	38.4	0.9%	1.0%	1.0%	1.1%	1.2%	1.2%
Italy	337.6	367.4	388.6	399.1	400.2	408.8	11.3%	12.1%	12.6%	12.8%	13.1%	13.2%
Luxembourg	10.0	9.6	10.6	8.9	8.5	7.8	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%
Netherlands	141.2	148.6	153.0	177.7	168.9	169.4	4.7%	4.9%	5.0%	5.7%	5.5%	5.5%
Portugal	25.1	29.9	39.1	45.6	47.9	51.6	0.8%	1.0%	1.3%	1.5%	1.6%	1.7%
Spain	177.4	181.4	202.0	222.2	239.0	244.7	5.9%	6.0%	6.6%	7.1%	7.9%	7.9%
Sweden	58.0	55.3	50.6	58.3	52.2	52.5	1.9%	1.8%	1.6%	1.9%	1.7%	1.7%
United Kingdom	544.2	563.0	566.9	551.2	528.3	542.8	18.2%	18.6%	18.4%	17.7%	17.4%	17.5%
EUROPEAN UNION	2992.1	3030.3	3076.2	3119.4	3043.7	3102.6	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

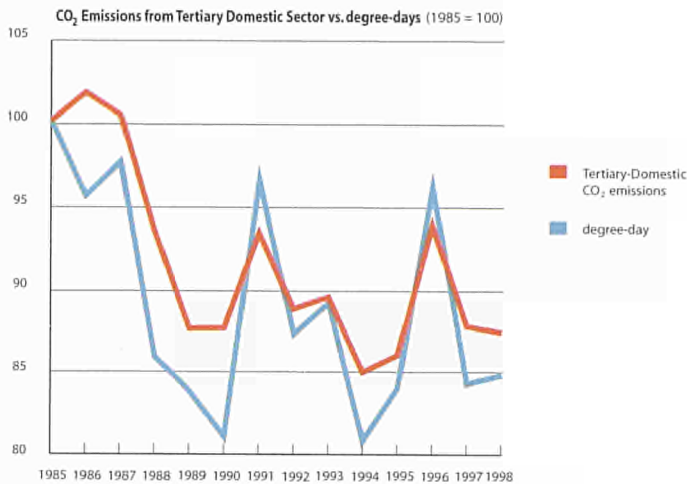
CO₂ EMISSIONS (1) (TOTAL INCLUDING BUNKER)

	1985	1988	1990	1996	1997	1998	1985	1988	1990	1996	1997	1998
	Million tonnes of CO ₂						Annual % Change					
Austria	51.0	50.7	55.0	58.6	60.1	59.8	1.7%	1.6%	1.7%	1.8%	1.9%	1.8%
Belgium	106.2	113.4	117.5	130.8	131.9	136.8	3.4%	3.6%	3.7%	4.0%	4.2%	4.2%
Denmark	62.1	59.0	55.7	78.6	68.6	64.1	2.0%	1.9%	1.7%	2.4%	2.2%	2.0%
Finland	48.2	51.6	53.4	61.2	60.0	56.3	1.6%	1.6%	1.7%	1.9%	1.9%	1.7%
France	367.5	345.5	360.5	369.2	367.4	388.2	11.9%	11.0%	11.3%	11.4%	11.6%	12.0%
Germany	1008.0	991.1	955.2	876.3	833.9	834.2	32.7%	31.7%	30.0%	27.1%	26.3%	25.8%
Greece	60.2	72.0	78.9	91.6	88.6	96.8	2.0%	2.3%	2.5%	2.8%	2.8%	3.0%
Ireland	26.2	29.3	29.8	35.4	36.7	38.8	0.8%	0.9%	0.9%	1.1%	1.2%	1.2%
Italy	348.4	377.1	397.0	406.4	407.7	417.1	11.3%	12.0%	12.5%	12.6%	12.9%	12.9%
Luxembourg	10.0	9.6	10.6	8.9	8.5	7.8	0.3%	0.3%	0.3%	0.3%	0.3%	0.2%
Netherlands	168.7	182.0	187.4	213.9	207.4	208.2	5.5%	5.8%	5.9%	6.6%	6.5%	6.4%
Portugal	26.6	31.4	41.0	47.2	49.4	52.8	0.9%	1.0%	1.3%	1.5%	1.6%	1.6%
Spain	185.7	191.5	214.0	236.8	257.0	263.7	6.0%	6.1%	6.7%	7.3%	8.1%	8.2%
Sweden	59.7	57.4	52.7	61.8	56.3	57.4	1.9%	1.8%	1.7%	1.9%	1.8%	1.8%
United Kingdom	550.8	568.6	574.7	559.4	537.4	552.3	17.9%	18.2%	18.0%	17.3%	16.9%	17.1%
EUROPEAN UNION	3080.7	3131.4	3184.6	3236.2	3170.9	3234.4	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

CO₂ EMISSIONS (1) (EXCLUDING BUNKERS AND AIR TRANSPORT)

	1985	1988	1990	1996	1997	1998	1985	1988	1990	1996	1997	1998
	Million tonnes of CO ₂						Annual % Change					
Austria	50.4	49.8	54.1	57.0	58.6	58.2	1.7%	1.7%	1.8%	1.9%	2.0%	1.9%
Belgium	97.2	99.7	101.7	113.3	111.7	114.8	3.3%	3.4%	3.4%	3.8%	3.8%	3.8%
Denmark	59.2	54.2	50.6	71.4	61.6	57.4	2.0%	1.8%	1.7%	2.4%	2.1%	1.9%
Finland	46.0	49.0	50.2	58.7	57.3	53.2	1.6%	1.7%	1.7%	1.9%	2.0%	1.8%
France	352.0	328.2	341.0	345.8	342.9	362.9	12.0%	11.1%	11.4%	11.5%	11.7%	12.1%
Germany	984.7	966.9	930.7	851.8	808.1	808.1	33.6%	32.7%	31.1%	28.2%	27.5%	27.1%
Greece	53.2	62.2	67.1	78.1	75.2	82.3	1.8%	2.1%	2.2%	2.6%	2.6%	2.8%
Ireland	25.4	28.1	28.7	33.7	34.9	37.0	0.9%	1.0%	1.0%	1.1%	1.2%	1.2%
Italy	332.3	362.5	383.0	391.3	392.1	399.4	11.3%	12.3%	12.8%	13.0%	13.4%	13.4%
Luxembourg	9.8	9.3	10.2	8.3	7.7	7.0	0.3%	0.3%	0.3%	0.3%	0.3%	0.2%
Netherlands	137.5	144.1	148.2	169.5	160.0	159.7	4.7%	4.9%	5.0%	5.6%	5.4%	5.3%
Portugal	23.7	28.4	37.3	43.8	46.1	49.7	0.8%	1.0%	1.2%	1.5%	1.6%	1.7%
Spain	171.6	174.2	194.7	212.2	228.2	232.9	5.9%	5.9%	6.5%	7.0%	7.8%	7.8%
Sweden	56.3	53.0	48.4	55.8	49.6	49.9	1.9%	1.8%	1.6%	1.8%	1.7%	1.7%
United Kingdom	528.9	544.0	546.8	526.8	502.8	514.8	18.1%	18.4%	18.3%	17.5%	17.1%	17.2%
EUROPEAN UNION	2929.6	2954.9	2993.7	3017.5	2936.8	2987.2	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

(1) CO₂ emissions given on an indicative basis, calculated using common emissions factors by energy aggregate



In fact, between 1990 and 1998, total CO₂ emissions, including bunkers have increased by only 1.5%. The reductions in industry (-12.3% in eight years) and the power sector (-3.0%) compensated for the increase from the transport sector (+18.0% including air transport) and bunkers (+22.0%); while emissions from the tertiary-domestic sector and from the energy branch remained stable. CO₂ emissions from all the sectors, with the exception of the tertiary-domestic sector, are almost independent of climatic conditions. On the contrary, in the tertiary-domestic sector where energy consumption for heating dominates, CO₂ emissions were directly correlated with degree-days. It appears that the impact of temperature variations on CO₂ emissions in the tertiary-domestic sector can be estimated at +/-6% following colder or warmer temperature extremes. As tertiary-domestic CO₂ emissions accounted in 1998 for 21% of total emissions, this means that the weather effect on total CO₂ emissions can be estimated to be +/-1.2% compared to an average climate. This is important in the context of the EU's political objective of stabilising CO₂ emissions in 2000 compared to the 1990 level.

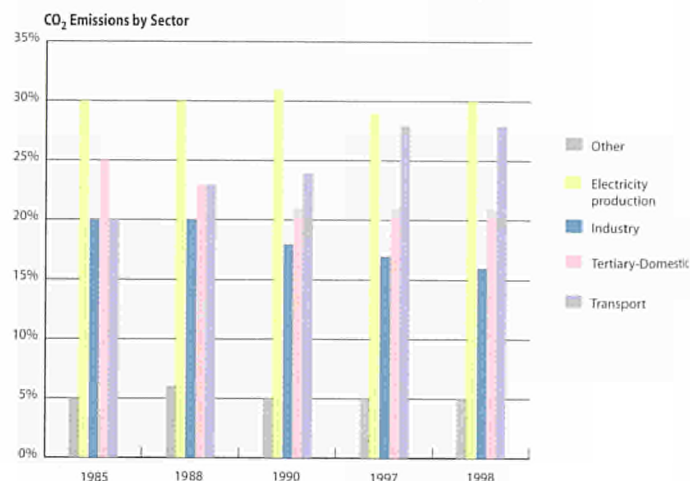
Power generation mainly responsible for incremental emissions in 1998...

The relative stabilisation of CO₂ emissions between 1990 and 1998 is the result of three main factors: the continuous improvement of technologies reducing specific energy consumption; the increasing contribution of non-fossil fuels, mainly nuclear together with some wind energy and biomass; and greater penetration of natural gas both for power generation and in final markets in substitution of solid fuels and oil products. It is important to underline that the contribution of these last two factors could be modified in the near future as illustrated by the 1998 situation. The potential for new nuclear power plants is very limited and the load factor of existing units is already so high that it will now be difficult to increase nuclear's contribution. The contribution of

renewable energy sources is increasing very slowly even though the European Union has proposed the goal of a 12% share of renewables by the year 2010. The substitution limits for natural gas in final markets will be progressively reached. This means that, to reduce CO₂ emissions in the near future, it will be necessary to substantially increase the contribution of renewable energy and to promote rational use of energy to reduce energy intensity in the Union. In 1998 incremental emissions came from the power sector (37 million tons of CO₂), and transport (30 million tons of CO₂) being partly compensated by the reduction from industry (11 million tons of CO₂). This important increase of emissions from the power sector as a consequence of the first reduction of total EU nuclear capacity clearly underlined the implications of this new trend.

Transport, in place to become the first contributor, accounted for 28% of total CO₂ emissions 1998...

The share of emissions from the power sector declined regularly from 31.2% in 1990 to 29.3% in 1997 but reached 30% in 1998 as CO₂ emissions from this sector increased by 4%. Within the final demand sectors, transport was the only one with steadily increasing emissions since 1990 (2.1% per year on average). The contribution of this sector grew from 24% in 1990 (19% in 1985) to 28% in 1998. The domestic and tertiary sectors stabilised their emissions despite the penetration of natural gas and distributed heat in the heating market in place of heating gas oil and solids. In fact the development of low CO₂ content fuels (natural gas, electricity and renewables) compensated for the increasing floor area and the change in consumers' behaviour. Consequently the share of the tertiary-domestic sector remained stable at about 21%. Industry experienced the greatest fall in CO₂ emissions since 1990 (-1.6% per year) that reduced its contribution in total emissions to only 16% in 1998 compared to 18.5% in 1990 and 20.5% in 1985.



CO₂ EMISSIONS (INLAND EMISSIONS)

	1985	1988	1990	1996	1997	1998	90/85	96/90	97/96	98/97	98/90
	Millions tons of CO ₂						Annual % Change				
Austria											
Total CO ₂ emissions	51.04	50.69	55.04	58.55	60.13	59.82	1.5%	-0.5%	2.7%	1.0%	0.6%
of which power generation	7.00	8.16	12.13	12.89	12.04	11.62	11.6%	-5.1%	-6.6%	1.0%	-1.5%
of which final markets	40.38	38.93	39.57	42.60	45.09	44.24	-0.4%	0.3%	1.5%	-0.4%	-0.2%
Belgium											
Total CO ₂ emissions	98.85	101.69	104.51	116.50	115.73	119.54	1.1%	1.4%	-0.7%	1.8%	1.2%
of which power generation	17.90	17.21	21.83	22.41	20.94	23.38	4.1%	1.2%	-6.6%	0.4%	0.9%
of which final markets	76.03	78.85	77.40	88.27	88.92	90.36	0.4%	1.5%	-3.3%	0.1%	0.0%
Denmark											
Total CO ₂ emissions	60.86	56.27	52.67	73.95	63.99	59.81	-2.8%	4.4%	-13.5%	5.8%	2.6%
of which power generation	26.87	25.51	22.99	42.07	33.49	29.57	-3.1%	8.6%	-20.4%	10.6%	4.8%
of which final markets	33.02	27.64	27.38	28.94	27.87	27.70	-3.7%	0.4%	1.0%	0.6%	-2.8%
Finland											
Total CO ₂ emissions	46.76	50.05	51.62	60.01	58.70	54.68	2.0%	3.3%	-2.2%	2.5%	1.7%
of which power generation	12.81	14.83	15.65	26.67	24.29	19.09	4.1%	9.9%	-8.9%	9.3%	5.7%
of which final markets	29.22	31.76	33.18	30.75	31.12	31.74	2.6%	-0.4%	-0.3%	0.0%	0.6%
France											
Total CO ₂ emissions	359.96	338.51	352.43	360.65	358.13	379.14	-0.4%	-1.4%	-0.7%	0.4%	-0.5%
of which power generation	47.29	31.50	40.02	28.91	29.57	43.11	-3.3%	-11.1%	2.3%	-5.3%	-7.2%
of which final markets	297.53	292.19	296.45	312.55	309.41	316.52	-0.1%	-0.5%	-0.1%	-0.1%	-0.1%
Germany											
Total CO ₂ emissions	997.06	981.96	947.39	869.89	827.14	827.73	-1.0%	-2.5%	-4.9%	-1.4%	-1.8%
of which power generation	344.07	342.90	342.48	316.76	297.41	304.96	-0.1%	-2.0%	-6.1%	-1.3%	-1.5%
of which final markets	592.18	579.12	548.29	515.15	498.54	490.88	-1.5%	-2.5%	0.6%	0.2%	-1.6%
Greece											
Total CO ₂ emissions	56.69	65.45	70.92	81.75	78.72	85.83	4.6%	1.5%	-3.7%	2.4%	1.9%
of which power generation	25.15	30.55	34.34	39.53	35.90	40.85	6.4%	2.1%	-9.2%	2.4%	2.5%
of which final markets	30.19	32.85	34.56	39.52	40.11	42.21	2.7%	0.8%	1.8%	-0.2%	1.8%
Ireland											
Total CO ₂ emissions	26.06	29.21	29.75	34.92	36.22	38.36	2.7%	2.0%	3.7%	2.7%	2.3%
of which power generation	8.26	10.06	10.28	13.87	14.23	14.93	4.5%	4.9%	2.6%	5.1%	5.5%
of which final markets	17.71	18.99	19.28	20.84	21.74	23.14	1.7%	0.3%	-0.9%	0.0%	0.3%
Italy											
Total CO ₂ emissions	337.57	367.37	388.56	399.12	400.18	408.78	2.9%	-0.5%	0.3%	0.4%	0.7%
of which power generation	90.16	105.93	118.64	122.22	122.65	125.10	5.6%	-0.8%	0.3%	0.5%	1.2%
of which final markets	229.42	243.85	252.61	259.87	260.96	264.90	1.9%	-0.3%	-0.5%	0.0%	0.9%
Luxembourg											
Total CO ₂ emissions	10.02	9.64	10.62	8.88	8.45	7.83	1.2%	0.2%	-4.8%	-2.9%	-3.9%
of which power generation	0.53	0.61	0.72	0.34	0.24	0.10	6.4%	-3.8%	-29.7%	-11.8%	-11.8%
of which final markets	9.49	9.03	9.90	8.54	8.21	7.74	0.8%	0.5%	1.6%	-0.3%	2.6%
Netherlands											
Total CO ₂ emissions	141.17	148.56	153.01	177.67	168.89	169.36	1.6%	1.2%	-4.9%	2.5%	1.7%
of which power generation	35.38	41.33	43.30	51.05	48.90	50.65	4.1%	1.7%	-4.2%	2.8%	2.5%
of which final markets	96.89	94.82	96.07	110.59	104.97	103.99	-0.2%	0.7%	4.2%	-0.8%	-0.5%
Portugal											
Total CO ₂ emissions	25.13	29.92	39.06	45.64	47.89	51.59	9.2%	3.2%	4.9%	2.6%	4.2%
of which power generation	5.76	7.87	14.81	15.16	16.07	18.23	20.8%	1.4%	6.0%	0.4%	5.3%
of which final markets	18.44	20.77	22.74	28.64	29.94	31.25	4.3%	4.0%	0.9%	-0.9%	3.2%
Spain											
Total CO ₂ emissions	177.42	181.42	202.00	222.23	239.05	244.73	2.6%	2.1%	7.6%	1.6%	2.1%
of which power generation	60.08	48.93	63.23	63.61	76.55	74.70	1.0%	0.9%	20.3%	0.1%	1.9%
of which final markets	108.70	121.44	127.25	145.29	149.22	157.08	3.2%	2.6%	-2.1%	-0.8%	2.8%
Sweden											
Total CO ₂ emissions	57.96	55.29	50.64	58.30	52.20	52.51	-2.7%	1.7%	-10.5%	2.4%	1.2%
of which power generation	7.71	5.79	4.07	9.55	5.79	6.15	-12.0%	13.8%	-39.4%	15.3%	8.4%
of which final markets	45.57	45.84	42.62	44.59	43.20	42.91	-1.3%	0.7%	-1.0%	0.7%	-1.5%
United Kingdom											
Total CO ₂ emissions	544.18	562.99	566.92	551.22	528.27	542.82	0.8%	-1.3%	-4.2%	-0.5%	-1.3%
of which power generation	203.85	205.57	216.43	169.60	157.63	170.15	1.2%	-5.5%	-7.1%	-4.0%	-4.2%
of which final markets	310.17	327.39	322.24	346.15	336.32	337.16	0.8%	0.8%	-0.9%	0.1%	0.1%
European Union											
Total CO ₂ emissions	2992.14	3030.30	3076.15	3119.38	3043.65	3102.56	0.6%	-0.7%	-2.4%	0.2%	-0.2%
of which power generation	893.87	897.77	961.96	935.25	896.26	933.24	1.5%	-1.6%	-4.2%	-0.5%	-0.7%
of which final markets	1935.25	1963.66	1949.47	2021.92	1995.18	2011.35	0.1%	-0.3%	-0.1%	0.0%	-0.2%

EUROPEAN UNION : CO₂ EMISSIONS BY SECTORS

European Union	1985	1988	1990	1996	1997	1998	90/85	96/90	97/96	98/97	98/90
Millions tonnes of CO ₂						Annual % Change					
Total (including bunkers)	3080.7	3131.4	3184.6	3236.2	3170.9	3234.4	0.7%	0.3%	-2.0%	2.0%	0.2%
Bunkers	88.6	101.1	108.4	116.9	127.3	131.8	4.1%	1.3%	8.9%	3.5%	2.5%
Air Transport	62.5	75.4	82.4	101.9	106.9	115.3	5.7%	3.6%	4.9%	7.9%	4.3%
Transformation	1056.9	1066.6	1126.7	1097.5	1048.5	1091.2	1.3%	-0.4%	-4.5%	4.1%	-0.4%
Power Generation	893.9	897.8	962.0	935.3	896.3	933.2	1.5%	-0.5%	-4.2%	4.1%	-0.4%
Energy sector	163.0	168.9	164.7	162.2	152.2	158.0	0.2%	-0.3%	-6.2%	3.8%	-0.5%
Final Demand sectors	1872.7	1888.3	1867.0	1920.1	1888.3	1896.0	-0.1%	0.5%	-1.7%	0.4%	0.2%
Industry	613.3	596.0	568.2	508.3	509.5	498.3	-1.5%	-1.8%	0.2%	-2.2%	-1.6%
Transport	525.5	607.0	656.1	723.8	735.0	756.8	4.5%	1.7%	1.5%	3.0%	1.8%
Domestic and Tertiary	733.9	685.3	642.7	688.0	643.7	641.0	-2.6%	1.1%	-6.4%	-0.4%	0.0%

SO₂ and NO_x emissions are declining substantially...

In the absence of complete statistical data for the last few years, the European situation concerning other polluting emissions, SO₂ and NO_x in particular, can be considered to be generally improving. SO₂ emissions are declining significantly as a result of different actions: improvement of fuel quality to reduce sulphur content in oil products, regulation of large industrial combustion installations, and substitution of solid fuels and oil products by natural gas. Between 1990 and 1994 SO₂ emissions were reduced by 28% and preliminary numbers for 1997 indicated a further improvement by 33% between 1994 and 1997. In that way SO₂ emissions would be halved in only seven years. NO_x emissions are also decreasing, but to a lesser extent than SO₂ emissions, given both regulation of large industrial combustion installations and regulations concerning catalytic converters for new cars. NO_x emissions have declined by 13% between 1990 and 1994 and

were expected to continue to decline at the same rate between 1994 and 1997.

The profile of emissions for these two components was quite different. With regard to SO₂ in 1994, the main sources were respectively public power, cogeneration and district heating with 51% of the total emissions; followed by industrial combustion and production processes with 36%; commercial, institutional and residential combustion with 7%; and road transport with 4%. As regards NO_x, 48% of emissions arose from road transport; 19% from public power, cogeneration and district heating; 11% from industrial combustion including production processes; 15% from other mobile sources and machinery; and 4% from commercial, institutional and residential combustion. In 1994, the five major Member States together accounted for 86.4% of SO emissions and 76.2% of NO_x emissions.

SO₂ AND NO_x EMISSIONS

Kton/year	SO ₂ Emissions						NO _x Emissions					
	1990	1992	1994	1996	1997	94/90	1990	1992	1994	1996	1997	94/90
Austria	91	63	56	52	57	-38%	195	189	185	163	173	-5%
Belgium	328	318	253	242	216	-23%	323	343	342	325	310	6%
Denmark	180	189	156	186	109	-14%	269	274	272	288	247	1%
Finland	260	141	112	105	100	-57%	300	283	282	269	260	-6%
France	1251	1203	1009	947	na	-19%	1885	1879	1748	1699	na	-7%
Germany	5331	3440	2994	1544	na	-44%	3071	2913	2209	1887	na	-28%
Greece	509	554	538	543	na	6%	343	352	358	374	na	4%
Ireland	178	160	177	143	165	-1%	116	125	117	115	na	1%
Italy	4261	3630	3190	na	na	-25%	1940	2009	1792	na	na	-8%
Luxembourg	15	14	13	8	na	-13%	23	23	23	22	na	-2%
Netherlands	203	172	146	135	124	-28%	596	572	527	502	471	-12%
Portugal	362	420	336	na	na	-7%	362	397	394	na	na	9%
Spain	2266	2195	2066	na	na	-9%	1188	1257	1269	na	na	7%
Sweden	132	102	96	83	69	-27%	398	391	392	302	280	-2%
United Kingdom	3760	3499	2718	2028	1656	-28%	2731	2543	2217	2061	1848	-19%
European Union	19126	16101	13859	na	na	-28%	13740	13550	12127	na	na	-12%

Source : EMEP/Corinair



GLOBAL MARKETS: Main evolution (1985-1998)

- Energy self-sufficiency declined slowly but regularly
- Diversified and stable sources for solid fuels
- The three main crude oil suppliers, Norway, Saudi Arabia and CIS, accounted for more than 50% of oil imports
- The interconnection of the European gas transport network continued to expand
- Security of supply reinforced by a set of bilateral agreements

SELF-SUFFICIENCY

Energy self-sufficiency declined slowly but regularly...

The degree of self-sufficiency of the European Union as a whole has fluctuated since 1985 in parallel with indigenous production. From 58.5% in 1985, it declined to 50.4% in 1992 to reach a level of 51.0% in 1997 - close to the 1992 minimum. Denmark, the Netherlands and the United Kingdom have the highest degrees of self-sufficiency, due to the exploitation of their large gas and oil reserves. In the cases of Belgium, France and Spain the levels of self-sufficiency are mainly related to the use of nuclear energy and, for the last two, to hydropower. The contributions of each Member State to European Union domestic production were quite varied, depending on reserves, implementation of nuclear programmes, and acceptance and promotion of renewable energy sources, especially biomass. Since 1990, although self-sufficiency declined only marginally at the overall European level, the trends in the Member States were more varied. Major increases, above 2% per year on average, occurred in Denmark (7.2%), Finland (2.4%), Italy (2.6%), Portugal (2.7%) and the United Kingdom (2.3%). Major falls, by more than 2% per year on average, were in Belgium (-3.2%), Germany (-4.1%), Greece (-2.7%), Ireland

(-5.5%), Luxembourg (-9.4%) and Spain (-4.2%), due especially to coal mine closures in Germany and Spain.

EXTERNAL SUPPLIES

To close the gap between domestic production and gross consumption, the European Union obtained about 49% of its total energy needs from third countries in 1998 (from 42% in 1985 with a peak of 50% in 1992). The **net import of energy** in the Union represented 723 Mtoe in 1998 and has increased, in absolute terms, by 1.5% per year on average since 1990 with a market acceleration in 1998 (+4.4%).

Diversified and stable sources for solid fuels...

For solid fuels some 45% of total needs came from external suppliers in 1998 (24% in 1985 and 29% in 1990). 22% of these imports came from South Africa (as in 1996 and 1997), 16% came from United States (23% in 1997), 14% from Australia (12% in 1997), 11% from Poland (as in 1996 and 1997) and 9% from Colombia (13% in 1997). In 1998 Australian and South African supplies increased respectively by 13% and 10% to compensate

DEGREE OF SELF-SUFFICIENCY IN ENERGY SUPPLY (Total Domestic Production / Gross Consumption)

%	1985	1988	1990	1996	1997	1998	Annual % Change				
							90/85	96/90	97/96	98/97	98/90
Austria	34.69	37.61	32.65	31.63	33.65	31.71	-1.2%	-0.5%	6.4%	-5.8%	-0.4%
Belgium	30.73	27.80	24.34	19.68	21.75	18.83	-4.6%	-3.5%	10.5%	-13.4%	-3.2%
Denmark	22.40	43.31	52.62	75.60	81.78	91.89	18.6%	6.2%	8.2%	12.4%	7.2%
Finland	40.93	44.88	37.88	44.96	44.16	45.64	-1.5%	2.9%	-1.8%	3.4%	2.4%
France	45.44	47.87	46.94	50.60	50.39	47.92	0.7%	1.3%	-0.4%	-4.9%	0.3%
Germany	58.00	55.24	53.64	40.59	39.83	38.36	-1.6%	-4.5%	-1.9%	-3.7%	-4.1%
Greece	39.26	38.67	37.94	33.98	33.18	30.50	-0.7%	-1.8%	-2.3%	-8.1%	-2.7%
Ireland	39.93	34.43	30.62	29.59	23.47	19.49	-5.2%	-0.6%	-20.7%	-16.9%	-5.5%
Italy	17.96	19.88	16.19	18.38	21.24	19.89	-2.1%	2.1%	15.6%	-6.4%	2.6%
Luxembourg	1.02	2.25	1.00	0.70	1.63	0.45	-0.5%	-5.8%	134.2%	-72.2%	-9.4%
Netherlands	94.28	73.05	77.64	83.98	73.88	72.99	-3.8%	1.3%	-12.0%	-1.2%	-0.8%
Portugal	24.84	23.54	13.17	18.65	15.38	16.27	-11.9%	6.0%	-17.5%	5.8%	2.7%
Spain	39.42	38.24	35.57	30.00	28.23	25.22	-2.0%	-2.8%	-5.9%	-10.7%	-4.2%
Sweden	57.82	63.05	62.57	60.07	61.32	59.73	1.6%	-0.7%	2.1%	-2.6%	-0.6%
United Kingdom	115.38	109.59	96.56	114.40	115.05	115.57	-3.5%	2.9%	0.6%	0.4%	2.3%
EUROPEAN UNION	58.51	56.32	52.40	53.16	52.23	51.06	-2.2%	0.2%	-1.8%	-2.2%	-0.3%

the reduction by 25% of imports from the United States. South Africa became the largest single supplier of the European Union, ahead of the United States. Although the shares varied a little from year to year between these main sources, depending on market conditions and long term contracts, they have the advantages of being well diversified and politically stable.

The three main crude oil suppliers, Norway, Saudi Arabia and CIS, accounted for more than 50% of oil imports...

In terms of crude oil, the European Union depended on external supplies for as much as 81% in 1998 (75% in 1985 and 85% in 1990), including requirements for marine bunkers. These mainly concerned crude oil, as net imports of oil products remained marginal in 1998. Of these external supplies, 55% came from OPEC (57% in 1997), 22% from Norway (25% in 1997) and 15% from CIS (20% in 1997). Inside OPEC the three main suppliers in 1998 were: Saudi Arabia (17% of total EU imports), Libya (10%) and Iran (9%). Since the mid-80's OPEC has regained some of the share lost to new non-OPEC producers following the oil price shocks of the 1980's. However, in recent years, technology and cost reduction advances in oil exploration and production, notably in the North Sea, have resulted in OPEC taking a lower than expected share of the growing demand for oil. In 1998, the three main suppliers remained unchanged: respectively Norway with 115 Mtoe, Saudi Arabia with 88 Mtoe and CIS with 75 Mtoe. They accounted for more than 50% of imports from other third-party countries.

The interconnection of the European gas transport network continued to expand...

The external dependency of the European Union in terms of natural gas was 42% in 1998 (35% in 1985 and 42% in 1990). The shares of the three major suppliers were 44% for CIS (41% in 1997), 29% for Algeria (30% in 1997) and 26% for Norway (27% in 1997) with only 1% from other diverse sources (Libya, UAE and Qatar). The market shares of each supplier remained stable over the last three years.

In addition, five major European pipelines began operating commercially in 1998, representing some 3.0 billion _ in investment:

- The NorFra pipeline linking directly Norway and France is the world's longest subsea pipeline. It is expected to provide up to one-third of the gas requirements projected by Gaz de France. Any excess capacity will be provided to Spain and Italy after 2000. Gaz de France is building a new transit pipeline for the "Norway-Italy" gas transmission. Norway signed a 25-year contract in 1997 for the supply of 5.5 Mtoe per year beginning in 2000;
- The second major pipeline completed in France linked the NorFra terminal at Dunkirk to the French pipeline system near the Gournay-sur-Arondes storage facility, north of Paris;

Main items

The European Union remains the largest net energy importer in the world and, in 1997, imports met 49% of its total energy requirements. Import dependency varies markedly between individual Member States. Considerable effort has been made to diversify the sources of oil, gas and coal imports. Over the next 20 years, import dependence is forecast to increase steadily (particularly upon OPEC and Russia) as indigenous production of fossil fuels declines. Greater emphasis is being placed on overseas direct investment in energy exporting regions; as well as on diplomatic efforts to engage in dialogue with the major exporting nations and to encourage free international trade in energy. In December 2000, the Commission adopted a Green Paper on security of energy supply (COM (2000) 769 final) to launch a debate on the matter.

- The interconnector linking Bacton, England and Zeebrugge, Belgium was completed on schedule and gas began to flow through the interconnector on 1 October 1998. It has the capability of exporting up to 18.5 Mtoe per of natural gas from the United Kingdom to European customers. The line can be reversed to import 7.8 Mtoe per year into the United Kingdom and increased compression capacity would make it possible for Britain to import even more;
- Distrigaz's new VTR-RTR transit network runs across Belgium. It has a capacity of 18.5 Mtoe per year of which 13.8 Mtoe were already under contract;
- Wingas's Wedal pipeline runs from Bielefeld to Aachen with a capacity of 10.1 Mtoe per year.

Security of supply reinforced by a set of bilateral agreements...

Following the fall in oil prices in 1986 (and greater stability in oil markets) until 1998, there was generally less concern about **security of supply**. But more than three-quarters of world oil and gas reserves are located in potentially unstable areas from political and/or economic points of view. Furthermore, these areas will remain the dominant source of European Union supplies in the future. For this reason, it is crucial for the European Union to reinforce good producer-consumer relations, fostered by a process of dialogue and alignment of interests via investment and operational arrangements. Upstream investment possibilities for European companies in producer countries are now opening up; and the developments that producer country companies have been pursuing in the European Union's downstream sector in recent years are continuing. Such moves consolidate the mutual interest that both parties have in the successful operation of the oil and gas markets as a whole.



EUROPEAN UNION : SUMMARY ENERGY BALANCE

Mtoe	1985	1988	1990	1996	1997	1998	90/85	96/90	97/96	98/97	98/90
Annual % Change											
Primary Production	735.21	740.49	707.21	764.37	761.76	753.02	-0.8%	1.3%	-0.3%	-1.1%	0.8%
Solids	239.43	230.64	209.87	131.42	126.27	114.77	-2.6%	-7.5%	-3.9%	-9.1%	-7.3%
Oil	150.87	143.54	116.96	159.18	158.28	161.96	-5.0%	5.3%	-0.6%	2.3%	4.2%
Natural gas	131.87	124.72	132.87	188.63	182.12	181.46	0.2%	6.0%	-3.5%	-0.4%	4.0%
Nuclear	147.38	173.33	181.44	208.86	212.61	209.66	4.2%	2.4%	1.8%	-1.4%	1.8%
Hydro & Wind	24.41	26.80	22.34	25.23	26.08	27.30	-1.8%	2.0%	3.4%	4.7%	2.5%
Geothermal	1.79	1.97	2.22	2.75	2.82	2.99	4.4%	3.6%	2.5%	6.3%	3.8%
Other renewable energy sources	39.46	39.48	41.50	48.29	53.58	54.86	1.0%	2.6%	10.9%	2.4%	3.5%
Net Imports	526.35	578.25	643.73	678.91	692.56	722.93	4.1%	0.9%	2.0%	4.4%	1.5%
Solids	74.45	73.14	88.25	95.19	98.46	101.04	3.5%	1.3%	3.4%	2.6%	1.7%
Oil	381.96	420.65	460.86	465.40	469.27	489.27	3.8%	0.2%	0.8%	4.3%	0.8%
Crude oil	343.38	398.08	436.75	454.79	465.07	483.61	4.9%	0.7%	2.3%	4.0%	1.3%
Oil products	38.58	22.58	24.11	10.61	4.20	5.66	-9.0%	-12.8%	-60.4%	34.7%	-16.6%
Natural gas	68.61	82.37	92.30	118.46	124.17	131.49	6.1%	4.2%	4.8%	5.9%	4.5%
Electricity	1.33	2.09	2.33	-0.14	0.67	1.13	12.0%	-	-	68.5%	-8.7%
Gross Inland Consumption	1240.79	1291.90	1318.09	1412.69	1409.54	1435.64	1.2%	1.2%	-0.2%	1.9%	1.1%
Solids	316.18	305.36	301.15	234.89	223.49	222.72	-1.0%	-4.1%	-4.9%	-0.3%	-3.7%
Oil	512.27	536.34	545.05	587.66	587.75	601.48	1.2%	1.3%	0.0%	2.3%	1.2%
natural gas	197.97	206.53	222.06	305.14	302.54	315.50	2.3%	5.4%	-0.9%	4.3%	4.5%
Other (1)	214.37	243.67	249.83	285.00	295.76	295.95	3.1%	2.2%	3.8%	0.1%	2.1%
Electricity Generation in TWh	1917.01	2073.86	2155.70	2409.99	2426.13	2489.64	2.4%	1.9%	0.7%	2.6%	1.8%
Nuclear	574.92	681.90	720.06	851.05	859.74	854.03	4.6%	2.8%	1.0%	-0.7%	2.2%
Hydro & wind (including pumping)	299.19	325.78	276.44	314.49	323.46	339.12	-1.6%	2.2%	2.9%	4.8%	2.6%
Thermal	1042.90	1066.19	1159.21	1244.45	1242.94	1296.49	2.1%	1.2%	-0.1%	4.3%	1.4%
Generation Capacity in GWe	480.95	510.56	522.98	549.93	558.77	561.29	1.7%	0.8%	1.6%	0.5%	0.9%
Nuclear	87.04	110.03	116.65	121.45	124.18	122.77	6.0%	0.7%	2.2%	-1.1%	0.6%
Hydro & wind	103.48	108.69	111.73	119.10	120.54	122.09	1.5%	1.1%	1.2%	1.3%	1.1%
Thermal	290.43	291.84	294.59	309.38	314.05	316.43	0.3%	0.8%	1.5%	0.8%	0.9%
Average Load Factor in %	45.5	46.4	47.1	50.0	49.6	50.6	0.7%	1.0%	-0.9%	2.2%	0.9%
Fuel Inputs for Thermal Power Generation	248.46	249.40	270.10	278.47	272.01	282.97	1.7%	0.5%	-2.3%	4.0%	0.6%
Solids	170.39	173.65	182.24	160.81	149.38	155.50	1.4%	-2.1%	-7.1%	4.1%	-2.0%
Oil	40.39	36.52	42.48	41.56	38.38	39.20	1.0%	-0.4%	-7.7%	2.1%	-1.0%
Gas	30.15	31.57	36.60	63.86	70.73	74.69	4.0%	9.7%	10.8%	5.6%	9.3%
Geothermal	1.70	1.84	1.88	2.35	2.44	2.63	2.0%	3.9%	3.8%	7.8%	4.3%
Biomass	5.83	5.82	6.90	9.89	11.09	10.95	3.4%	6.2%	12.1%	-1.3%	5.9%
Average Thermal Efficiency in %	36.1	36.8	36.9	38.4	39.3	39.4	0.4%	0.7%	2.2%	0.3%	0.8%
Non-Energy Uses	75.89	85.42	85.20	92.84	98.49	94.88	2.3%	1.4%	6.1%	-3.7%	1.4%
Total Final Energy Demand	822.07	852.63	862.58	935.59	931.39	945.87	1.0%	1.4%	-0.4%	1.6%	1.2%
Solids	101.44	89.19	80.14	46.31	46.43	42.34	-4.6%	-8.7%	0.3%	-8.8%	-7.7%
Oil	373.58	394.75	396.81	430.12	429.54	436.06	1.2%	1.4%	-0.1%	1.5%	1.2%
Gas	161.39	169.64	178.23	227.71	216.67	222.77	2.0%	4.2%	-4.9%	2.8%	2.8%
Electricity	136.31	148.99	155.97	173.85	177.05	181.42	2.7%	1.8%	1.8%	2.5%	1.9%
Heat	16.01	16.65	16.74	21.09	20.88	21.11	0.9%	3.9%	-1.0%	1.1%	2.9%
Renewable energy sources	33.34	33.41	34.69	36.52	40.82	42.18	0.8%	0.9%	11.8%	3.3%	2.5%
CO2 Emissions in Mt of CO2 (2)	2992.1	3030.3	3076.2	3119.4	3043.7	3102.6	0.6%	0.2%	-2.4%	1.9%	0.1%
Indicators											
Population (Million)	358.80	361.44	364.51	373.06	374.06	374.89	0.3%	0.4%	0.3%	0.2%	0.4%
GDP (bil. EUR 1990)	4570.5	5038.7	5315.0	5777.8	5930.8	6101.3	3.1%	1.4%	2.6%	2.9%	1.7%
Gross Inl Cons./GDP (toe/1990 MEUR)	271.5	256.4	248.0	244.5	237.7	235.3	-1.8%	-0.2%	-2.8%	-1.0%	-0.7%
Gross Inl Cons./Capita (Kgoe/inhabitant)	3458.1	3574.3	3616.1	3786.8	3768.2	3829.5	0.9%	0.8%	-0.5%	1.6%	0.7%
Electricity Generated/Capita (kWh/inhabitant)	5342.8	5737.6	5914.0	6459.9	6485.9	6641.0	2.1%	1.5%	0.4%	2.4%	1.5%
CO2 Emissions/Capita (kg of CO2/inhabitant)	8339.3	8384.0	8439.2	8361.6	8136.8	8276.0	0.2%	-0.2%	-2.7%	1.7%	-0.2%
Import Dependency %	41.5	43.7	47.6	46.8	47.8	48.9	2.8%	-0.3%	2.0%	2.4%	0.3%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Given on an indicative basis; calculated using common emission factors across all countries in the world

EUROPEAN UNION : MAIN INDICATORS

	1985	1990	1996	1997	1998	90/85	96/90	97/96	98/97	98/90
	Annual % Change									
Gross Inland Consumption (Mtoe)	1240.8	1318.1	1412.7	1409.5	1435.6	1.2%	1.2%	-0.2%	1.9%	1.1%
Public Thermal Power Generation	356.5	412.8	451.1	445.9	452.1	3.0%	1.5%	-1.1%	1.4%	1.1%
Autoprod. Thermal Power Generation	39.0	38.6	36.2	38.7	40.6	-0.2%	-1.0%	6.7%	4.8%	0.6%
Energy Branch	60.4	63.3	70.8	69.4	71.6	0.9%	1.9%	-2.0%	3.3%	1.6%
Final Energy Consumption	822.0	862.2	935.2	931.0	945.5	1.0%	1.4%	-0.4%	1.6%	1.2%
Industry	264.1	265.2	259.6	262.6	262.5	0.1%	-0.4%	1.2%	-0.1%	-0.1%
Transport	202.8	253.8	283.4	288.8	298.6	4.6%	1.9%	1.9%	3.4%	2.1%
Tertiary-Domestic	355.0	343.1	392.2	379.6	384.4	-0.7%	2.3%	-3.2%	1.3%	1.4%
Energy Intensity (toe/1990 MEUR)	271.5	248.0	244.5	237.7	235.3	-1.8%	-0.2%	-2.8%	-1.0%	-0.7%
Public Thermal Power Generation	78.0	77.7	78.1	75.2	74.1	-0.1%	0.1%	-3.7%	-1.5%	-0.6%
Autoprod. Thermal Power Generation	8.5	7.3	6.3	6.5	6.6	-3.2%	-2.4%	4.0%	1.9%	-1.1%
Industry	57.8	49.9	44.9	44.3	43.0	-2.9%	-1.7%	-1.4%	-2.8%	-1.8%
Transport	44.4	47.8	49.0	48.7	48.9	1.5%	0.4%	-0.7%	0.5%	0.3%
Tertiary-Domestic	77.7	64.6	67.9	64.0	63.0	-3.6%	0.8%	-5.7%	-1.6%	-0.3%
Energy per Capita (Kgoe/inhabitant)	3458	3616	3787	3768	3830	0.9%	0.8%	-0.5%	1.6%	0.7%
Industry	736	728	696	702	700	-0.2%	-0.7%	0.9%	-0.3%	-0.5%
Transport	565	696	760	772	797	4.3%	1.5%	1.6%	3.2%	1.7%
Tertiary-Domestic	989	941	1051	1015	1025	-1.0%	1.9%	-3.5%	1.0%	1.1%
Electricity Share (%)										
Final Energy Consumption	16.6%	18.1%	18.6%	19.0%	19.2%	1.8%	0.5%	2.3%	0.9%	0.7%
Industry	23.4%	26.1%	27.6%	28.3%	29.0%	2.2%	0.9%	2.3%	2.4%	1.3%
Transport	1.7%	1.6%	1.7%	1.7%	1.6%	-1.1%	1.3%	-0.8%	-5.1%	0.2%
Tertiary-Domestic	20.0%	24.1%	24.8%	25.8%	26.2%	3.8%	0.5%	0.7%	5.5%	0.2%
Total Renewable Consumption (Mtoe)	65.5	65.8	76.1	81.8	84.8	0.1%	2.4%	11.5%	11.5%	0.5%
Hydro	24.4	22.3	24.8	25.5	26.3	-1.8%	1.8%	2.0%	5.8%	0.4%
Biomass	39.2	41.1	47.8	52.6	54.2	1.0%	2.5%	16.1%	13.4%	0.4%
Other renewable energy sources	1.9	2.4	3.5	3.8	4.4	5.4%	6.0%	20.2%	26.5%	1.9%
Renewable Intensity (toe/1990MEUR)	14.3	12.4	13.2	13.8	13.9	-2.9%	1.0%	6.8%	5.6%	0.1%
Renewable per capita (Kgoe/inhabitant)	182.4	180.5	203.9	218.6	226.2	-0.2%	2.0%	10.9%	11.0%	0.4%
CO₂ Emissions (Mt of CO₂)	2992.1	3076.2	3119.4	3043.7	3102.6	0.6%	0.2%	-2.4%	1.9%	0.1%
Public Thermal Power Generation	762.5	837.4	833.4	790.7	824.8	1.9%	-0.1%	-5.1%	4.3%	-0.2%
Autoprod. Thermal Power Generation	131.4	124.6	101.9	105.5	108.4	-1.1%	-3.3%	3.6%	2.7%	-1.7%
Energy Branch	123.2	127.4	147.3	142.7	148.4	0.7%	2.4%	-3.1%	4.0%	1.9%
Industry	613.3	568.2	508.3	509.5	498.3	-1.5%	-1.8%	0.2%	-2.2%	-1.6%
Transport	588.0	738.5	825.7	841.9	872.1	4.7%	1.9%	2.0%	3.6%	2.1%
Tertiary-Domestic	733.9	642.7	688.0	643.7	641.0	-2.6%	1.1%	-6.4%	-0.4%	0.0%
Carbon Intensity (tn of CO₂/toe)	2.4	2.3	2.2	2.2	2.2	-0.7%	-0.9%	-2.2%	0.1%	-1.0%
Public Thermal Power Generation	3.6	3.6	3.4	3.4	3.4	-0.1%	-0.8%	-1.5%	0.4%	-0.8%
Autoprod. Thermal Power Generation	3.4	3.2	2.8	2.7	2.7	-0.8%	-2.3%	-2.9%	-2.0%	-2.3%
Energy Branch	2.0	2.0	2.1	2.1	2.1	-0.3%	0.5%	-1.2%	0.7%	0.3%
Industry	2.3	2.1	2.0	1.9	1.9	-1.6%	-1.5%	-0.9%	-2.2%	-1.5%
Transport	2.9	2.9	2.9	2.9	2.9	0.1%	0.0%	0.1%	0.2%	0.0%
Tertiary-Domestic	2.1	1.9	1.8	1.7	1.7	-2.0%	-1.1%	-3.3%	-1.7%	-1.4%
CO₂ per Capita (kg of CO₂/inhabitant)	8339	8439	8362	8137	8276	0.2%	-0.2%	-2.7%	1.7%	-0.2%
Industry	1709	1559	1362	1362	1329	-1.8%	-2.2%	0.0%	-2.4%	-2.0%
Transport	1639	2026	2213	2251	2326	4.3%	1.5%	1.7%	3.4%	1.7%
Tertiary-Domestic	2046	1763	1844	1721	1710	-2.9%	0.7%	-6.7%	-0.6%	-0.4%
CO₂ per unit of GDP (tn of CO₂/1990 MEUR)	655	579	540	513	509	-2.4%	-1.2%	-4.9%	-0.9%	-1.6%
Public Thermal Power Generation	167	158	144	133	135	-1.1%	-1.5%	-7.6%	1.4%	-1.9%
Autoprod. Thermal Power Generation	29	23	18	18	18	-4.0%	-4.6%	0.9%	-0.1%	-3.4%
Energy Branch	27	24	25	24	24	-2.3%	1.0%	-5.6%	1.1%	0.2%
Industry	134	107	88	86	82	-4.4%	-3.2%	-2.3%	-4.9%	-3.3%
Transport	129	139	143	142	143	1.6%	0.5%	-0.7%	0.7%	0.4%
Tertiary-Domestic	161	121	119	109	105	-5.5%	-0.3%	-8.8%	-3.2%	-1.7%



AUSTRIA : SUMMARY ENERGY BALANCE

Mtoe	1985	1988	1990	1996	1997	1998	90/85	96/90	97/96	98/97	98/90
	Annual % Change										
Primary Production	8.43	8.92	8.69	8.70	8.99	9.06	0.6%	0.0%	3.4%	0.8%	0.3%
Solids	0.63	0.56	0.64	0.30	0.26	0.26	0.6%	-13.9%	-14.6%	2.0%	-9.3%
Oil	1.15	1.21	1.19	1.06	0.97	0.98	0.5%	-2.2%	-8.5%	0.9%	-3.5%
Natural gas	1.01	1.09	1.11	1.26	1.27	1.22	1.9%	2.6%	0.7%	-4.3%	1.9%
Nuclear	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Hydro & Wind	2.66	3.08	2.71	3.19	2.94	3.09	0.4%	3.3%	-7.7%	5.2%	2.8%
Geothermal	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Other renewable energy sources	2.99	2.99	3.05	2.89	3.55	3.51	0.4%	-1.1%	23.0%	-1.3%	0.1%
Net Imports	15.46	15.08	17.28	17.38	18.96	18.86	2.3%	0.1%	9.1%	-0.5%	-0.4%
Solids	3.57	3.35	3.12	2.52	3.03	3.10	-2.7%	-4.2%	20.3%	2.5%	-4.4%
Oil	8.39	8.73	9.71	9.65	10.26	10.69	3.0%	-0.1%	6.2%	4.3%	-0.8%
Crude oil	6.68	6.51	7.80	8.01	8.16	8.98	3.1%	0.5%	1.8%	10.1%	-0.2%
Oil products	1.71	2.22	1.91	1.64	2.09	1.71	2.2%	-3.0%	27.7%	-18.3%	-3.1%
Natural gas	3.64	3.24	4.49	5.42	5.59	5.13	4.3%	3.8%	3.3%	-8.3%	3.7%
Electricity	-0.15	-0.23	-0.04	-0.21	0.08	-0.07	-23.2%	40.0%	-	-	-
Gross Inland Consumption	23.67	24.17	25.64	26.27	27.79	28.35	1.6%	0.5%	5.8%	2.0%	-0.4%
Solids	3.96	3.72	4.16	3.22	3.33	3.57	1.0%	-5.0%	3.4%	7.2%	-4.6%
Oil	9.61	10.19	10.52	10.86	11.10	11.71	1.8%	0.6%	2.2%	5.4%	-1.1%
Natural gas	4.60	4.43	5.24	6.33	6.79	6.54	2.6%	3.9%	7.2%	-3.6%	2.6%
Other (1)	5.50	5.83	5.72	5.86	6.58	6.54	0.8%	0.5%	12.2%	-0.6%	0.7%
Electricity Generation in TWh	44.82	49.34	50.83	56.58	54.83	56.84	2.6%	2.2%	-3.1%	3.7%	1.5%
Nuclear	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Hydro & wind (including pumping)	31.89	36.86	32.91	38.47	35.57	37.29	0.6%	3.2%	-7.5%	4.8%	2.6%
Thermal	12.93	12.48	17.92	18.11	19.25	19.55	6.7%	0.2%	6.3%	1.6%	-0.6%
Generation Capacity in GWe	15.25	16.74	16.69	17.44	17.52	17.86	1.8%	0.9%	0.5%	1.9%	0.6%
Nuclear	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Hydro & wind	10.17	10.76	10.95	11.31	11.38	11.55	1.5%	0.6%	0.7%	1.5%	0.4%
Thermal	5.08	5.98	5.74	6.13	6.14	6.31	2.5%	1.3%	0.1%	2.7%	1.1%
Average Load Factor in %	33.5	33.6	34.8	37.0	35.7	36.3	0.7%	1.3%	-3.5%	1.7%	0.8%
Fuel Inputs for Thermal Power Generation	2.57	2.92	4.17	4.07	4.97	4.82	10.2%	-0.5%	22.1%	-3.0%	-0.7%
Solids	0.66	0.84	1.46	1.04	1.13	1.22	17.2%	-6.6%	9.0%	7.4%	-6.8%
Oil	0.33	0.41	0.45	0.58	0.58	0.58	6.1%	5.5%	0.0%	0.0%	5.4%
Gas	1.31	1.41	1.97	2.11	2.75	2.38	8.5%	1.4%	30.4%	-13.7%	1.4%
Geothermal	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Biomass	0.26	0.26	0.29	0.33	0.50	0.64	1.8%	2.9%	49.8%	29.0%	1.8%
Average Thermal Efficiency in %	43.3	36.8	37.0	38.3	33.3	34.9	-3.1%	0.7%	-12.9%	4.7%	0.2%
Non-Energy Uses	1.52	1.48	1.57	1.23	1.66	1.66	0.5%	-4.8%	35.6%	0.0%	-3.5%
Total Final Energy Demand	19.15	19.19	19.91	21.18	22.02	21.91	0.8%	1.2%	4.0%	-0.5%	0.2%
Solids	2.43	1.92	1.75	1.39	1.43	1.44	-6.4%	-4.4%	2.4%	1.0%	-3.8%
Oil	7.43	7.83	8.12	8.82	8.87	8.87	1.8%	1.7%	0.6%	0.0%	-0.1%
Gas	2.98	2.81	3.03	3.65	3.83	3.83	0.3%	3.8%	5.1%	0.0%	1.8%
Electricity	3.18	3.45	3.71	4.01	4.12	4.20	3.1%	1.6%	2.8%	1.8%	0.7%
Heat	0.44	0.48	0.57	0.79	0.83	0.83	5.3%	6.8%	5.0%	0.0%	3.1%
Renewable energy sources	2.70	2.70	2.74	2.52	2.94	2.74	0.3%	-1.7%	16.7%	-6.8%	-0.2%
CO₂ Emissions in Mt of CO₂ (2)	51.0	50.7	55.0	56.7	59.5	59.5	1.5%	0.6%	5.0%	-0.1%	-0.5%
Indicators											
Population (Million)	7.58	7.62	7.73	8.05	8.06	8.08	0.4%	0.8%	0.2%	0.3%	0.5%
GDP (bil. EUR 1990)	107.3	115.2	125.6	138.5	140.7	144.2	3.2%	2.0%	1.6%	2.5%	1.1%
Gross Inl Cons./GDP (toe/1990 MEUR)	220.5	209.7	204.1	189.7	197.5	196.5	-1.5%	-1.5%	4.1%	-0.5%	-1.5%
Gross Inl Cons./Capita (Kgoe/inhabitant)	3122.8	3174.2	3317.1	3265.1	3448.4	3508.8	1.2%	-0.3%	5.6%	1.8%	-0.9%
Electricity Generated/Capita (kWh/inhabitant)	5913.9	6478.8	6576.6	7031.2	6802.6	7034.9	2.1%	1.3%	-3.3%	3.4%	1.0%
CO ₂ Emissions/Capita (kg of CO ₂ /inhabitant)	6734.6	6656.2	7110.2	7046.0	7386.0	7361.5	1.1%	-0.2%	4.8%	-0.3%	-1.0%
Import Dependency (%)	65.3	62.4	67.4	66.1	68.2	66.5	0.6%	-0.4%	3.1%	-2.5%	0.0%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Given on an indicative basis; calculated using common emission factors across all countries in the world

BELGIUM : SUMMARY ENERGY BALANCE

Mtoe	1985	1988	1990	1996	1997	1998	90/85	96/90	97/96	98/97	98/90
Annual % Change											
Primary Production	13.69	13.23	12.54	11.72	12.90	12.31	-1.7%	-1.3%	10.0%	-4.6%	-0.2%
Solids	4.38	1.85	1.08	0.24	0.18	0.13	-24.4%	-26.3%	-23.8%	-26.9%	-23.2%
Oil	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Natural gas	0.03	0.01	0.01	0.00	0.00	0.00	-22.3%	-29.2%	-92.5%	-	-
Nuclear	8.70	10.80	10.71	10.69	11.96	11.39	4.2%	0.0%	11.8%	-4.7%	0.8%
Hydro & Wind	0.02	0.03	0.02	0.02	0.03	0.03	-0.7%	-2.1%	26.7%	27.8%	4.8%
Geothermal	0.00	0.00	0.00	0.00	0.00	0.00	24.6%	12.3%	-1.3%	0.0%	7.3%
Other renewable energy sources	0.55	0.53	0.71	0.77	0.73	0.74	5.4%	1.7%	-5.4%	2.0%	0.6%
Net Imports	31.97	35.59	38.86	46.97	47.07	49.98	4.0%	3.9%	0.2%	6.2%	3.2%
Solids	5.57	6.75	9.49	7.96	8.09	8.54	11.3%	-3.5%	1.7%	5.5%	-1.3%
Oil	19.12	21.88	21.47	26.77	27.41	28.89	2.3%	4.5%	2.4%	5.4%	3.8%
Crude oil	20.35	24.97	26.12	30.79	31.86	33.47	5.1%	3.3%	3.5%	5.0%	3.1%
Oil products	-1.23	-3.08	-4.65	-4.02	-4.45	-4.58	30.5%	-2.9%	10.7%	2.8%	-0.2%
Natural gas	7.29	7.15	8.22	11.88	11.28	12.43	2.4%	7.6%	-5.0%	10.2%	5.3%
Electricity	0.00	-0.18	-0.32	0.36	0.28	0.12	140.8%	-	-22.0%	-57.4%	-
Gross Inland Consumption	43.84	45.62	47.26	53.97	55.09	56.18	1.5%	2.7%	2.1%	2.0%	2.2%
Solids	9.90	8.77	10.24	8.17	8.36	8.44	0.7%	-4.4%	2.3%	0.9%	-2.4%
Oil	17.34	18.46	17.73	22.14	22.46	22.97	0.4%	4.5%	1.5%	2.3%	3.3%
natural gas	7.33	7.21	8.17	11.82	11.26	12.47	2.2%	7.7%	-4.7%	10.7%	5.4%
Other (1)	9.27	11.18	11.12	11.85	13.00	12.29	3.7%	1.3%	9.7%	-5.4%	1.3%
Electricity Generation in TWh	57.31	65.34	70.83	76.13	78.88	83.23	4.3%	1.5%	3.6%	5.5%	2.0%
Nuclear	34.59	43.09	42.71	43.33	47.40	46.16	4.3%	0.3%	9.4%	-2.6%	1.0%
Hydro & wind (including pumping)	1.35	1.17	0.90	1.21	1.28	1.51	-7.7%	5.9%	6.4%	17.4%	6.6%
Thermal	21.37	21.07	27.21	31.60	30.19	35.56	5.0%	3.0%	-4.4%	17.8%	3.4%
Generation Capacity in GWe	14.17	14.03	14.14	14.85	14.69	15.40	0.0%	1.0%	-1.1%	4.8%	1.1%
Nuclear	5.48	5.50	5.50	5.69	5.71	5.71	0.1%	0.7%	0.4%	0.0%	0.5%
Hydro & wind	1.33	1.34	1.41	1.41	1.41	1.41	1.2%	0.0%	0.1%	0.1%	0.0%
Thermal	7.36	7.19	7.24	7.75	7.57	8.27	-0.3%	1.4%	-2.3%	9.2%	1.7%
Average Load Factor in %	46.2	53.2	57.2	58.5	61.3	61.7	4.4%	0.5%	4.7%	0.7%	1.0%
Fuel Inputs for Thermal Power Generation	5.26	4.97	6.58	7.12	6.76	7.74	4.6%	1.6%	-5.0%	14.4%	2.0%
Solids	2.83	3.02	3.87	3.53	3.12	3.04	6.5%	-1.8%	-11.7%	-2.6%	-3.0%
Oil	0.96	0.31	0.32	0.19	0.20	0.55	-19.9%	-9.9%	6.3%	173.1%	7.1%
Gas	1.24	1.42	1.98	2.93	2.97	3.66	9.9%	8.1%	1.5%	23.2%	8.0%
Geothermal	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Biomass	0.23	0.22	0.40	0.47	0.47	0.49	11.5%	3.2%	0.1%	3.1%	2.4%
Average Thermal Efficiency in %	34.9	36.4	35.6	38.2	38.4	39.5	0.4%	1.4%	0.6%	3.0%	1.3%
Non-Energy Uses	2.90	3.21	3.16	4.74	5.07	4.59	1.7%	8.4%	7.0%	-9.5%	4.8%
Total Final Energy Demand	29.21	30.89	30.84	36.35	36.46	37.37	1.1%	3.3%	0.3%	2.5%	2.4%
Solids	4.46	3.74	3.79	3.23	3.71	3.31	-3.2%	-3.1%	14.6%	-10.6%	-1.7%
Oil	13.09	15.15	14.29	17.20	17.33	17.94	1.8%	3.8%	0.7%	3.5%	2.9%
Gas	6.96	6.82	7.25	9.36	8.72	9.17	0.8%	5.2%	-6.9%	5.2%	3.0%
Electricity	4.16	4.66	4.99	6.01	6.18	6.36	3.7%	3.8%	2.8%	3.0%	3.1%
Heat	0.22	0.21	0.21	0.25	0.27	0.32	-0.6%	3.0%	9.6%	19.3%	5.3%
Renewable energy sources	0.31	0.31	0.31	0.30	0.26	0.26	-0.3%	-0.4%	-14.2%	0.0%	-2.2%
CO₂ Emissions in Mt of CO₂ (2)	98.8	101.7	104.5	116.5	115.7	119.5	1.1%	2.2%	-0.7%	3.3%	1.7%
Indicators											
Population (Million)	9.86	9.90	9.97	10.16	10.18	10.20	0.2%	0.4%	0.2%	0.2%	0.3%
GDP (bil. EUR 1990)	133.1	144.7	154.5	166.9	171.9	176.9	3.0%	1.6%	3.0%	2.9%	1.7%
Gross Inl Cons./GDP (toe/1990 MEUR)	329.5	315.2	305.9	323.4	320.4	317.6	-1.5%	1.1%	-0.9%	-0.9%	0.5%
Gross Inl Cons./Capita (Kgoe/inhabitant)	4447.3	4607.5	4741.9	5314.2	5410.6	5505.8	1.3%	2.3%	1.8%	1.8%	1.9%
Electricity Generated/Capita (kWh/inhabitant)	5813.5	6598.6	7106.5	7496.0	7747.4	8157.0	4.1%	1.1%	3.4%	5.3%	1.7%
CO ₂ Emissions/Capita (kg of CO ₂ /inhabitant)	10026.9	10270.3	10485.3	11470.6	11366.7	11716.3	0.9%	1.8%	-0.9%	3.1%	1.4%
Import Dependency %	69.3	72.2	75.7	80.3	78.2	81.2	1.8%	1.2%	-2.6%	3.7%	0.9%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Given on an indicative basis; calculated using common emission factors across all countries in the world



DENMARK : SUMMARY ENERGY BALANCE

Mtoe	1985	1988	1990	1996	1997	1998	90/85	96/90	97/96	98/97	98/90
Annual % Change											
Primary Production	4.85	7.88	9.94	17.52	20.27	20.19	15.4%	9.9%	15.6%	-0.4%	9.3%
Solids	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Oil	2.92	4.78	6.06	10.30	11.59	11.66	15.7%	9.2%	12.6%	0.6%	8.5%
Natural gas	0.97	2.11	2.74	5.65	6.96	6.76	23.1%	12.8%	23.2%	-2.8%	12.0%
Nuclear	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Hydro & Wind	0.01	0.03	0.05	0.11	0.17	0.24	51.1%	11.8%	56.7%	43.7%	20.4%
Geothermal	0.00	0.00	0.00	0.00	0.00	0.00	0.5%	-6.5%	56.2%	8.0%	1.5%
Other renewable energy sources	0.96	0.96	1.09	1.47	1.55	1.53	2.7%	5.1%	5.1%	-1.4%	4.2%
Net Imports	15.53	11.17	9.08	6.03	4.20	1.83	-10.2%	-6.6%	-30.3%	-56.6%	-18.2%
Solids	7.70	6.26	6.23	7.65	8.00	4.74	-4.1%	3.5%	4.7%	-40.8%	-3.4%
Oil	8.19	5.28	3.16	1.41	-0.39	-0.04	-17.3%	-12.6%	-	-90.4%	-
Crude oil	4.03	3.10	2.03	0.34	-2.74	-3.62	-12.8%	-25.9%	-	32.2%	-
Oil products	4.16	2.18	1.13	1.07	2.34	3.58	-23.0%	-0.8%	117.9%	52.9%	15.5%
Natural gas	-0.40	-0.74	-0.93	-1.70	-2.78	-2.51	18.5%	10.6%	63.7%	-9.9%	13.2%
Electricity	0.04	0.36	0.61	-1.32	-0.62	-0.37	72.6%	-	-52.9%	-40.4%	-
Gross Inland Consumption	19.60	18.83	18.20	23.23	21.59	21.14	-1.5%	4.2%	-7.1%	-2.1%	1.9%
Solids	7.38	6.87	6.11	8.87	6.66	5.64	-3.7%	6.4%	-25.0%	-15.2%	-1.0%
Oil	10.65	9.21	8.55	10.43	9.98	9.88	-4.3%	3.4%	-4.3%	-1.1%	1.8%
natural gas	0.57	1.39	1.79	3.67	3.86	4.22	25.8%	12.8%	5.1%	9.4%	11.4%
Other (1)	1.00	1.35	1.76	0.26	1.09	1.40	11.8%	-27.4%	325.4%	27.7%	-2.8%
Electricity Generation in TWh	29.04	27.96	25.73	53.55	44.30	41.07	-2.4%	13.0%	-17.3%	-7.3%	6.0%
Nuclear	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Hydro & wind (including pumping)	0.08	0.33	0.64	1.25	1.95	2.81	51.1%	11.8%	56.7%	43.7%	20.4%
Thermal	28.96	27.63	25.10	52.31	42.35	38.27	-2.8%	13.0%	-19.0%	-9.6%	5.4%
Generation Capacity in GWe	8.57	8.44	9.13	11.16	11.81	12.54	1.3%	3.4%	5.9%	6.2%	4.0%
Nuclear	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Hydro & wind	0.06	0.21	0.35	0.85	1.14	1.45	43.5%	15.8%	33.8%	27.5%	19.4%
Thermal	8.52	8.24	8.78	10.31	10.67	11.09	0.6%	2.7%	3.5%	3.9%	3.0%
Average Load Factor in %	38.7	37.8	32.2	54.8	42.8	37.4	-3.6%	9.3%	-21.8%	-12.7%	1.9%
Fuel Inputs for Thermal Power Generation	7.27	6.95	6.35	12.00	9.91	9.02	-2.7%	11.2%	-17.4%	-9.0%	4.5%
Solids	6.49	6.13	5.55	8.55	6.29	5.26	-3.1%	7.5%	-26.4%	-16.4%	-0.7%
Oil	0.35	0.32	0.25	1.68	1.63	1.47	-6.1%	37.1%	-2.9%	-9.7%	24.7%
Gas	0.08	0.14	0.14	1.29	1.49	1.76	12.5%	45.4%	15.5%	18.7%	37.7%
Geothermal	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Biomass	0.36	0.36	0.41	0.49	0.50	0.52	3.0%	2.7%	3.1%	3.7%	2.9%
Average Thermal Efficiency in %	34.3	34.2	34.0	37.5	36.7	36.5	-0.2%	1.6%	-2.0%	-0.7%	0.9%
Non-Energy Uses	0.52	0.44	0.33	0.43	0.43	0.39	-8.7%	4.7%	-0.4%	-9.6%	2.2%
Total Final Energy Demand	14.49	13.87	14.34	15.64	15.13	15.10	-0.2%	1.5%	-3.3%	-0.2%	0.6%
Solids	0.77	0.42	0.46	0.37	0.37	0.34	-9.6%	-3.7%	0.7%	-8.1%	-3.8%
Oil	9.46	7.87	7.59	7.68	7.38	7.33	-4.3%	0.2%	-3.9%	-0.7%	-0.4%
Gas	0.51	0.94	1.13	1.87	1.81	1.86	17.5%	8.8%	-3.5%	3.0%	6.4%
Electricity	2.18	2.41	2.52	2.77	2.74	2.75	2.9%	1.6%	-0.9%	0.3%	1.1%
Heat	1.09	1.75	2.10	2.42	2.27	2.29	14.0%	2.4%	-6.0%	1.0%	1.1%
Renewable energy sources	0.48	0.48	0.54	0.54	0.56	0.52	2.4%	-0.1%	3.6%	-6.4%	-0.5%
CO₂ Emissions in Mt of CO₂ (2)	60.9	56.3	52.7	73.9	64.0	59.8	-2.8%	5.8%	-13.5%	-6.5%	1.6%
Indicators											
Population (Million)	5.11	5.13	5.14	5.26	5.28	5.30	0.1%	0.4%	0.4%	0.3%	0.4%
GDP (bil. EUR 1990)	91.7	100.1	101.6	118.5	122.4	125.7	2.1%	2.6%	3.3%	2.7%	2.7%
Gross Inl Cons./GDP (toe/1990 MEUR)	213.8	188.1	179.2	196.1	176.4	168.2	-3.5%	1.5%	-10.0%	-4.7%	-0.8%
Gross Inl Cons./Capita (Kgoe/inhabitant)	3833.8	3670.8	3541.7	4415.9	4086.6	3987.6	-1.6%	3.7%	-7.5%	-2.4%	1.5%
Electricity Generated/Capita (kWh/inhabitant)	5679.6	5450.8	5010.4	10178.0	8383.6	7748.0	-2.5%	12.5%	-17.6%	-7.6%	5.6%
CO ₂ Emissions/Capita (kg of CO ₂ /inhabitant)	11900.7	10969.0	10247.9	14054.4	12110.0	11282.8	-2.9%	5.4%	-13.8%	-6.8%	1.2%
Import Dependency %	77.6	56.7	47.4	24.4	18.2	8.1	-9.4%	-10.5%	-25.3%	-55.5%	-19.8%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Given on an indicative basis; calculated using common emission factors across all countries in the world

FINLAND : SUMMARY ENERGY BALANCE

Mtoe	1985	1988	1990	1996	1997	1998	90/85	96/90	97/96	98/97	98/90
	Annual % Change										
Primary Production	11.16	11.62	11.74	13.38	14.91	13.28	1.0%	2.2%	11.4%	-10.9%	1.6%
Solids	0.76	1.01	1.46	2.25	2.66	0.43	13.8%	7.5%	18.5%	-83.9%	-14.2%
Oil	0.00	0.00	0.00	0.00	0.00	0.07	-	-	-	-	-
Natural gas	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Nuclear	4.97	5.09	5.01	5.02	5.39	5.37	0.2%	0.1%	7.3%	-0.4%	0.9%
Hydro & Wind	1.06	1.15	0.93	1.02	1.05	1.30	-2.5%	1.5%	3.3%	23.0%	4.2%
Geothermal	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Other renewable energy sources	4.37	4.37	4.34	5.09	5.80	6.11	-0.2%	2.7%	13.9%	5.5%	4.4%
Net Imports	16.10	15.89	18.03	17.23	18.38	18.32	2.3%	-0.8%	6.7%	-0.3%	0.2%
Solids	4.02	3.53	4.38	4.37	4.65	3.15	1.7%	0.0%	6.3%	-32.2%	-4.0%
Oil	10.87	10.33	10.48	9.58	10.17	11.04	-0.7%	-1.5%	6.2%	8.5%	0.7%
Crude oil	9.99	9.11	8.89	9.79	10.28	12.27	-2.3%	1.6%	5.0%	19.3%	4.1%
Oil products	0.88	1.21	1.59	-0.22	-0.11	-1.23	12.6%	-	-47.9%	983.6%	-
Natural gas	0.80	1.40	2.26	2.97	2.91	3.34	23.1%	4.6%	-2.0%	14.8%	5.0%
Electricity	0.40	0.63	0.92	0.31	0.66	0.80	17.8%	-16.3%	109.0%	21.6%	-1.7%
Gross Inland Consumption	26.79	28.35	28.46	30.93	32.51	33.19	1.2%	1.4%	5.1%	2.1%	1.9%
Solids	4.98	5.06	5.07	7.31	6.71	5.44	0.4%	6.3%	-8.2%	-18.9%	0.9%
Oil	10.22	10.64	9.94	9.20	10.00	10.84	-0.6%	-1.3%	8.6%	8.4%	1.1%
natural gas	0.80	1.40	2.26	2.97	2.91	3.34	23.1%	4.6%	-2.0%	14.8%	5.0%
Other (1)	10.80	11.25	11.19	11.45	12.90	13.58	0.7%	0.4%	12.7%	5.3%	2.4%
Electricity Generation in TWh	49.71	53.89	54.37	69.36	69.16	70.16	1.8%	4.1%	-0.3%	1.4%	3.2%
Nuclear	19.06	19.55	19.21	19.47	20.89	21.85	0.2%	0.2%	7.3%	4.6%	1.6%
Hydro & wind (including pumping)	12.33	13.36	10.86	11.87	12.26	15.07	-2.5%	1.5%	3.3%	23.0%	4.2%
Thermal	18.32	20.98	24.30	38.02	36.02	33.24	5.8%	7.7%	-5.3%	-7.7%	4.0%
Generation Capacity in GWe	11.32	11.90	13.22	14.57	15.70	16.14	3.2%	1.6%	7.7%	2.8%	2.5%
Nuclear	2.30	2.35	2.36	2.31	2.55	2.64	0.5%	-0.4%	10.4%	3.5%	1.4%
Hydro & wind	2.51	2.60	2.62	2.79	2.87	2.90	0.9%	1.1%	2.9%	0.9%	1.3%
Thermal	6.51	6.95	8.24	9.47	10.27	10.61	4.8%	2.3%	8.5%	3.2%	3.2%
Average Load Factor in %	50.1	51.7	46.9	54.3	50.3	49.6	-1.3%	2.5%	-7.4%	-1.4%	0.7%
Fuel Inputs for Thermal Power Generation	4.41	5.06	5.41	8.19	8.01	6.83	4.1%	7.2%	-2.2%	-14.7%	3.0%
Solids	2.76	3.01	3.01	5.19	4.80	3.36	1.8%	9.5%	-7.5%	-30.0%	1.4%
Oil	0.17	0.34	0.29	0.41	0.28	0.24	11.6%	5.5%	-29.9%	-16.9%	-2.7%
Gas	0.41	0.63	1.02	1.71	1.52	1.81	19.9%	9.1%	-11.2%	18.9%	7.5%
Geothermal	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Biomass	1.07	1.07	1.09	0.89	1.41	1.43	0.3%	-3.3%	58.7%	1.6%	3.5%
Average Thermal Efficiency in %	35.7	35.7	38.6	39.9	38.7	41.8	1.6%	0.5%	-3.1%	8.2%	1.0%
Non-Energy Uses	1.32	1.93	1.80	0.97	1.24	1.32	6.4%	-9.8%	27.4%	6.8%	-3.8%
Total Final Energy Demand	18.50	20.06	20.90	22.14	22.94	23.63	2.5%	1.0%	3.6%	3.0%	1.5%
Solids	1.27	1.16	1.18	1.01	1.04	1.16	-1.5%	-2.6%	3.7%	11.2%	-0.2%
Oil	7.33	8.01	8.06	7.33	7.27	7.44	1.9%	-1.6%	-0.9%	2.5%	-1.0%
Gas	0.61	1.00	1.51	1.60	1.77	1.72	19.6%	1.0%	10.5%	-2.7%	1.7%
Electricity	4.17	4.74	5.07	5.72	6.05	6.26	4.0%	2.0%	5.8%	3.5%	2.7%
Heat	1.87	1.91	1.91	2.75	2.70	2.52	0.5%	6.2%	-1.8%	-6.7%	3.5%
Renewable energy sources	3.25	3.25	3.18	3.73	4.11	4.52	-0.4%	2.7%	10.0%	10.1%	4.5%
CO₂ Emissions in Mt of CO₂ (2)	46.8	50.1	51.6	60.0	58.7	54.7	2.0%	2.5%	-2.2%	-6.8%	0.7%
Indicators											
Population (Million)	4.90	4.95	4.99	5.12	5.14	5.15	0.3%	0.5%	0.3%	0.3%	0.4%
GDP (bil. EUR 1990)	89.9	100.5	106.2	107.0	113.4	119.4	3.4%	0.1%	6.0%	5.3%	1.5%
Gross Inl Cons./GDP (toe/1990 MEUR)	298.2	282.2	268.1	289.2	286.7	278.0	-2.1%	1.3%	-0.9%	-3.0%	0.5%
Gross Inl Cons./Capita (Kgoe/inhabitant)	5465.4	5730.7	5708.2	6036.4	6325.8	6440.8	0.9%	0.9%	4.8%	1.8%	1.5%
Electricity Generated/Capita (kWh/inhabitant)	10139.7	10893.9	10903.0	13534.7	13456.2	13613.5	1.5%	3.7%	-0.6%	1.2%	2.8%
CO ₂ Emissions/Capita (kg of CO ₂ /inhabitant)	9538.4	10118.4	10352.1	11710.4	11419.7	10609.6	1.7%	2.1%	-2.5%	-7.1%	0.3%
Import Dependency %	59.1	55.1	62.1	55.0	55.8	54.4	1.0%	-2.0%	1.5%	-2.7%	-1.7%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Given on an indicative basis; calculated using common emission factors across all countries in the world





FRANCE : SUMMARY ENERGY BALANCE

Mtoe	1985	1988	1990	1996	1997	1998	90/85	96/90	97/96	98/97	98/90
Annual % Change											
Primary Production	90,29	100,60	108,40	125,67	124,11	120,99	3,7%	2,5%	-1,2%	-2,5%	1,4%
Solids	10,45	8,40	7,63	4,89	4,09	3,42	-6,1%	-7,1%	-16,3%	-16,4%	-9,5%
Oil	3,36	3,44	3,49	2,63	2,48	2,20	0,8%	-4,6%	-5,5%	-11,3%	-5,6%
Natural gas	4,54	2,61	2,42	2,41	2,13	1,84	-11,8%	-0,1%	-11,6%	-13,6%	-3,4%
Nuclear	57,27	70,18	79,13	97,85	98,77	96,64	6,7%	3,6%	0,9%	-2,2%	2,5%
Hydro & Wind	5,38	6,64	4,64	5,65	5,40	5,39	-2,9%	3,4%	-4,4%	-0,2%	1,9%
Geothermal	0,08	0,12	0,12	0,15	0,13	0,12	9,2%	3,6%	-14,8%	-10,7%	-0,8%
Other renewable energy sources	9,21	9,21	10,97	12,09	11,11	11,38	3,6%	1,6%	-8,1%	2,4%	0,5%
Net Imports	111,73	110,13	119,75	124,31	122,07	132,68	1,4%	0,6%	-1,8%	8,7%	1,3%
Solids	12,55	7,81	13,00	10,72	9,68	14,20	0,7%	-3,2%	-9,7%	46,7%	1,1%
Oil	81,08	84,52	86,55	89,89	88,66	93,31	1,3%	0,6%	-1,4%	5,2%	0,9%
Crude oil	75,98	74,73	76,00	84,14	87,95	89,98	0,0%	1,7%	4,5%	2,3%	2,1%
Oil products	5,10	9,79	10,55	5,76	0,72	3,32	15,7%	-9,6%	-87,6%	363,8%	-13,5%
Natural gas	20,11	20,98	24,10	29,62	29,35	30,13	3,7%	3,5%	-0,9%	2,7%	2,8%
Electricity	-2,01	-3,18	-3,91	-5,92	-5,62	-4,95	14,2%	7,2%	-5,0%	-12,0%	3,0%
Gross Inland Consumption	202,43	209,06	223,19	248,99	243,15	251,91	2,0%	1,8%	-2,3%	3,6%	1,5%
Solids	24,40	18,27	19,96	16,25	14,58	18,29	-3,9%	-3,4%	-10,3%	25,5%	-1,1%
Oil	83,90	84,47	87,67	90,22	87,44	91,63	0,9%	0,5%	-3,1%	4,8%	0,6%
natural gas	24,19	23,34	24,61	32,69	31,34	33,41	0,3%	4,8%	-4,1%	6,6%	3,9%
Other (1)	69,93	82,98	90,95	109,83	109,79	108,58	5,4%	3,2%	0,0%	-1,1%	2,2%
Electricity Generation in TWh	344,24	391,86	420,08	512,32	503,63	510,24	4,1%	3,4%	-1,7%	1,3%	2,5%
Nuclear	224,06	275,47	314,02	397,27	395,41	387,92	7,0%	4,0%	-0,5%	-1,9%	2,7%
Hydro & wind (including pumping)	64,25	78,77	57,91	70,78	68,01	66,66	-2,1%	3,4%	-3,9%	-2,0%	1,8%
Thermal	55,92	37,62	48,14	44,27	40,21	55,66	-3,0%	-1,4%	-9,2%	38,4%	1,8%
Generation Capacity in GWe	86,56	100,62	103,41	109,70	113,91	112,34	3,6%	1,0%	3,8%	-1,4%	1,0%
Nuclear	37,49	52,43	55,75	59,97	62,88	61,68	8,3%	1,2%	4,8%	-1,9%	1,3%
Hydro & wind	21,83	24,65	24,99	25,32	25,10	25,11	2,7%	0,2%	-0,9%	0,0%	0,1%
Thermal	27,24	23,54	22,67	24,41	25,93	25,56	-3,6%	1,2%	6,2%	-1,4%	1,5%
Average Load Factor in %	45,4	44,5	46,4	53,3	50,5	51,8	0,4%	2,4%	-5,3%	2,7%	1,4%
Fuel Inputs for Thermal Power Generation	13,17	9,01	11,93	9,53	9,78	13,45	-2,0%	-3,7%	2,6%	37,5%	1,5%
Solids	9,32	5,85	7,37	5,76	5,28	7,91	-4,6%	-4,0%	-8,2%	49,8%	0,9%
Oil	1,61	1,03	1,84	0,59	1,17	2,05	2,8%	-17,3%	97,4%	76,1%	1,4%
Gas	1,53	1,41	1,42	1,28	1,50	1,60	-1,5%	-1,7%	17,1%	6,6%	1,5%
Geothermal	0,00	0,00	0,00	0,00	0,00	0,00	-	-	-	-	-
Biomass	0,72	0,72	1,29	1,90	1,83	1,88	12,6%	6,6%	-3,7%	2,7%	4,8%
Average Thermal Efficiency in %	36,5	35,9	34,7	39,9	35,3	35,6	-1,0%	2,4%	-11,5%	0,7%	0,3%
Non-Energy Uses	11,91	12,63	13,08	16,67	17,61	15,63	1,9%	4,1%	5,6%	-11,3%	2,3%
Total Final Energy Demand	129,79	131,33	136,19	148,83	146,64	150,46	1,0%	1,5%	-1,5%	2,6%	1,3%
Solids	10,89	9,36	9,05	6,94	7,04	6,71	-3,6%	-4,3%	1,4%	-4,7%	-3,7%
Oil	65,80	66,63	67,57	70,92	70,11	72,23	0,5%	0,8%	-1,1%	3,0%	0,8%
Gas	22,70	22,51	23,69	29,92	29,43	30,23	0,9%	4,0%	-1,6%	2,7%	3,1%
Electricity	21,75	24,09	25,96	30,57	30,54	31,57	3,6%	2,8%	-0,1%	3,4%	2,5%
Heat	0,08	0,12	0,12	0,15	0,13	0,12	9,2%	3,6%	-14,8%	-10,7%	-0,8%
Renewable energy sources	8,57	8,62	9,79	10,32	9,40	9,60	2,7%	0,9%	-9,0%	2,2%	-0,3%
CO₂ Emissions in Mt of CO₂ (2)	360,0	338,5	352,4	360,7	358,1	379,1	-0,4%	0,4%	-0,7%	5,9%	0,9%
Indicators											
Population (Million)	55,28	56,12	56,74	58,37	58,61	58,85	0,5%	0,5%	0,4%	0,4%	0,5%
GDP (bil. EUR 1990)	811,0	885,0	940,0	1000,7	1022,7	1055,4	3,0%	1,0%	2,2%	3,2%	1,5%
Gross Inl Cons./GDP (toe/1990 MEUR)	249,6	236,2	237,4	248,8	237,7	238,7	-1,0%	0,8%	-4,4%	0,4%	0,1%
Gross Inl Cons./Capita (Kgoe/inhabitant)	3661,5	3725,3	3933,9	4265,4	4148,6	4280,8	1,4%	1,4%	-2,7%	3,2%	1,1%
Electricity Generated/Capita (kWh/inhabitant)	6226,7	6982,7	7404,2	8776,3	8593,1	8670,6	3,5%	2,9%	-2,1%	0,9%	2,0%
CO ₂ Emissions/Capita (kg of CO ₂ /inhabitant)	6511,1	6032,0	6211,9	6178,3	6110,5	6442,8	-0,9%	-0,1%	-1,1%	5,4%	0,5%
Import Dependency %	54,6	52,1	53,1	49,4	49,6	52,1	-0,6%	-1,2%	0,4%	5,0%	-0,2%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Given on an indicative basis; calculated using common emission factors across all countries in the world



GERMANY : SUMMARY ENERGY BALANCE

Mtoe	1985	1988	1990	1996	1997	1998	90/85	96/90	97/96	98/97	98/90
Annual % Change											
Primary Production	209.40	202.89	185.90	138.42	138.36	131.95	-2.4%	-4.8%	0.0%	-4.6%	-4.2%
Solids	148.32	138.73	125.04	73.79	70.64	65.69	-3.4%	-8.4%	-4.3%	-7.0%	-7.7%
Oil	4.25	3.98	3.75	3.16	3.04	3.18	-2.4%	-2.8%	-3.9%	4.6%	-2.1%
Natural gas	16.30	15.39	13.73	16.12	16.08	15.67	-3.4%	2.7%	-0.2%	-2.5%	1.7%
Nuclear	34.87	38.89	37.67	38.92	41.11	38.91	1.6%	0.5%	5.6%	-5.4%	0.4%
Hydro & Wind	1.35	1.59	1.39	1.90	1.75	1.91	0.5%	5.3%	-7.6%	8.7%	4.0%
Geothermal	0.01	0.01	0.01	0.01	0.01	0.01	0.2%	5.4%	1.8%	0.0%	4.3%
Other renewable energy sources	4.30	4.31	4.31	4.52	5.73	6.59	0.0%	0.8%	26.8%	14.9%	5.4%
Net Imports	152.52	163.81	165.28	207.78	208.35	212.77	1.6%	3.9%	0.3%	2.1%	3.2%
Solids	-0.07	2.27	3.27	12.41	14.86	17.35	-	24.9%	19.7%	16.8%	23.2%
Oil	117.91	123.61	120.13	135.77	135.53	139.44	0.4%	2.1%	-0.2%	2.9%	1.9%
Crude oil	83.77	91.15	88.51	103.04	98.06	109.09	1.1%	2.6%	-4.8%	11.2%	2.6%
Oil products	34.15	32.46	31.62	32.73	37.48	30.35	-1.5%	0.6%	14.5%	-19.0%	-0.5%
Natural gas	34.44	37.75	41.82	60.06	58.16	56.04	4.0%	6.2%	-3.2%	-3.6%	3.7%
Electricity	0.23	0.18	0.07	-0.45	-0.20	-0.05	-21.6%	-	-55.4%	-72.8%	-
Gross Inland Consumption	359.65	363.09	354.02	347.74	344.15	343.17	-0.3%	-0.3%	-1.0%	-0.3%	-0.4%
Solids	148.01	140.86	131.52	90.92	86.72	85.43	-2.3%	-6.0%	-4.6%	-1.5%	-5.3%
Oil	121.30	124.54	124.05	136.85	137.07	137.66	0.4%	1.6%	0.2%	0.4%	1.3%
natural gas	49.58	52.72	55.00	75.08	71.95	72.73	2.1%	5.3%	-4.2%	1.1%	3.6%
Other (1)	40.76	44.97	43.45	44.90	48.41	47.36	1.3%	0.6%	7.8%	-2.2%	1.1%
Electricity Generation in TWh	520.89	547.96	548.69	554.90	551.47	556.65	1.0%	0.2%	-0.6%	0.9%	0.2%
Nuclear	138.62	156.79	152.44	161.58	170.30	161.61	1.9%	1.0%	5.4%	-5.1%	0.7%
Hydro & wind (including pumping)	17.82	21.02	18.63	26.74	23.93	26.18	0.9%	6.2%	-10.5%	9.4%	4.3%
Thermal	364.46	370.15	377.62	366.58	357.24	368.86	0.7%	-0.5%	-2.5%	3.3%	-0.3%
Generation Capacity in GWe	114.67	119.41	121.17	114.90	113.98	113.62	1.1%	-0.9%	-0.8%	-0.3%	-0.8%
Nuclear	17.92	23.32	24.24	22.91	22.31	22.31	6.2%	-0.9%	-2.6%	0.0%	-1.0%
Hydro & wind	8.54	8.70	8.76	10.49	10.81	11.53	0.5%	3.0%	3.1%	6.7%	3.5%
Thermal	88.21	87.39	88.18	81.50	80.86	79.78	0.0%	-1.3%	-0.8%	-1.3%	-1.2%
Average Load Factor in %	51.9	52.4	51.7	55.1	55.2	55.9	-0.1%	1.1%	0.2%	1.3%	1.0%
Fuel Inputs for Thermal Power Generation	88.87	89.24	89.81	85.57	79.91	81.38	0.2%	-0.8%	-6.6%	1.8%	-1.2%
Solids	77.50	76.03	75.54	67.75	64.10	66.53	-0.5%	-1.8%	-5.4%	3.8%	-1.6%
Oil	2.56	3.18	2.86	1.68	1.32	1.23	2.3%	-8.5%	-21.4%	-6.4%	-10.0%
Gas	7.62	8.84	10.16	14.84	13.28	12.48	5.9%	6.5%	-10.5%	-6.0%	2.6%
Geothermal	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Biomass	1.19	1.19	1.24	1.30	1.21	1.14	0.8%	0.7%	-6.6%	-6.1%	-1.1%
Average Thermal Efficiency in %	35.3	35.7	36.2	36.8	38.4	39.0	0.5%	0.3%	4.3%	1.4%	0.9%
Non-Energy Uses	21.05	22.73	22.78	23.10	23.93	24.88	1.6%	0.2%	3.6%	4.0%	1.1%
Total Final Energy Demand	234.71	234.99	227.31	228.62	223.95	223.61	-0.6%	0.1%	-2.0%	-0.2%	-0.2%
Solids	48.62	43.06	37.15	13.75	13.36	11.28	-5.2%	-15.3%	-2.8%	-15.6%	-13.8%
Oil	95.44	98.46	96.81	106.69	105.32	104.76	0.3%	1.6%	-1.3%	-0.5%	1.0%
Gas	41.52	42.54	42.72	57.32	52.74	53.88	0.6%	5.0%	-8.0%	2.2%	2.9%
Electricity	36.51	38.40	38.39	39.38	39.70	40.11	1.0%	0.4%	0.8%	1.0%	0.5%
Heat	9.51	9.41	9.16	8.75	8.75	8.75	-0.7%	-0.8%	0.0%	0.0%	-0.6%
Renewable energy sources	3.12	3.12	3.07	2.73	4.08	4.84	-0.3%	-1.9%	49.2%	18.6%	5.8%
CO₂ Emissions in Mt of CO₂ (2)	997.1	982.0	947.4	869.9	827.1	827.7	-1.0%	-1.4%	-4.9%	0.1%	-1.7%
Indicators											
Population (Million)	77.67	78.12	79.36	81.90	82.05	82.02	0.4%	0.5%	0.2%	0.0%	0.4%
GDP (bil. EUR 1990)	1140.8	1233.0	1297.4	1423.4	1454.7	1495.5	2.6%	1.6%	2.2%	2.8%	1.8%
Gross Inl Cons./GDP (toe/1990 MEUR)	315.3	294.5	272.9	244.3	236.6	229.5	-2.8%	-1.8%	-3.2%	-3.0%	-2.1%
Gross Inl Cons./Capita (Kgoe/inhabitant)	4630.4	4648.0	4460.6	4246.2	4194.3	4183.8	-0.7%	-0.8%	-1.2%	-0.3%	-0.8%
Electricity Generated/Capita (kWh/inhabitant)	6706.5	7014.7	6913.5	6775.5	6721.0	6786.4	0.6%	-0.3%	-0.8%	1.0%	-0.2%
CO ₂ Emissions/Capita (kg of CO ₂ /inhabitant)	12837.0	12570.5	11937.2	10622.0	10080.8	10091.3	-1.4%	-1.9%	-5.1%	0.1%	-2.1%
Import Dependency %	42.0	44.8	46.4	59.4	60.2	61.6	2.0%	4.2%	1.3%	2.4%	3.6%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Given on an indicative basis; calculated using common emission factors across all countries in the world





GREECE - SUMMARY ENERGY BALANCE

Mtoe	1985	1988	1990	1996	1997	1998	90/85	96/90	97/96	98/97	98/90
	Annual % Change										
Primary Production	7.34	8.63	9.15	10.14	9.95	10.06	4.5%	1.7%	-1.9%	1.2%	1.2%
Solids	4.84	6.29	7.08	8.20	8.07	8.35	7.9%	2.5%	-1.6%	3.5%	2.1%
Oil	1.32	1.12	0.83	0.51	0.47	0.32	-8.8%	-7.7%	-9.4%	-32.2%	-11.4%
Natural gas	0.07	0.13	0.14	0.05	0.04	0.04	14.0%	-16.6%	-3.1%	-10.2%	-14.2%
Nuclear	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Hydro & Wind	0.24	0.20	0.15	0.38	0.34	0.33	-8.8%	16.3%	-10.6%	-3.3%	10.0%
Geothermal	0.00	0.00	0.00	0.00	0.00	0.00	14.9%	1.1%	-14.8%	7.1%	-0.4%
Other renewable energy sources	0.86	0.88	0.95	1.00	1.02	1.03	1.9%	0.9%	2.2%	0.2%	1.0%
Net Imports	11.81	13.62	15.37	18.83	19.19	21.11	5.4%	3.4%	1.9%	10.0%	4.0%
Solids	1.23	0.86	0.99	1.17	0.76	0.85	-4.3%	2.8%	-34.5%	11.2%	-1.9%
Oil	10.52	12.74	14.32	17.54	18.10	19.43	6.4%	3.4%	3.2%	7.3%	3.9%
Crude oil	10.54	14.39	14.71	18.32	18.40	19.28	6.9%	3.7%	0.4%	4.8%	3.4%
Oil products	-0.02	-1.65	-0.39	-0.78	-0.29	0.15	83.4%	12.5%	-62.7%	-	-
Natural gas	0.00	0.00	0.00	0.01	0.13	0.69	-	-	1585.4%	433.7%	-
Electricity	0.06	0.03	0.06	0.12	0.20	0.14	-0.7%	11.3%	69.9%	-29.8%	10.8%
Gross Inland Consumption	18.34	20.16	22.24	25.41	25.61	26.90	3.9%	2.2%	0.8%	5.0%	2.4%
Solids	6.08	7.42	8.09	8.95	8.82	9.16	5.9%	1.7%	-1.5%	3.8%	1.6%
Oil	11.01	11.50	12.85	14.91	15.06	15.53	3.1%	2.5%	1.0%	3.1%	2.4%
natural gas	0.07	0.13	0.14	0.05	0.17	0.73	14.0%	-15.7%	246.9%	324.2%	23.1%
Other (1)	1.17	1.11	1.17	1.50	1.56	1.49	-0.1%	4.3%	4.2%	-4.4%	3.1%
Electricity Generation in TWh	27.74	33.40	34.99	42.55	43.50	46.32	4.8%	3.3%	2.2%	6.5%	3.6%
Nuclear	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Hydro & wind (including pumping)	2.80	2.60	2.00	4.54	4.13	3.94	-6.6%	14.7%	-9.0%	-4.7%	8.9%
Thermal	24.93	30.79	33.00	38.01	39.37	42.39	5.8%	2.4%	3.6%	7.7%	3.2%
Generation Capacity in GWe	7.13	8.12	8.51	9.12	9.58	10.02	3.6%	1.2%	5.0%	4.6%	2.1%
Nuclear	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Hydro & wind	2.03	2.15	2.41	2.55	2.76	2.89	3.5%	0.9%	8.1%	5.0%	2.3%
Thermal	5.10	5.97	6.10	6.57	6.82	7.12	3.7%	1.2%	3.8%	4.4%	2.0%
Average Load Factor in %	44.4	46.9	46.9	53.2	51.9	52.8	1.1%	2.1%	-2.6%	1.8%	1.5%
Fuel Inputs for Thermal Power Generation	6.44	7.72	8.72	10.01	9.15	10.45	6.2%	2.3%	-8.6%	14.2%	2.3%
Solids	4.81	6.23	6.89	7.97	7.11	8.19	7.5%	2.5%	-10.8%	15.1%	2.2%
Oil	1.63	1.47	1.80	2.02	1.96	1.90	1.9%	2.0%	-2.8%	-3.0%	0.7%
Gas	0.00	0.02	0.03	0.02	0.07	0.35	-	-10.1%	326.9%	402.1%	35.4%
Geothermal	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Biomass	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Average Thermal Efficiency in %	33.3	34.3	32.5	32.7	37.0	34.9	-0.4%	0.1%	13.4%	-5.7%	0.9%
Non-Energy Uses	0.54	0.52	0.64	0.45	0.49	0.58	3.2%	-5.5%	7.6%	19.3%	-1.1%
Total Final Energy Demand	12.52	13.72	14.54	16.88	17.28	18.19	3.0%	2.5%	2.4%	5.2%	2.8%
Solids	1.28	1.20	1.07	1.08	0.96	0.96	-3.5%	0.1%	-10.6%	0.0%	-1.3%
Oil	8.29	9.29	10.05	11.72	12.02	12.67	3.9%	2.6%	2.6%	5.4%	2.9%
Gas	0.01	0.01	0.01	0.02	0.08	0.14	11.2%	3.1%	347.5%	77.8%	32.6%
Electricity	2.05	2.31	2.45	3.06	3.19	3.38	3.6%	3.8%	4.3%	6.0%	4.1%
Heat	0.00	0.00	0.00	0.00	0.00	0.00	14.9%	1.1%	-14.8%	7.1%	-0.4%
Renewable energy sources	0.89	0.91	0.95	1.01	1.03	1.03	1.4%	0.9%	2.2%	0.2%	1.0%
CO₂ Emissions in Mt of CO₂ (2)	56.7	65.5	70.9	81.7	78.7	85.8	4.6%	2.4%	-3.7%	9.0%	2.4%
Indicators											
Population (Million)	9.93	10.04	10.16	10.48	10.50	10.52	0.5%	0.5%	0.2%	0.2%	0.4%
GDP (bil. EUR 1990)	59.5	62.8	65.3	71.1	73.3	76.0	1.9%	1.4%	3.2%	3.7%	1.9%
Gross Inl Cons./GDP (toe/1990 MEUR)	308.4	321.0	340.9	357.5	349.2	353.8	2.0%	0.8%	-2.3%	1.3%	0.5%
Gross Inl Cons./Capita (Kgoe/inhabitant)	1845.9	2009.0	2189.3	2425.8	2439.1	2556.5	3.5%	1.7%	0.6%	4.8%	2.0%
Electricity Generated/Capita (kWh/inhabitant)	2791.8	3327.6	3444.2	4061.5	4143.2	4402.6	4.3%	2.8%	2.0%	6.3%	3.1%
CO ₂ Emissions/Capita (kg of CO ₂ /inhabitant)	5706.6	6521.0	6979.6	7803.6	7497.5	8157.5	4.1%	1.9%	-3.9%	8.8%	2.0%
Import Dependency %	60.7	61.3	62.1	66.0	66.8	69.5	0.4%	1.0%	1.2%	4.0%	1.4%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Given on an indicative basis; calculated using common emission factors across all countries in the world

IRELAND : SUMMARY ENERGY BALANCE

Mtoe	1985	1988	1990	1996	1997	1998	90/85	96/90	97/96	98/97	98/90
	Annual % Change										
Primary Production	2.86	3.31	3.50	3.61	2.84	2.48	4.1%	0.6%	-21.3%	-12.8%	-4.2%
Solids	0.76	1.53	1.43	1.26	0.74	0.81	13.4%	-2.1%	-41.3%	9.9%	-6.9%
Oil	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Natural gas	1.94	1.63	1.89	2.17	1.91	1.41	-0.5%	2.3%	-12.1%	-26.2%	-3.6%
Nuclear	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Hydro & Wind	0.07	0.07	0.06	0.06	0.06	0.09	-3.4%	0.9%	-1.1%	49.0%	5.7%
Geothermal	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.0%	0.0%	-
Other renewable energy sources	0.08	0.08	0.11	0.12	0.14	0.17	5.2%	2.2%	10.0%	22.5%	5.5%
Net Imports	5.32	6.26	7.08	8.34	9.49	10.63	5.9%	2.8%	13.8%	12.0%	5.2%
Solids	1.26	2.29	2.08	1.78	1.95	1.82	10.5%	-2.6%	9.9%	-6.7%	-1.6%
Oil	4.06	3.97	5.00	6.09	6.67	7.40	4.3%	3.3%	9.6%	10.9%	5.0%
Crude oil	1.25	1.38	2.02	2.18	2.92	3.15	10.0%	1.3%	33.9%	8.2%	5.7%
Oil products	2.81	2.59	2.99	3.91	3.75	4.25	1.2%	4.6%	-4.0%	13.1%	4.5%
Natural gas	0.00	0.00	0.00	0.48	0.87	1.40	-	-	79.0%	61.3%	-
Electricity	0.00	0.00	0.00	-0.01	0.00	0.01	-	-	-90.7%	-	-
Gross Inland Consumption	8.83	9.52	10.19	11.69	12.25	13.04	2.9%	2.3%	4.8%	6.5%	3.1%
Solids	2.58	3.69	3.53	3.00	2.87	2.85	6.5%	-2.7%	-4.6%	-0.6%	-2.7%
Oil	4.15	4.05	4.59	5.86	6.42	7.12	2.1%	4.1%	9.5%	11.1%	5.6%
natural gas	1.95	1.63	1.89	2.65	2.77	2.80	-0.5%	5.8%	4.5%	1.1%	5.0%
Other (1)	0.15	0.16	0.17	0.18	0.20	0.27	1.6%	0.7%	12.4%	35.0%	5.9%
Electricity Generation in TWh	12.09	13.23	14.51	19.18	19.96	21.15	3.7%	4.8%	4.1%	6.0%	4.8%
Nuclear	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Hydro & wind (including pumping)	1.18	1.20	0.98	1.00	0.99	1.36	-3.6%	0.2%	-0.4%	36.9%	4.1%
Thermal	10.91	12.02	13.53	18.18	18.97	19.79	4.4%	5.0%	4.3%	4.4%	4.9%
Generation Capacity in GWe	3.19	3.81	3.82	4.41	4.25	4.40	3.7%	2.4%	-3.5%	3.6%	1.8%
Nuclear	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Hydro & wind	0.51	0.51	0.52	0.53	0.53	0.53	0.4%	0.4%	-0.4%	0.0%	0.3%
Thermal	2.68	3.30	3.30	3.87	3.72	3.87	4.2%	2.7%	-3.9%	4.1%	2.0%
Average Load Factor in %	43.2	39.6	43.4	49.7	53.6	54.8	0.1%	2.3%	7.8%	2.3%	3.0%
Fuel Inputs for Thermal Power Generation	2.63	2.82	2.95	4.11	4.27	4.51	2.4%	5.7%	3.9%	5.5%	5.4%
Solids	0.82	1.83	1.78	2.15	2.07	2.04	16.8%	3.3%	-3.7%	-1.8%	1.7%
Oil	0.54	0.25	0.34	0.62	0.79	1.09	-8.8%	10.6%	27.9%	37.8%	15.8%
Gas	1.27	0.75	0.84	1.33	1.39	1.35	-7.9%	8.0%	4.2%	-2.5%	6.1%
Geothermal	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Biomass	0.00	0.00	0.00	0.01	0.02	0.03	-	-	115.3%	38.5%	-
Average Thermal Efficiency in %	35.7	36.6	39.4	38.0	38.2	37.7	2.0%	-0.6%	0.4%	-1.1%	-0.5%
Non-Energy Uses	0.53	0.58	0.66	0.60	0.80	0.72	4.5%	-1.4%	32.4%	-9.3%	1.2%
Total Final Energy Demand	6.22	6.71	7.06	8.23	8.68	9.22	2.6%	2.6%	5.5%	6.3%	3.4%
Solids	1.77	1.87	1.56	0.93	0.86	0.86	-2.4%	-8.3%	-6.9%	-0.8%	-7.2%
Oil	3.24	3.43	3.79	4.96	5.34	5.75	3.2%	4.6%	7.7%	7.7%	5.3%
Gas	0.29	0.41	0.57	0.87	0.87	0.96	14.9%	7.2%	0.1%	10.4%	6.7%
Electricity	0.84	0.92	1.02	1.36	1.44	1.52	4.0%	4.9%	5.3%	5.9%	5.1%
Heat	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.0%	0.0%	-
Renewable energy sources	0.08	0.08	0.11	0.11	0.17	0.14	5.2%	0.8%	50.5%	-20.2%	2.9%
CO₂ Emissions in Mt of CO₂ (2)	26.1	29.2	29.8	34.9	36.2	38.4	2.7%	2.7%	3.7%	5.9%	3.2%
Indicators											
Population (Million)	3.54	3.53	3.51	3.63	3.66	3.72	-0.2%	0.6%	1.0%	1.6%	0.7%
GDP (bil. EUR 1990)	27.4	31.2	35.9	52.2	57.8	64.7	5.5%	6.5%	10.6%	11.9%	7.7%
Gross Inl Cons./GDP (toe/1990 MEUR)	322.4	304.9	284.2	223.8	212.0	201.7	-2.5%	-3.9%	-5.3%	-4.9%	-4.2%
Gross Inl Cons./Capita (Kgoe/inhabitant)	2494.6	2697.6	2906.7	3223.7	3346.7	3506.6	3.1%	1.7%	3.8%	4.8%	2.4%
Electricity Generated/Capita (kWh/inhabitant)	3414.1	3745.9	4139.5	5288.8	5452.0	5686.8	3.9%	4.2%	3.1%	4.3%	4.0%
CO ₂ Emissions/Capita (kg of CO ₂ /inhabitant)	7362.8	8273.3	8486.0	9629.8	9894.0	10313.3	2.9%	2.1%	2.7%	4.2%	2.5%
Import Dependency %	60.1	65.6	69.4	70.4	76.5	80.5	2.9%	0.2%	8.7%	5.2%	1.9%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Given on an indicative basis; calculated using common emission factors across all countries in the world



ITALY : SUMMARY ENERGY BALANCE

Mtoe	1985	1988	1990	1996	1997	1998	90/85	96/90	97/96	98/97	98/90
Annual % Change											
Primary Production	24.94	27.43	27.41	31.63	35.16	34.58	1.9%	2.4%	11.2%	-1.7%	2.9%
Solids	0.33	0.29	0.34	0.07	0.03	0.01	0.3%	-22.2%	-65.5%	-76.5%	-39.5%
Oil	2.41	4.86	4.70	5.52	6.00	5.67	14.3%	2.7%	8.8%	-5.5%	2.4%
Natural gas	11.54	13.50	14.03	16.36	15.78	15.57	4.0%	2.6%	-3.6%	-1.3%	1.3%
Nuclear	1.98	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Hydro & Wind	3.53	3.50	2.72	3.62	3.59	3.56	-5.1%	4.9%	-0.8%	-0.6%	3.4%
Geothermal	1.70	1.84	2.07	2.52	2.61	2.80	4.1%	3.3%	3.5%	7.3%	3.8%
Other renewable energy sources	3.44	3.44	3.55	3.54	7.16	6.97	0.6%	0.0%	102.2%	-2.6%	8.8%
Net Imports	114.41	120.25	131.96	134.45	134.23	140.37	2.9%	0.3%	-0.2%	4.6%	0.8%
Solids	14.77	13.24	13.79	11.45	10.64	11.55	-1.4%	-3.1%	-7.1%	8.6%	-2.2%
Oil	81.57	84.81	89.88	89.36	88.28	90.43	2.0%	-0.1%	-1.2%	2.4%	0.1%
Crude oil	75.20	78.25	84.28	82.43	88.08	92.35	2.3%	-0.4%	6.9%	4.8%	1.1%
Oil products	6.36	6.56	5.60	6.93	0.20	-1.92	-2.5%	3.6%	-97.1%	-	-
Natural gas	16.04	19.51	25.31	30.43	31.98	34.89	9.6%	3.1%	5.1%	9.1%	4.1%
Electricity	2.04	2.69	2.98	3.21	3.34	3.50	7.9%	1.3%	3.9%	4.9%	2.0%
Gross Inland Consumption	136.05	147.03	154.79	162.44	168.05	172.58	2.6%	0.8%	3.5%	2.7%	1.4%
Solids	15.16	13.92	14.64	11.28	11.22	11.71	-0.7%	-4.3%	-0.6%	4.4%	-2.8%
Oil	81.01	88.08	89.81	92.20	92.66	92.91	2.1%	0.4%	0.5%	0.3%	0.4%
natural gas	27.20	33.57	39.02	46.07	47.49	51.13	7.5%	2.8%	3.1%	7.7%	3.4%
Other (1)	12.69	11.47	11.32	12.90	16.69	16.84	-2.3%	2.2%	29.5%	0.8%	5.1%
Electricity Generation in TWh	185.71	203.52	216.85	244.38	251.42	259.74	3.1%	2.0%	2.9%	3.3%	2.3%
Nuclear	7.02	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Hydro & wind (including pumping)	44.59	43.54	35.07	47.10	46.66	47.59	-4.7%	5.0%	-0.9%	2.0%	3.9%
Thermal	134.10	159.99	181.78	197.28	204.76	212.15	6.3%	1.4%	3.8%	3.6%	2.0%
Generation Capacity in GWe	55.51	55.62	56.56	68.18	70.25	72.35	0.4%	3.2%	3.0%	3.0%	3.1%
Nuclear	1.15	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Hydro & wind	17.82	17.94	18.77	19.95	20.07	20.22	1.0%	1.0%	0.6%	0.8%	0.9%
Thermal	36.54	37.68	37.79	48.23	50.19	52.13	0.7%	4.1%	4.1%	3.9%	4.1%
Average Load Factor in %	38.2	41.8	43.8	40.9	40.9	41.0	2.8%	-1.1%	-0.1%	0.3%	-0.8%
Fuel Inputs for Thermal Power Generation	30.07	35.38	39.77	42.28	43.47	44.62	5.8%	1.0%	2.8%	2.7%	1.4%
Solids	5.94	6.68	7.07	4.89	4.51	4.95	3.6%	-6.0%	-7.6%	9.6%	-4.4%
Oil	16.20	19.14	21.53	24.15	23.26	21.93	5.8%	1.9%	-3.7%	-5.7%	0.2%
Gas	5.92	7.41	8.90	10.60	12.52	14.58	8.5%	3.0%	18.0%	16.5%	6.4%
Geothermal	1.70	1.84	1.87	2.31	2.40	2.59	2.0%	3.6%	3.8%	7.9%	4.1%
Biomass	0.31	0.31	0.40	0.33	0.78	0.59	5.2%	-3.1%	136.6%	-24.8%	5.0%
Average Thermal Efficiency in %	38.4	38.9	39.3	40.1	40.5	40.9	0.5%	0.3%	1.0%	0.9%	0.5%
Non-Energy Uses	8.41	10.14	9.84	13.51	14.18	10.74	3.2%	5.4%	5.0%	-24.3%	1.1%
Total Final Energy Demand	96.51	104.99	110.62	117.50	121.43	123.74	2.8%	1.0%	3.3%	1.9%	1.4%
Solids	5.12	3.86	4.28	3.72	3.87	3.94	-3.6%	-2.3%	3.9%	1.8%	-1.0%
Oil	52.58	55.37	54.69	53.92	54.42	54.50	0.8%	-0.2%	0.9%	0.1%	0.0%
Gas	20.74	25.59	29.68	35.57	35.03	36.59	7.4%	3.1%	-1.5%	4.5%	2.7%
Electricity	14.93	17.03	18.41	20.65	21.31	21.90	4.3%	1.9%	3.2%	2.8%	2.2%
Heat	0.00	0.00	0.20	0.21	0.21	0.21	-	1.0%	0.0%	0.0%	0.7%
Renewable energy sources	3.13	3.13	3.35	3.42	6.58	6.59	1.4%	0.3%	92.7%	0.0%	8.8%
CO₂ Emissions in Mt of CO₂ (2)	337.6	367.4	388.6	399.1	400.2	408.8	2.9%	0.4%	0.3%	2.1%	0.6%
Indicators											
Population (Million)	56.59	56.63	56.72	57.40	57.51	57.59	0.0%	0.2%	0.2%	0.1%	0.2%
GDP (bil. EUR 1990)	744.0	819.3	861.2	916.6	930.4	943.4	3.0%	1.0%	1.5%	1.4%	1.1%
Gross Inl Cons./GDP (toe/1990 MEUR)	182.9	179.5	179.7	177.2	180.6	182.9	-0.3%	-0.2%	1.9%	1.3%	0.2%
Gross Inl Cons./Capita (Kgoe/inhabitant)	2404.0	2596.4	2729.1	2830.2	2922.1	2996.8	2.6%	0.6%	3.2%	2.6%	1.2%
Electricity Generated/Capita (kWh/inhabitant)	3281.4	3594.0	3823.3	4257.1	4371.5	4510.3	3.1%	1.8%	2.7%	3.2%	2.1%
CO ₂ Emissions/Capita (kg of CO ₂ /inhabitant)	5964.8	6487.3	6850.6	6953.7	6958.2	7098.3	2.8%	0.2%	0.1%	2.0%	0.4%
Import Dependency %	82.0	80.1	83.8	81.6	78.8	80.1	0.4%	-0.4%	-3.5%	1.7%	-0.6%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Given on an indicative basis; calculated using common emission factors across all countries in the world

LUXEMBOURG : SUMMARY ENERGY BALANCE

Mtoe	1985	1988	1990	1996	1997	1998	90/85	96/90	97/96	98/97	98/90
Annual % Change											
Primary Production	0.05	0.05	0.05	0.04	0.05	0.05	-1.2%	-2.6%	17.3%	7.6%	1.0%
Solids	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Oil	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Natural gas	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Nuclear	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Hydro & Wind	0.01	0.01	0.01	0.01	0.01	0.01	-2.2%	-2.1%	38.3%	51.8%	8.0%
Geothermal	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Other renewable energy sources	0.04	0.04	0.04	0.03	0.04	0.04	-1.0%	-2.6%	14.1%	-0.4%	-0.4%
Net Imports	3.10	3.09	3.52	3.38	3.30	3.25	2.5%	-0.7%	-2.4%	-1.3%	-1.0%
Solids	1.42	1.10	1.13	0.49	0.31	0.11	-4.5%	-13.1%	-35.8%	-65.9%	-25.6%
Oil	1.07	1.32	1.62	1.86	1.91	2.05	8.6%	2.3%	2.9%	7.1%	3.0%
Crude oil	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Oil products	1.07	1.32	1.62	1.86	1.91	2.05	8.6%	2.3%	2.9%	7.1%	3.0%
Natural gas	0.30	0.35	0.43	0.61	0.63	0.63	7.2%	6.0%	2.5%	1.0%	5.0%
Electricity	0.30	0.32	0.34	0.42	0.45	0.47	2.0%	3.9%	5.7%	4.4%	4.2%
Gross Inland Consumption	3.13	3.16	3.55	3.40	3.35	3.27	2.5%	-0.7%	-1.5%	-2.5%	-1.0%
Solids	1.42	1.10	1.13	0.49	0.31	0.11	-4.5%	-13.1%	-35.8%	-65.9%	-25.6%
Oil	1.06	1.34	1.61	1.84	1.92	2.01	8.8%	2.3%	4.2%	4.8%	2.8%
natural gas	0.30	0.35	0.43	0.61	0.63	0.63	7.2%	6.0%	2.5%	1.0%	5.0%
Other (1)	0.35	0.37	0.38	0.46	0.49	0.52	1.6%	3.2%	6.7%	4.7%	3.8%
Electricity Generation in TWh	0.94	1.33	1.38	1.31	1.26	1.30	8.0%	-0.9%	-3.6%	3.5%	-0.7%
Nuclear	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Hydro & wind (including pumping)	0.50	0.81	0.82	0.88	0.94	1.05	10.4%	1.1%	7.0%	12.6%	3.2%
Thermal	0.44	0.52	0.56	0.43	0.32	0.25	5.0%	-4.2%	-25.1%	-22.9%	-9.6%
Generation Capacity in GWe	1.24	1.24	1.24	1.26	1.28	1.20	0.0%	0.3%	0.9%	-5.9%	-0.4%
Nuclear	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Hydro & wind	1.13	1.13	1.13	1.16	1.14	1.14	0.0%	0.5%	-2.0%	0.1%	0.1%
Thermal	0.11	0.11	0.11	0.10	0.14	0.06	0.0%	-1.4%	33.7%	-56.3%	-7.5%
Average Load Factor in %	8.6	12.3	12.7	11.8	11.3	12.4	8.0%	-1.2%	-4.4%	10.0%	-0.3%
Fuel Inputs for Thermal Power Generation	0.15	0.17	0.20	0.12	0.10	0.06	5.4%	-8.3%	-16.5%	-32.9%	-12.9%
Solids	0.01	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Oil	0.00	0.02	0.01	0.00	0.00	0.00	7.0%	-	-	-	-
Gas	0.10	0.13	0.16	0.10	0.07	0.04	9.3%	-8.1%	-24.8%	-44.7%	-15.9%
Geothermal	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Biomass	0.03	0.03	0.03	0.02	0.02	0.02	-1.5%	-5.7%	29.4%	4.4%	-0.6%
Average Thermal Efficiency in %	25.2	25.9	24.6	32.0	28.7	33.0	-0.4%	4.5%	-10.3%	14.9%	3.7%
Non-Energy Uses	0.02	0.02	0.02	0.02	0.01	0.02	2.9%	-0.3%	-34.8%	20.1%	-3.3%
Total Final Energy Demand	2.97	2.99	3.32	3.24	3.23	3.18	2.2%	-0.4%	-0.2%	-1.7%	-0.5%
Solids	0.99	0.74	0.75	0.36	0.24	0.11	-5.4%	-11.7%	-33.4%	-55.1%	-21.7%
Oil	1.02	1.30	1.58	1.82	1.91	1.99	9.0%	2.4%	4.8%	4.1%	2.9%
Gas	0.61	0.60	0.62	0.62	0.62	0.59	0.2%	0.1%	-1.1%	-4.4%	-0.7%
Electricity	0.33	0.34	0.35	0.42	0.44	0.46	1.7%	3.0%	4.4%	3.2%	3.2%
Heat	0.00	0.00	0.00	0.00	0.01	0.02	-	-	-	78.3%	-
Renewable energy sources	0.02	0.02	0.02	0.02	0.02	0.02	-0.2%	0.0%	0.0%	0.0%	0.0%
CO₂ Emissions in Mt of CO₂ (2)	10.0	9.6	10.6	8.9	8.5	7.8	1.2%	-2.9%	-4.8%	-7.3%	-3.7%
Indicators											
Population (Million)	0.37	0.37	0.38	0.42	0.42	0.43	0.8%	1.4%	1.3%	1.3%	1.4%
GDP (bil. EUR 1990)	7.0	8.0	8.5	10.5	10.9	11.6	3.9%	3.7%	4.1%	5.7%	4.0%
Gross Inl Cons./GDP (toe/1990 MEUR)	448.1	395.8	419.7	323.8	306.5	282.8	-1.3%	-4.2%	-5.3%	-7.7%	-4.8%
Gross Inl Cons./Capita (Kgoe/inhabitant)	8548.5	8466.8	9300.5	8184.2	7960.2	7662.8	1.7%	-2.1%	-2.7%	-3.7%	-2.4%
Electricity Generated/Capita (kWh/inhabitant)	2560.2	3572.9	3610.7	3144.7	2992.3	3057.2	7.1%	-2.3%	-4.8%	2.2%	-2.1%
CO ₂ Emissions/Capita (kg of CO ₂ /inhabitant)	27328.4	25825.4	27814.0	21369.8	20073.3	18366.3	0.4%	-4.3%	-6.1%	-8.5%	-5.1%
Import Dependency %	99.0	97.8	99.0	99.3	98.4	99.5	0.0%	0.1%	-0.9%	1.2%	0.1%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Given on an indicative basis; calculated using common emission factors across all countries in the world



NETHERLANDS : SUMMARY ENERGY BALANCE

Mtoe	1985	1988	1990	1996	1997	1998	90/85	96/90	97/96	98/97	98/90
Annual % Change											
Primary Production	65.47	55.58	60.29	73.72	65.52	62.68	-1.6%	3.4%	-11.1%	-4.3%	0.5%
Solids	0.07	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Oil	4.09	4.25	4.03	3.14	2.96	2.68	-0.3%	-4.0%	-5.8%	-9.4%	-5.0%
Natural gas	59.52	49.59	54.61	68.34	60.59	57.61	-1.7%	3.8%	-11.3%	-4.9%	0.7%
Nuclear	0.98	0.92	0.88	1.04	0.59	0.94	-2.1%	2.8%	-43.1%	58.6%	0.8%
Hydro & Wind	0.00	0.00	0.01	0.04	0.05	0.06	116.0%	24.2%	9.7%	31.6%	23.2%
Geothermal	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Other renewable energy sources	0.81	0.81	0.76	1.15	1.33	1.39	-1.4%	7.1%	16.0%	4.5%	7.9%
Net Imports	4.02	20.31	17.35	14.02	22.69	23.46	34.0%	-3.5%	61.8%	3.4%	3.8%
Solids	6.60	8.21	9.48	8.88	10.38	8.66	7.5%	-1.1%	17.0%	-16.6%	-1.1%
Oil	24.19	30.72	30.88	35.12	36.46	36.48	5.0%	2.2%	3.8%	0.1%	2.1%
Crude oil	38.30	50.79	47.96	61.55	60.74	62.16	4.6%	4.2%	-1.3%	2.3%	3.3%
Oil products	-14.12	-20.07	-17.08	-26.43	-24.28	-25.68	3.9%	7.5%	-8.1%	5.8%	5.2%
Natural gas	-27.21	-19.12	-23.80	-30.89	-25.25	-22.69	-2.6%	4.4%	-18.3%	-10.1%	-0.6%
Electricity	0.44	0.50	0.79	0.91	1.09	1.02	12.4%	2.4%	19.3%	-6.5%	3.2%
Gross Inland Consumption	61.54	64.85	66.78	76.09	74.78	74.68	1.6%	2.2%	-1.7%	-0.1%	1.4%
Solids	6.59	8.18	9.12	9.11	9.10	9.24	6.7%	0.0%	-0.1%	1.4%	0.2%
Oil	20.40	23.98	24.41	26.38	27.28	27.09	3.7%	1.3%	3.4%	-0.7%	1.3%
natural gas	32.32	30.45	30.81	37.46	35.33	34.95	-1.0%	3.3%	-5.7%	-1.1%	1.6%
Other (1)	2.23	2.24	2.44	3.14	3.06	3.41	1.8%	4.3%	-2.6%	11.5%	4.2%
Electricity Generation in TWh	62.92	69.60	71.82	85.31	86.64	91.10	2.7%	2.9%	1.6%	5.1%	3.0%
Nuclear	3.90	3.67	3.50	4.16	2.41	3.81	-2.1%	2.9%	-42.1%	58.4%	1.1%
Hydro & wind (including pumping)	0.00	0.02	0.14	0.52	0.57	0.75	116.0%	24.2%	9.7%	31.6%	23.2%
Thermal	59.02	65.91	68.18	80.63	83.67	86.54	2.9%	2.8%	3.8%	3.4%	3.0%
Generation Capacity in GWe	17.05	17.49	17.56	20.40	20.09	20.16	0.6%	2.5%	-1.5%	0.3%	1.7%
Nuclear	0.51	0.51	0.51	0.51	0.45	0.45	0.0%	-0.2%	-11.1%	0.0%	-1.6%
Hydro & wind	0.00	0.02	0.09	0.34	0.37	0.40	-	24.6%	10.1%	7.6%	20.4%
Thermal	16.54	16.96	16.96	19.55	19.27	19.31	0.5%	2.4%	-1.4%	0.2%	1.6%
Average Load Factor in %	42.1	45.4	46.7	47.7	49.2	51.6	2.1%	0.4%	3.1%	4.8%	1.3%
Fuel Inputs for Thermal Power Generation	12.85	14.08	14.53	17.96	17.76	18.34	2.5%	3.6%	-1.1%	3.3%	3.0%
Solids	3.17	4.98	5.70	5.94	5.16	5.42	12.5%	0.7%	-13.2%	5.2%	-0.6%
Oil	0.69	0.78	0.70	0.82	0.68	0.67	0.4%	2.6%	-16.8%	-2.3%	-0.7%
Gas	8.56	7.89	7.65	10.32	10.88	11.16	-2.2%	5.1%	5.4%	2.6%	4.8%
Geothermal	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Biomass	0.43	0.43	0.48	0.88	1.05	1.10	2.3%	10.4%	19.5%	4.8%	10.8%
Average Thermal Efficiency in %	39.5	40.3	40.3	38.6	40.5	40.6	0.4%	-0.7%	4.9%	0.2%	0.1%
Non-Energy Uses	7.65	8.76	9.26	7.68	8.74	8.45	3.9%	-3.1%	13.8%	-3.3%	-1.1%
Total Final Energy Demand	42.58	42.15	42.98	51.35	49.08	49.22	0.2%	3.0%	-4.4%	0.3%	1.7%
Solids	2.03	1.71	1.68	1.39	1.56	1.47	-3.7%	-3.1%	11.9%	-5.4%	-1.6%
Oil	12.07	13.16	13.19	15.52	15.86	16.02	1.8%	2.7%	2.2%	1.0%	2.5%
Gas	22.57	20.74	21.24	25.06	21.93	21.48	-1.2%	2.8%	-12.5%	-2.0%	0.1%
Electricity	5.28	5.88	6.32	7.41	7.70	7.97	3.7%	2.7%	3.9%	3.6%	2.9%
Heat	0.25	0.27	0.27	1.70	1.76	1.98	1.3%	35.9%	3.7%	12.9%	28.3%
Renewable energy sources	0.38	0.38	0.28	0.27	0.28	0.29	-6.3%	-0.3%	4.6%	3.3%	0.8%
CO₂ Emissions in Mt of CO₂ (2)	141.2	148.6	153.0	177.7	168.9	169.4	1.6%	2.5%	-4.9%	0.3%	1.3%
Indicators											
Population (Million)	14.49	14.76	14.95	15.53	15.61	15.71	0.6%	0.6%	0.5%	0.6%	0.6%
GDP (bil. EUR 1990)	192.0	204.2	222.5	254.7	264.0	273.7	3.0%	2.3%	3.6%	3.7%	2.6%
Gross Inl Cons./GDP (toe/1990 MEUR)	320.6	317.6	300.1	298.8	283.3	272.8	-1.3%	-0.1%	-5.2%	-3.7%	-1.2%
Gross Inl Cons./Capita (Kgoe/inhabitant)	4246.8	4393.9	4466.7	4899.7	4790.2	4755.1	1.0%	1.6%	-2.2%	-0.7%	0.8%
Electricity Generated/Capita (kWh/inhabitant)	4342.1	4715.3	4803.8	5492.9	5550.3	5800.4	2.0%	2.3%	1.0%	4.5%	2.4%
CO ₂ Emissions/Capita (kg of CO ₂ /inhabitant)	9741.5	10065.2	10233.6	11440.1	10818.9	10783.3	1.0%	1.9%	-5.4%	-0.3%	0.7%
Import Dependency %	5.7	26.9	22.4	16.0	26.1	27.0	31.3%	-5.4%	63.0%	3.4%	2.4%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Given on an indicative basis; calculated using common emission factors across all countries in the world

PORTUGAL : SUMMARY ENERGY BALANCE

Mtoe	1985	1988	1990	1996	1997	1998	90/85	96/90	97/96	98/97	98/90
Annual % Change											
Primary Production	3.20	3.32	2.77	3.58	3.60	3.59	-2.8%	4.3%	0.5%	-0.2%	3.3%
Solids	0.10	0.09	0.12	0.00	0.00	0.00	3.4%	-	-	-	-
Oil	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Natural gas	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Nuclear	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Hydro & Wind	0.93	1.05	0.79	1.27	1.13	1.12	-3.2%	8.3%	-11.1%	-0.5%	4.5%
Geothermal	0.00	0.00	0.00	0.04	0.04	0.04	-	53.6%	6.6%	0.0%	39.1%
Other renewable energy sources	2.17	2.18	1.87	2.27	2.42	2.42	-3.0%	3.3%	6.9%	0.0%	3.3%
Net Imports	9.64	11.65	15.16	16.66	18.44	19.42	9.5%	1.6%	10.7%	5.3%	3.1%
Solids	0.94	1.80	2.79	3.39	3.62	3.20	24.4%	3.3%	6.9%	-11.6%	1.7%
Oil	8.51	9.65	12.37	13.17	14.46	15.50	7.8%	1.1%	9.8%	7.1%	2.9%
Crude oil	7.19	8.60	11.36	12.12	13.51	13.84	9.6%	1.1%	11.5%	2.5%	2.5%
Oil products	1.31	1.05	1.01	1.06	0.96	1.66	-5.2%	0.8%	-9.5%	73.2%	6.4%
Natural gas	0.00	0.00	0.00	0.00	0.10	0.70	-	-	-	602.6%	-
Electricity	0.19	0.21	0.00	0.10	0.25	0.02	-56.0%	76.3%	160.9%	-90.5%	28.4%
Gross Inland Consumption	12.36	14.78	16.86	19.98	21.29	22.82	6.4%	2.9%	6.6%	7.1%	3.9%
Solids	0.66	1.97	2.58	3.46	3.49	3.17	31.2%	5.0%	0.8%	-9.2%	2.6%
Oil	8.40	9.38	11.61	12.84	13.87	15.33	6.7%	1.7%	8.0%	10.5%	3.5%
natural gas	0.00	0.00	0.00	0.00	0.09	0.70	-	-	-	704.4%	-
Other (1)	3.29	3.43	2.66	3.67	3.85	3.61	-4.2%	5.5%	4.7%	-6.0%	3.9%
Electricity Generation in TWh	19.10	22.47	28.50	34.51	34.20	38.98	8.3%	3.2%	-0.9%	14.0%	4.0%
Nuclear	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Hydro & wind (including pumping)	10.85	12.29	9.30	14.88	13.21	13.14	-3.0%	8.1%	-11.2%	-0.5%	4.4%
Thermal	8.26	10.19	19.19	19.64	20.99	25.84	18.4%	0.4%	6.9%	23.1%	3.8%
Generation Capacity in GWe	6.01	6.92	7.39	9.38	9.47	9.78	4.2%	4.1%	0.9%	3.3%	3.6%
Nuclear	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Hydro & wind	3.06	3.29	3.34	4.45	4.47	4.55	1.8%	4.9%	0.5%	1.8%	3.9%
Thermal	2.95	3.63	4.05	4.93	5.00	5.24	6.5%	3.3%	1.4%	4.7%	3.3%
Average Load Factor in %	36.3	37.1	44.0	42.0	41.2	45.5	3.9%	-0.8%	-1.8%	10.3%	0.4%
Fuel Inputs for Thermal Power Generation	1.86	2.26	4.27	4.29	4.56	5.38	18.1%	0.1%	6.4%	17.9%	2.9%
Solids	0.22	1.32	2.03	2.74	2.84	2.65	56.0%	5.2%	3.8%	-7.0%	3.4%
Oil	1.51	0.81	2.10	1.33	1.44	2.11	6.9%	-7.4%	8.9%	46.1%	0.0%
Gas	0.02	0.02	0.02	0.03	0.08	0.43	4.3%	8.8%	137.8%	460.8%	47.3%
Geothermal	0.00	0.00	0.00	0.04	0.04	0.04	-	53.6%	6.6%	0.0%	39.1%
Biomass	0.11	0.11	0.11	0.15	0.15	0.15	0.0%	4.3%	3.5%	0.0%	3.7%
Average Thermal Efficiency in %	38.2	38.7	38.7	39.4	39.6	41.3	0.2%	0.3%	0.5%	4.4%	0.8%
Non-Energy Uses	1.01	1.92	2.10	1.88	2.05	2.44	15.8%	-1.8%	9.1%	19.2%	1.9%
Total Final Energy Demand	9.54	10.60	11.21	14.19	14.96	15.64	3.3%	4.0%	5.4%	4.6%	4.2%
Solids	0.43	0.64	0.62	0.60	0.49	0.41	7.5%	-0.4%	-19.0%	-15.2%	-4.9%
Oil	5.42	5.99	6.69	8.73	9.25	9.64	4.3%	4.5%	6.0%	4.1%	4.7%
Gas	0.09	0.10	0.10	0.09	0.13	0.33	1.7%	-2.1%	46.9%	145.7%	15.5%
Electricity	1.50	1.79	2.02	2.60	2.75	2.91	6.2%	4.3%	5.7%	6.0%	4.6%
Heat	0.03	0.03	0.03	0.05	0.07	0.08	-2.8%	10.3%	31.6%	19.5%	13.9%
Renewable energy sources	2.06	2.06	1.75	2.12	2.27	2.27	-3.2%	3.2%	7.1%	0.0%	3.3%
CO₂ Emissions in Mt of CO₂ (2)	25.1	29.9	39.1	45.6	47.9	51.6	9.2%	2.6%	4.9%	7.7%	3.5%
Indicators											
Population (Million)	10.01	9.97	9.90	9.93	9.95	9.97	-0.2%	0.1%	0.2%	0.2%	0.1%
GDP (bil. EUR 1990)	41.6	49.5	54.3	60.8	63.1	65.6	5.5%	1.9%	3.7%	4.0%	2.4%
Gross Inl Cons./GDP (toe/1990 MEUR)	297.2	298.5	310.3	328.5	337.6	347.8	0.9%	1.0%	2.8%	3.0%	1.4%
Gross Inl Cons./Capita (Kgoe/inhabitant)	1234.2	1482.5	1703.2	2012.8	2141.1	2288.8	6.7%	2.8%	6.4%	6.9%	3.8%
Electricity Generated/Capita (kWh/inhabitant)	1908.3	2255.7	2879.5	3476.6	3438.8	3910.0	8.6%	3.2%	-1.1%	13.7%	3.9%
CO ₂ Emissions/Capita (kg of CO ₂ /inhabitant)	2509.7	3001.8	3946.5	4597.2	4815.4	5175.2	9.5%	2.6%	4.7%	7.5%	3.4%
Import Dependency %	75.2	76.5	86.8	81.3	84.6	83.7	2.9%	-1.1%	4.0%	-1.1%	-0.5%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Given on an indicative basis; calculated using common emission factors across all countries in the world



SPAIN : SUMMARY ENERGY BALANCE

Mtoe	1985	1988	1990	1996	1997	1998	90/85	96/90	97/96	98/97	98/90
Annual % Change											
Primary Production	30.24	33.39	33.41	32.20	30.88	31.35	2.0%	-0.6%	-4.1%	1.5%	-0.8%
Solids	13.94	11.20	11.68	10.00	9.89	9.31	-3.5%	-2.6%	-1.1%	-5.9%	-2.8%
Oil	2.17	1.47	0.79	0.51	0.37	0.52	-18.2%	-7.1%	-27.6%	41.3%	-5.1%
Natural gas	0.23	0.81	1.27	0.43	0.16	0.10	40.9%	-16.7%	-61.8%	-37.1%	-27.0%
Nuclear	7.38	13.02	13.70	13.99	13.51	14.42	13.2%	0.4%	-3.5%	6.7%	0.6%
Hydro & Wind	2.69	3.04	2.19	3.42	3.05	3.11	-4.1%	7.8%	-10.9%	1.9%	4.5%
Geothermal	0.00	0.00	0.00	0.01	0.01	0.01	22.9%	18.1%	0.0%	0.0%	13.3%
Other renewable energy sources	3.84	3.84	3.77	3.84	3.88	3.89	-0.4%	0.3%	1.2%	0.0%	0.4%
Net Imports	46.37	53.40	59.85	73.85	80.23	87.21	5.2%	3.6%	8.6%	8.7%	4.8%
Solids	5.23	5.30	7.04	7.78	7.04	8.79	6.1%	1.7%	-9.5%	24.8%	2.8%
Oil	39.10	45.63	49.16	57.66	61.91	66.07	4.7%	2.7%	7.4%	6.7%	3.8%
Crude oil	43.95	49.88	53.25	54.70	56.37	59.85	3.9%	0.4%	3.1%	6.2%	1.5%
Oil products	-4.85	-4.25	-4.09	2.97	5.54	6.22	-3.4%	-	86.7%	12.3%	-
Natural gas	2.14	2.59	3.69	8.31	11.54	12.06	11.5%	14.5%	38.8%	4.5%	16.0%
Electricity	-0.09	-0.11	-0.04	0.09	-0.26	0.29	-17.1%	-	-	-	-
Gross Inland Consumption	73.91	83.28	89.08	100.91	106.12	110.67	3.8%	2.1%	5.2%	4.3%	2.7%
Solids	19.48	15.72	18.94	16.37	18.52	17.77	-0.6%	-2.4%	13.1%	-4.0%	-0.8%
Oil	38.27	44.41	45.54	54.54	56.10	59.58	3.5%	3.1%	2.9%	6.2%	3.4%
natural gas	2.35	3.35	4.97	8.64	11.31	11.61	16.1%	9.7%	30.8%	2.7%	11.2%
Other (1)	13.81	19.79	19.63	21.35	20.19	21.71	7.3%	1.4%	-5.4%	7.5%	1.3%
Electricity Generation in TWh	127.34	139.68	151.71	173.73	190.22	195.84	3.6%	2.3%	9.5%	3.0%	3.2%
Nuclear	28.04	50.46	54.26	56.32	55.29	58.98	14.1%	0.6%	-1.8%	6.7%	1.0%
Hydro & wind (including pumping)	33.03	36.36	26.18	40.87	36.71	37.95	-4.5%	7.7%	-10.2%	3.4%	4.7%
Thermal	66.27	52.86	71.28	76.55	98.22	98.91	1.5%	1.2%	28.3%	0.7%	4.2%
Generation Capacity in GWe	39.61	42.79	43.42	46.92	48.59	50.01	1.9%	1.3%	3.6%	2.9%	1.8%
Nuclear	5.55	7.47	6.97	7.09	7.25	7.30	4.7%	0.3%	2.3%	0.7%	0.6%
Hydro & wind	14.53	15.32	16.24	17.10	17.15	17.47	2.2%	0.9%	0.3%	1.9%	0.9%
Thermal	19.53	20.00	20.21	22.73	24.19	25.24	0.7%	2.0%	6.4%	4.3%	2.8%
Average Load Factor in %	36.7	37.2	39.9	42.3	44.7	44.7	1.7%	1.0%	5.7%	0.0%	1.4%
Fuel Inputs for Thermal Power Generation	15.65	12.79	16.51	17.53	21.62	20.97	1.1%	1.0%	23.4%	-3.0%	3.0%
Solids	12.86	10.44	13.76	13.11	15.26	14.65	1.4%	-0.8%	16.4%	-4.0%	0.8%
Oil	1.97	1.87	2.17	2.72	2.72	3.28	1.9%	3.8%	0.0%	20.7%	5.3%
Gas	0.76	0.43	0.49	1.13	3.05	2.44	-8.5%	15.1%	169.6%	-20.1%	22.3%
Geothermal	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Biomass	0.06	0.06	0.09	0.56	0.59	0.59	9.5%	34.8%	5.9%	0.0%	26.0%
Average Thermal Efficiency in %	36.4	35.5	37.1	37.6	39.1	40.6	0.4%	0.2%	4.0%	3.9%	1.1%
Non-Energy Uses	4.87	5.94	5.85	6.69	7.87	9.17	3.7%	2.3%	17.7%	16.5%	5.8%
Total Final Energy Demand	47.52	53.47	56.53	65.19	67.69	71.23	3.5%	2.4%	3.8%	5.2%	2.9%
Solids	4.25	3.45	3.52	1.97	2.03	1.81	-3.7%	-9.2%	2.6%	-10.4%	-8.0%
Oil	28.10	32.67	33.60	39.92	40.47	42.64	3.6%	2.9%	1.4%	5.4%	3.0%
Gas	2.55	3.75	4.90	7.29	8.16	9.13	13.9%	6.8%	11.9%	12.0%	8.1%
Electricity	8.84	9.82	10.82	12.66	13.67	14.27	4.1%	2.7%	8.0%	4.4%	3.5%
Heat	0.00	0.00	0.00	0.07	0.07	0.08	22.9%	76.5%	1.3%	2.7%	53.9%
Renewable energy sources	3.78	3.78	3.68	3.28	3.29	3.29	-0.5%	-1.9%	0.4%	0.0%	-1.4%
CO₂ Emissions in Mt of CO₂ (2)	177.4	181.4	202.0	222.2	239.0	244.7	2.6%	1.6%	7.6%	2.4%	2.4%
Indicators											
Population (Million)	38.42	38.72	38.85	39.27	39.32	39.37	0.2%	0.2%	0.1%	0.1%	0.2%
GDP (bil. EUR 1990)	313.3	366.9	398.2	435.3	450.1	467.2	4.9%	1.5%	3.4%	3.8%	2.0%
Gross Inl Cons./GDP (toe/1990 MEUR)	235.9	226.9	223.7	231.8	235.8	236.9	-1.1%	0.6%	1.7%	0.5%	0.7%
Gross Inl Cons./Capita (Kgoe/inhabitant)	1923.8	2150.9	2292.9	2569.5	2698.5	2811.0	3.6%	1.9%	5.0%	4.2%	2.6%
Electricity Generated/Capita (kWh/inhabitant)	3314.4	3605.1	3905.0	4424.1	4837.2	4974.2	3.3%	2.1%	9.3%	2.8%	3.1%
CO ₂ Emissions/Capita (kg of CO ₂ /inhabitant)	4617.9	4685.9	5199.4	5659.1	6079.0	6215.9	2.4%	1.4%	7.4%	2.3%	2.3%
Import Dependency %	60.6	61.8	64.4	70.0	71.8	74.8	1.2%	1.4%	2.5%	4.2%	1.9%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Given on an indicative basis; calculated using common emission factors across all countries in the world

SWEDEN : SUMMARY ENERGY BALANCE

Mtoe	1985	1988	1990	1996	1997	1998	90/85	96/90	97/96	98/97	98/90
Annual % Change											
Primary Production	26.73	29.51	29.61	31.26	31.73	30.23	2.1%	0.9%	1.5%	-4.7%	0.3%
Solids	0.10	0.15	0.27	0.36	0.28	0.33	21.8%	5.2%	-24.3%	20.8%	2.7%
Oil	0.01	0.00	0.00	0.00	0.00	0.00	-17.8%	-	-	-	-
Natural gas	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Nuclear	15.26	18.09	17.76	19.16	18.04	16.17	3.1%	1.3%	-5.9%	-10.4%	-1.2%
Hydro & Wind	6.11	6.01	6.23	4.46	5.95	6.42	0.4%	-5.4%	33.4%	7.8%	0.4%
Geothermal	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Other renewable energy sources	5.26	5.26	5.33	7.27	7.46	7.32	0.3%	5.3%	2.6%	-2.0%	4.0%
Net Imports	20.03	18.39	17.82	21.09	19.98	20.01	-2.3%	2.9%	-5.3%	0.2%	1.5%
Solids	3.08	2.48	2.33	2.38	2.48	2.26	-5.4%	0.3%	4.3%	-8.7%	-0.4%
Oil	17.01	15.81	15.11	17.46	17.01	17.96	-2.3%	2.4%	-2.6%	5.5%	2.2%
Crude oil	14.06	14.65	16.93	18.99	20.10	19.85	3.8%	1.9%	5.9%	-1.3%	2.0%
Oil products	2.95	1.16	-1.82	-1.53	-3.09	-1.89	-	-2.9%	102.3%	-38.7%	0.5%
Natural gas	0.07	0.32	0.53	0.73	0.72	0.71	47.8%	5.5%	-1.3%	-0.9%	3.8%
Electricity	-0.13	-0.22	-0.15	0.53	-0.23	-0.92	3.2%	-	-	295.0%	25.2%
Gross Inland Consumption	46.94	49.11	46.94	51.73	50.35	48.14	0.0%	1.6%	-2.7%	-4.4%	0.3%
Solids	2.80	2.88	2.73	3.14	2.64	2.69	-0.5%	2.3%	-15.9%	2.0%	-0.2%
Oil	17.58	16.79	14.50	16.44	15.77	15.75	-3.8%	2.1%	-4.1%	-0.1%	1.0%
natural gas	0.07	0.32	0.53	0.73	0.72	0.71	47.8%	5.5%	-1.3%	-0.9%	3.8%
Other (1)	26.49	29.13	29.18	31.42	31.22	28.98	2.0%	1.2%	-0.6%	-7.2%	-0.1%
Electricity Generation in TWh	137.13	146.21	146.48	140.61	149.34	158.25	1.3%	-0.7%	6.2%	6.0%	1.0%
Nuclear	58.55	69.41	68.17	74.26	69.92	73.57	3.1%	1.4%	-5.9%	5.2%	1.0%
Hydro & wind (including pumping)	71.59	70.47	73.03	51.91	69.25	74.68	0.4%	-5.5%	33.4%	7.8%	0.3%
Thermal	6.98	6.33	5.28	14.44	10.18	10.00	-5.4%	18.2%	-29.5%	-1.8%	8.3%
Generation Capacity in GWe	33.18	33.17	34.19	34.16	34.54	33.03	0.6%	0.0%	1.1%	-4.4%	-0.4%
Nuclear	9.46	9.70	9.97	10.06	10.08	10.08	1.1%	0.1%	0.3%	0.0%	0.1%
Hydro & wind	15.70	16.12	16.34	16.31	16.58	16.43	0.8%	0.0%	1.7%	-0.9%	0.1%
Thermal	8.02	7.35	7.88	7.80	7.87	6.51	-0.4%	-0.2%	0.9%	-17.3%	-2.4%
Average Load Factor in %	47.2	50.3	48.9	47.0	49.4	54.7	0.7%	-0.7%	5.0%	10.8%	1.4%
Fuel Inputs for Thermal Power Generation	2.93	2.31	1.78	4.36	3.13	3.09	-9.5%	16.1%	-28.1%	-1.5%	7.1%
Solids	0.89	0.91	0.63	0.96	0.61	0.65	-6.6%	7.3%	-37.0%	6.4%	0.3%
Oil	1.15	0.48	0.23	1.38	0.61	0.63	-27.8%	35.2%	-56.0%	4.0%	13.7%
Gas	0.13	0.16	0.25	0.42	0.45	0.47	14.9%	9.1%	5.5%	4.6%	8.1%
Geothermal	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Biomass	0.76	0.76	0.67	1.59	1.47	1.34	-2.5%	15.4%	-7.3%	-8.7%	9.0%
Average Thermal Efficiency in %	20.5	23.5	25.5	28.5	27.9	27.8	4.5%	1.9%	-2.0%	-0.3%	1.1%
Non-Energy Uses	1.51	1.90	1.87	2.06	2.35	2.28	4.4%	1.7%	13.8%	-2.9%	2.5%
Total Final Energy Demand	31.16	31.42	30.43	34.12	33.44	33.61	-0.5%	1.9%	-2.0%	0.5%	1.3%
Solids	1.14	1.18	1.23	1.16	1.13	1.07	1.5%	-0.9%	-2.5%	-5.7%	-1.7%
Oil	13.13	13.15	12.00	12.68	12.26	12.29	-1.8%	0.9%	-3.3%	0.3%	0.3%
Gas	0.33	0.47	0.59	0.65	0.65	0.62	11.9%	1.7%	0.9%	-5.7%	0.6%
Electricity	9.77	10.32	10.35	10.83	10.56	10.62	1.2%	0.8%	-2.6%	0.6%	0.3%
Heat	2.51	2.02	1.71	3.90	3.64	3.71	-7.4%	14.8%	-6.7%	1.9%	10.2%
Renewable energy sources	4.28	4.28	4.57	4.89	5.19	5.30	1.3%	1.1%	6.2%	2.1%	1.9%
CO₂ Emissions in Mt of CO₂ (2)	58.0	55.3	50.6	58.3	52.2	52.5	-2.7%	2.4%	-10.5%	0.6%	0.5%
Indicators											
Population (Million)	8.35	8.44	8.56	8.84	8.85	8.85	0.5%	0.5%	0.1%	0.1%	0.4%
GDP (bil. EUR 1990)	161.5	174.3	180.8	187.5	190.8	196.3	2.3%	0.6%	1.8%	2.9%	1.0%
Gross Inl Cons./GDP (toe/1990 MEUR)	290.6	281.8	259.6	276.0	263.9	245.2	-2.2%	1.0%	-4.4%	-7.1%	-0.7%
Gross Inl Cons./Capita (Kgoe/inhabitant)	5621.6	5821.5	5484.8	5851.3	5691.4	5439.0	-0.5%	1.1%	-2.7%	-4.4%	-0.1%
Electricity Generated/Capita (kWh/inhabitant)	16421.4	17331.0	17114.7	15904.0	16882.0	17879.0	0.8%	-1.2%	6.1%	5.9%	0.5%
CO ₂ Emissions/Capita (kg of CO ₂ /inhabitant)	6941.4	6553.2	5916.7	6593.9	5901.4	5932.4	-3.1%	1.8%	-10.5%	0.5%	0.0%
Import Dependency %	42.2	36.9	37.4	39.9	38.7	40.3	-2.4%	1.1%	-3.1%	4.1%	0.9%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Given on an indicative basis; calculated using common emission factors across all countries in the world



UNITED KINGDOM : SUMMARY ENERGY BALANCE

Mtoe	1985	1988	1990	1996	1997	1998	90/85	96/90	97/96	98/97	98/90
	Annual % Change										
Primary Production	236.57	234.12	203.80	262.42	262.39	269.92	-2.9%	4.3%	0.0%	2.9%	3.6%
Solids	54.74	60.51	53.11	30.09	29.43	26.02	-0.6%	-9.0%	-2.2%	-11.6%	-8.5%
Oil	129.20	118.44	92.12	132.44	130.40	134.68	-6.5%	6.2%	-1.5%	3.3%	4.9%
Natural gas	35.72	37.85	40.92	75.84	77.26	81.13	2.8%	10.8%	1.9%	5.0%	8.9%
Nuclear	15.98	16.34	16.57	22.18	23.25	25.83	0.7%	5.0%	4.8%	11.1%	5.7%
Hydro & Wind	0.35	0.40	0.44	0.33	0.41	0.53	4.4%	-4.5%	24.6%	27.5%	2.3%
Geothermal	0.00	0.00	0.00	0.00	0.00	0.00	0.0%	11.2%	0.0%	-2.9%	7.9%
Other renewable energy sources	0.58	0.58	0.64	1.53	1.64	1.74	2.2%	15.5%	7.7%	5.6%	13.2%
Net Imports	-31.65	-20.39	7.34	-33.21	-33.97	-36.35	-	-	2.3%	7.0%	-
Solids	6.59	7.90	9.12	11.75	12.83	14.45	6.7%	4.3%	9.2%	12.6%	5.9%
Oil	-49.62	-38.33	-8.99	-46.76	-47.63	-50.24	-28.9%	31.6%	1.9%	5.5%	24.0%
Crude oil	-47.91	-29.43	-3.11	-31.96	-29.44	-37.21	-42.1%	47.5%	-7.9%	26.4%	36.4%
Oil products	-1.71	-8.90	-5.88	-14.79	-18.19	-13.04	28.0%	16.6%	22.9%	-28.3%	10.5%
Natural gas	11.39	8.93	6.18	0.36	-0.59	-1.63	-11.5%	-37.8%	-	176.4%	-
Electricity	0.00	1.10	1.03	1.43	1.43	1.07	-	5.7%	-0.6%	-24.8%	0.5%
Gross Inland Consumption	203.70	210.88	210.86	228.11	222.74	230.49	0.7%	1.3%	-2.4%	3.5%	1.1%
Solids	62.77	66.93	63.31	44.23	39.82	41.24	0.2%	-5.8%	-10.0%	3.6%	-5.2%
Oil	77.38	79.32	81.66	82.49	80.01	80.75	1.1%	0.2%	-3.0%	0.9%	-0.1%
natural gas	46.64	46.21	47.20	75.92	76.18	79.34	0.2%	8.2%	0.3%	4.1%	6.7%
Other (1)	16.91	18.42	18.68	25.47	26.73	29.17	2.0%	5.3%	4.9%	9.1%	5.7%
Electricity Generation in TWh	298.04	308.08	318.92	347.32	345.32	358.18	1.4%	1.4%	-0.6%	3.7%	1.5%
Nuclear	61.08	63.44	65.74	94.65	98.13	100.12	1.5%	6.3%	3.7%	2.0%	5.4%
Hydro & wind (including pumping)	6.93	6.97	7.06	5.40	6.28	7.73	0.4%	-4.4%	16.2%	23.2%	1.1%
Thermal	230.03	237.67	246.12	247.27	240.91	250.33	1.4%	0.1%	-2.6%	3.9%	0.2%
Generation Capacity in GWe	67.43	69.63	73.02	73.37	72.79	72.85	1.6%	0.1%	-0.8%	0.1%	0.0%
Nuclear	7.07	7.69	11.35	12.92	12.95	12.60	9.9%	2.2%	0.2%	-2.7%	1.3%
Hydro & wind	4.19	4.16	4.18	4.48	4.60	4.59	0.0%	1.2%	2.7%	-0.3%	1.2%
Thermal	56.17	57.78	57.49	55.97	55.24	55.66	0.5%	-0.4%	-1.3%	0.8%	-0.4%
Average Load Factor in %	50.5	50.5	49.9	54.0	54.2	56.1	-0.2%	1.4%	0.2%	3.6%	1.5%
Fuel Inputs for Thermal Power Generation	54.33	53.72	57.12	50.51	48.92	52.55	1.0%	-2.0%	-3.1%	7.4%	-1.0%
Solids	42.13	46.40	47.58	31.13	27.07	30.00	2.5%	-6.8%	-13.1%	10.8%	-5.6%
Oil	10.72	6.11	7.59	3.46	1.75	1.26	-6.7%	-12.3%	-49.4%	-28.3%	-20.1%
Gas	1.20	0.92	1.57	15.10	19.17	20.27	5.5%	45.9%	27.0%	5.7%	37.7%
Geothermal	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Biomass	0.29	0.29	0.38	0.81	0.93	1.02	5.7%	13.5%	14.4%	10.0%	13.2%
Average Thermal Efficiency in %	36.4	38.0	37.1	42.1	42.3	41.0	0.4%	2.2%	0.6%	-3.3%	1.3%
Non-Energy Uses	12.14	13.22	12.26	12.36	12.05	12.14	0.2%	0.1%	-2.5%	0.8%	-0.1%
Total Final Energy Demand	127.20	136.25	136.37	151.10	147.58	148.89	1.4%	1.7%	-2.3%	0.9%	1.1%
Solids	15.99	14.89	12.04	8.37	8.03	7.39	-5.5%	-5.9%	-4.0%	-8.0%	-5.9%
Oil	51.17	56.46	58.78	62.01	61.38	61.62	2.8%	0.9%	-1.0%	0.4%	0.6%
Gas	38.92	41.35	41.17	53.65	50.79	52.03	1.1%	4.5%	-5.3%	2.4%	3.0%
Electricity	20.81	22.82	23.60	26.28	26.59	27.14	2.5%	1.8%	1.2%	2.1%	1.8%
Heat	0.01	0.44	0.45	0.00	0.00	0.00	104.0%	-65.1%	0.0%	-2.9%	-54.7%
Renewable energy sources	0.29	0.29	0.34	0.80	0.80	0.72	2.8%	15.5%	0.3%	-10.0%	10.0%
CO₂ Emissions in Mt of CO₂ (2)	544.2	563.0	566.9	551.2	528.3	542.8	0.8%	-0.5%	-4.2%	2.8%	-0.5%
Indicators											
Population (Million)	56.69	57.16	57.56	58.70	58.91	59.13	0.3%	0.3%	0.3%	0.4%	0.3%
GDP (bil. EUR 1990)	650.6	743.9	763.1	831.9	861.1	880.9	3.2%	1.4%	3.5%	2.3%	1.8%
Gross Inl Cons./GDP (toe/1990 MEUR)	313.1	283.5	276.3	274.2	258.7	261.7	-2.5%	-0.1%	-5.7%	1.2%	-0.7%
Gross Inl Cons./Capita (Kgoe/inhabitant)	3593.5	3689.4	3663.2	3885.7	3781.4	3898.2	0.4%	1.0%	-2.7%	3.1%	0.8%
Electricity Generated/Capita (kWh/inhabitant)	5257.7	5389.9	5540.5	5916.6	5862.2	6057.8	1.1%	1.1%	-0.9%	3.3%	1.1%
CO ₂ Emissions/Capita (kg of CO ₂ /inhabitant)	9600.1	9849.7	9849.1	9390.0	8968.2	9180.4	0.5%	-0.8%	-4.5%	2.4%	-0.9%
Import Dependency %	-15.4	-9.6	3.4	-14.4	-15.1	-15.6	-	-	4.6%	3.4%	-

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Given on an indicative basis; calculated using common emission factors across all countries in the world





THE ENLARGMENT PROCESS

- A new challenge for the European Union at the beginning of the new Millennium...
- Thirteen countries are candidates for adhesion: ten countries belonging to Central and Eastern Europe...
- Cyprus and Malta, on the basis of Association Agreements...
- and Turkey, which benefited from a specific European strategy

THE ACQUIS COMMUNAUTAIRE IN THE ENERGY SECTOR

- European energy policy is based on three European Treaties
- The *acquis communautaire* for the energy sector comprised 253 legislative acts by 1998

ADOPTION OF THE ACQUIS

- Mixed performance of candidate countries to transpose the *acquis communautaire*
- Energy sector still to be examined, except nuclear safety

EAST-WEST ENERGY COOPERATION

- A move towards European integration will benefit both parties
- Major financial efforts in energy sectors will be needed over many years
- Central and Eastern Europe are an investment location for EU energy supply undertakings
- East-West cooperation on electricity started with the integration of CENTREL countries
- But reticence still exists to opening electricity and gas markets in candidate countries...
- ... as for a fundamental reform of pricing structures
- EU is expanding trans-European infrastructure networks

ENERGY BALANCE OF CANDIDATE COUNTRIES

- Energy profile far from the European Union average
- Energy balance largely based on solid fuels, both at the production and consumption level
- Energy intensity four times higher than in the European Union
- CO₂ emissions per unit of GDP five times higher than in the European Union

THE ENLARGMENT PROCESS

A new challenge for the European Union at the beginning of the new Millennium...

With the new millennium the European Union is preparing for the biggest expansion in its history. On the basis of shared ideals and agreed common rules of political, economic and social behaviour the current Member States and candidate countries will be able to choose to join together in a wider Union. The countries of Central and Eastern Europe, Malta, Cyprus and Turkey have already shown their determination and their capacity for change. Their economies are increasingly integrated with that of the Union and huge efforts are being made by Parliaments, governments, and the public and private sectors to prepare for EU membership. The Commission is aware that there are two potentially conflicting objectives in the enlargement process: speed and quality. Speed is needed because there is a window of opportunity for enhanced momentum in the preparations for enlargement, in accordance with the expectations of the candidate countries. Quality is vital

because the EU does not want partial membership, but rather new members exercising full rights and responsibilities. Abandoning this principle would create severe internal tensions, hamper the EU's efficiency and damage public confidence.

Thirteen countries are candidates for adhesion: ten countries belonging to Central and Eastern Europe...

Ten countries belonging to Central and Eastern Europe are engaged in the enlargement process: Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. Enormous changes have taken place in the political and economic situations of these candidate countries in the last decade. Governments, and the population at large, have taken difficult and courageous decisions to give up the old certainties in favour of liberalisation and open markets in the belief that the sacrifices which are being made in the short term represent a long-term investment in a better future. The structural reforms which are being made constitute a very real preparation for accession but are not sufficient in themselves to guarantee that these coun-

¹ This chapter is largely based on two documents: The report on "Progress towards accession by each of the candidate countries" published by the Commission and the briefing paper "Energy policy and the enlargement of the European Union" published by the European Parliament. Readers interested in enlargement questions will find complete information on the two following internet sites: <http://europa.eu.int/comm/enlargement/index.htm> and <http://www.europarl.eu.int/enlargement>





tries will be able to function as Member States in the early years of this century. Therefore the EU has been actively involved in helping these candidates to undertake a more focused preparation through the enhanced pre-accession strategy decided by the Luxembourg European Council in December 1997. The pre-accession strategy consists of a combination of priority setting coupled with financial assistance, and preparation of the negotiations through screening. It helps the candidate countries to prepare for their future membership by aligning with the Union's *acquis communautaire* before accession. It centres on the Accession Partnerships, the Europe Agreements and participation of the countries of Central and Eastern Europe in Community programmes and agencies.

Cyprus and Malta, on the basis of Association Agreements...

Relations with Cyprus and Malta are both based on Association Agreements but have followed slightly different paths in recent years. The Luxembourg European Council decided a specific pre-accession strategy for Cyprus in 1997. In order to take the pre-accession strategy further the Commission has decided to propose an Accession Partnership for Cyprus and has asked the authorities to draw up a National Programme for the adoption of the *acquis communautaire*. Following the reactivation of Malta's application for EU membership the Council invited the Commission to make proposals for a pre-accession strategy for Malta and give the green light to begin screening in 1999. In June 1999 the Council agreed to extend the current multilateral political dialogue with the countries of central and Eastern Europe and Cyprus to Malta. As for Cyprus, the Commission has decided to propose an Accession Partnership for Malta and has asked the Maltese authorities to prepare a National Programme for the adoption of the *acquis*.

and Turkey, which benefited from a specific European strategy

The last candidate for adhesion is Turkey. In Luxembourg in 1997 the European Council indicated that it wished to bring Turkey into the enlargement process and the Council Presidency in the first half of 1999 made serious efforts to take this process forward. The EU has developed a specific European strategy for Turkey and in October 1998 the Commission put forward two proposals, which are now before the European Parliament, designed to support this strategy with a financial envelope of _ 50 million a year. Turkey has expressed the wish to be a candidate country and should be considered as such. To date the pre-accession strategy for Turkey has been more narrowly focused than for the other candidate countries. In particular the financial support from the EU, which could have underpinned the process of alignment, has been limited. To encourage in-depth reforms, it is now time to take a step

Main items

The most significant political and economic challenge facing the European Union over the next decade is perhaps that related to the process of enlargement. Numerous countries, mainly in central and Eastern Europe, are seeking to transform their future prospects by securing accession to what is already the largest economic and trading bloc in the world. If all thirteen applicants were eventually to be accepted into membership, then the EU's existing population would - on the basis of the current data - rise by some 45%, its energy consumption by some 24% but its GDP by only 6%. The economic challenges are thus considerable, but not insurmountable, and huge new internal market opportunities would be provided. But, for accession to be successful, a wide range of adjustments will be required by the prospective new Member States. These include market, financial and juridical reforms; as well as fundamental changes in broader economic and social structures. The European Council and Commission are at present engaged in negotiations with these countries. These are intended to establish the frameworks necessary for the detailed elaboration of the accession process; and to explore the scope of (and willingness to accept) the progressive alignment of very many sectoral and macroeconomic policies. In turn these will influence the ultimate decisions on accession of each of the applicants.

forward and to further develop the strategy with regard to Turkey. While retaining specific features linked to the current situation of the country it can in future be aligned more closely with the strategy followed with the other candidate countries.

Negotiations formally opened with six candidates in March 1998...

Accession negotiations were formally opened on 31 March 1998 with Hungary, Poland, Czech Republic, Estonia, Slovenia and Cyprus. The orientations for the negotiations were set out by the European Council in Luxembourg. The decision to enter into negotiations with these countries does not imply that they will be concluded at the same time. Each of the applicant countries will proceed at its own pace, depending upon its degree of preparedness. The principle is that each candidate is assessed on its own merits and will join when it is able to meet the obligations of membership.

The negotiations are conducted in bilateral accession conferences between the Member States and each of the applicants, on the



basis of 31 chapters covering all areas of the *acquis communautaire*. They started on 10 November 1998 at Ministerial level on 7 out of the 31 chapters: science & research, education & training, small & medium-sized enterprises, culture & audio-visual policy, telecommunications, industrial policy, and common foreign & security policy. During the first semester of 1999, 8 additional negotiating chapters were opened: on company law, statistics, consumer and health protection, fisheries, competition policy, free movement of goods, customs union and external relations. Of the 15 chapters which had been opened by the end of September 1999, seven of them (statistics, telecommunications, industrial policy, consumer protection, research, small & medium sized enterprises and education & training) have been provisionally closed with all countries. For Hungary, the Czech Republic and Slovenia, fisheries has also been provisionally closed and for Cyprus, three other chapters have been provisionally closed: culture & audio-visual, external relations and customs union. The Presidency of the Council intends to open negotiations on the following eight chapters before the end of 1999: social policy, EMU, free movement of capital, energy, transport, taxation, freedom to provide services and environment. The next Presidency intends to open the remaining seven chapters by the end of June 2000: agriculture, regional policy, free movement of persons, justice and home affairs, financial control, financial and budgetary provisions and institutions. The last chapter can only be considered after the EU's internal institutional reform has taken place. Once all of these chapters have been opened it should be possible to identify the most difficult negotiating problems.

For the other candidate countries the Commission launched in April 1998 an analytical examination ("screening") of the *acquis communautaire*. The aim of this exercise was primarily to speed up their preparation for accession by facilitating a better understanding of the *acquis* and of how its adoption should gradually be undertaken. Bilateral screening has also helped to identify areas in the adoption and implementation of the *acquis* where pre-accession assistance would help in overcoming the difficulties. Completion of bilateral screening is foreseen by the end of 1999.

THE ACQUIS COMMUNAUTAIRE IN THE ENERGY SECTOR

European energy policy is based on three European Treaties...

European energy policy is based on the three European Treaties and special provisions apply for individual sources of energy. The

European Coal and Steel Community Treaty of 18 April 1951 contains provisions for the coal sector. It created the first common energy market for coal and steel with common objectives and institutions. It also marked the start of European integration. The objectives included ensuring that consumers had equal access to production sources, offering undertaking incentives to improve their production potential and promoting the development of international trade. The aim of the European Atomic Energy Community Treaty of 25 March 1957 was to bring together the efforts which had previously been made by the individual Member States to promote nuclear power; and to facilitate the development of an effective nuclear industry by creating new institutions on the territory of the Member States. The other sources of energy (oil, natural gas, electricity) are covered by the EC Treaty where there are no other specific provisions for them.

The acquis communautaire for the energy sector comprised 253 legislative acts by 1998...

The European Union's secondary legislation for the energy sector, which derives from the basic legislation in the Communities' treaties, has reached considerable proportions. Incorporating the *acquis communautaire* in the energy sector, comprising no less than 253 legislative acts by 1998, imposes considerable burdens on the applicant countries. However the majority of the legal acts are decisions on specific cases or are, in part, not legally binding. In fact 17 were adopted as directives, 16 as regulations, 88 as general decisions and 19 as recommendations. The range of legislation on energy varies considerably in the individual sectors. The directory published by the European Communities on current Community legislation distinguishes between the following sectors:

- General principles and programmes. This section contains mainly general legislation on energy policy and legislation on the rational use of energy and energy saving. It has 70 legal acts including 8 directives and 9 regulations;
- Coal. The coal section mainly contains measures to promote the coal industry, measures on prices, sales conditions and coal products. There are 66 legal acts, almost all of which are general decisions;
- Electricity. The electricity section has 7 legal acts, including 2 directives and no regulations;
- Nuclear Power. The nuclear power section contains in particular measures on the supply of fuel, joint power plants and undertakings, safety checks and nuclear research. It has 86 legal acts, including 6 regulations;
- Hydrocarbons. The hydrocarbons section has 16 legal acts, including 6 directives and 2 regulations. Most of this section is



concerned with oil, but it also covers gas and contains provisions on supplies and stocks, intra-Community trade, import and export and extraction;

- Other sources of energy. This section contains 7 legal acts on the use of waste heat and on the research and development in the non-nuclear power sector.

ADOPTION OF THE ACQUIS

*Mixed performance of candidate countries to transpose the *acquis communautaire*...*

The adoption of the *acquis communautaire* involves a process of transposition, implementation and enforcement. It needs to be set in a strategic context with realistic timetables established in relation to administrative and budgetary resources. The importance not only of incorporating Community legislation into national legislation, but also of ensuring its effective application through appropriate administrative and juridical structures was highlighted by the European Council in Madrid and is a central feature of the accession negotiations.

All of the candidate countries have continued their efforts on legal approximation. Concrete progress in the adoption of the *acquis*, however, varies significantly between candidate countries. In general, Hungary, Latvia and Bulgaria have maintained a good pace of legislative approximation. Slovenia and Slovakia have stepped up their efforts significantly. Estonia, Lithuania and Romania have a mixed record, with good progress in certain areas offset by delays in others. The pace of transposition remains sluggish in Poland and the Czech Republic. The slow pace and piecemeal approach to alignment in these two countries is not consistent with their political aspirations for rapid accession to the European Union. Cyprus still has to transpose a substantial amount of legislation and the scheduling of transposition has been set for dates which are very close to Cyprus' own target date for accession, which leaves little margin for demonstrating effective implementation of the legislation. Malta's progress is limited, with little or no progress having been made in areas other than free movement of services. Turkey continues to comply with its obligations under the Customs Union but continued efforts are needed - notably in the competition and custom fields.

Energy sector still to be examined, except nuclear safety...

The report on "progress towards accession by each of the candidate countries" published regularly by the Commission presented

an updated status of progress for the 31 chapters covering all areas of the *acquis communautaire*. The recent edition reported progress made on the more advanced chapters: internal market, environment, financial control, nuclear safety, justice and home affairs, social and health sectors, and agricultural structural reform. As energy has not been a priority for screening, very little progress has been made until now except for nuclear safety issues.

Ensuring high standards of **nuclear safety** throughout the European continent is a top priority for the EU, and in particular the need, as early as possible, to close the oldest Soviet designed reactors which cannot be upgraded to European safety levels. There are non-upgradeable reactors in three candidate countries - Units 1 and 2 at Ignalina in Lithuania, Units 1-2 VI at Bohunice in Slovakia and Units 1-4 at Kosloduy in Bulgaria. The Commission has been involved in an intensive dialogue with each of these countries with the aim of securing agreement on closure dates for these reactors. The Commission has stressed the willingness of the EU and wider international community to provide financial and technical help to decommission these units.

Subsequently, the Lithuanian government, supported by the Parliament, decided to close Unit 1 at Ignalina before the year 2005. This decision is in line with Lithuania's commitments under the Nuclear Safety Account Agreement. A closure date for Unit 2 will be decided following a national energy strategy review in 2004. However, taking account of the age difference between Units 1 and 2, the Commission expects the closure of Unit 2 to take place by 2009 at the latest. Similarly the Slovak government decided to close Units 1-2 VI at Bohunice by 2006 and 2008 respectively. Slovakia does not have any international obligations under the Nuclear Safety Account Agreement and has invested heavily in recent years in safety upgrades for these reactors. Both governments have taken farsighted and courageous decisions which will help ensure higher levels of nuclear safety for their own populations and their neighbours. The Commission recognises that these decisions were taken in a spirit of European integration and that they constitute a significant step in preparation for EU membership.

Given the important decisions made by these governments in the context of their preparations for joining the EU it is all the more disappointing that the Bulgarian government has still not been prepared to commit itself to the closure of Units 1-4 at Kosloduy. The Commission will continue to work with the Bulgarian authorities to identify a realistic closure timetable.



EAST-WEST ENERGY COOPERATION

A move towards European integration will benefit both parties...

The accession of the Central and Eastern European states is clearly in the interests not only of the western European states but also of the other industrialized countries. In the context of this accession strategy, the energy industry plays a key role. Energy prices free of political regulation are important for the further economic development of these countries and for making these countries an attractive location for foreign investors. Because of the crucial importance of the infrastructure, the comprehensive modernization of the energy sector in Central and Eastern Europe is a key factor not only in accelerating economic growth but also in improving the quality of the environment and thus also in achieving accession to the European Union.

The economic and environmental gap between the former socialist states and the western industrialised countries is linked to shortcomings in systems which, in the case of energy efficiency, became apparent after the political changes in Central and Eastern Europe. The energy intensity in these Central European states prior to 1990 was more than four times above the average for the EU average. In the early years of the restructuring towards a market economy, i.e. between 1990 and 1993, energy intensity in Eastern and Central Europe fell only slowly (-0.6% p.a.), in parallel with the decline in GDP of 13% and energy consumption of 17%. Not least as a result of support from abroad and economic stabilisation, the fall in energy intensity became much faster in subsequent years (1994: -6.5%; 1995: -3.5%), but it is still several times the EU average.

Major financial efforts in energy sectors will be needed over many years....

In order to make full use of the potential to save energy in Central and Eastern Europe, and to ensure an expansion of supply capacities in line with the forecast demand evolution and environmental considerations, major financial efforts will be needed over many years. According to estimates from the World Energy Council, the modernisation of the energy industries in Central and Eastern Europe (including CIS) over the next 30 years will require funding of over 2€ trillion, i.e. 70€ billion annually. The Polish electricity industry alone will require funding over the next 15 years of 25€ billion for environmental protection measures and new investments. It will not be possible to obtain financial resources on this scale from either public budgets or international financial institutions alone. Without sizeable private investment it will

hardly be possible to produce the necessary funding to speed up the economic and environmental modernisation process.

Central and Eastern Europe are an investment location for EU energy supply undertakings...

On the other hand, the central European states undertaking reforms are interesting investment locations for European energy supply undertakings. The geographical proximity, the level of general legal security and economic stability that has already been achieved and an expected medium to long-term growth of the gas and electricity markets make these countries highly attractive. After the drastic fall in energy and electricity consumption, in some countries as a result of the transformation crisis, a slight recovery in electricity consumption could be observed as early as 1995. Forecasts from the International Energy Agency (IEA) indicate that demand for power in Central and Eastern Europe taking account of the potential for energy saving, will probably increase annually by an average of 2.9% between 2000 and 2010. The electricity markets will grow markedly more strongly in the medium-term in Central and Eastern Europe than in the European Union. The forecast for the gas sector for the same period is for an annual average increase in consumption of 3.1%. In addition to these opportunities for growth there are specific grid-related considerations which are of particular importance when considering the electricity markets.

East-West cooperation on electricity started with the integration of CENTREL countries...

With the successful trial integration in October 1995 of the CENTREL countries (Poland, Hungary, Czech and Slovak Republics) into the Western European grid system UCPTÉ (Union for the Coordination of Production and Transmission of Electricity), the East-West cooperation on electricity as regards the grid was enhanced. Following the successful conclusion of the trial phase, the four network companies of the CENTREL countries have had the status of associated UCPTÉ members since 1997 on the basis of a durable and synchronous network operation. The inclusion of these countries in the synchronous trans-frontier exchange of power makes the electricity markets of central and eastern Europe all the more interesting, in terms of optimising overall electricity production and distribution. It is possible that Romania and Bulgaria will follow the CENTREL countries in the foreseeable future if they are able to meet the demanding technical requirements for synchronous network operation with the UCPTÉ system.



But reticence still exists to opening electricity and gas markets in candidate countries...

Given the convergence of interests - the need for large investments by the states carrying out reforms and additional opportunities for growth for the western countries - there are good prospects for greater cooperation in the energy industry, offering benefits to both parties. After the relatively rapid break up of the different organisational groupings (production, distribution, transmission) in the previously centralised, state-dominated energy supply systems and the decentralisation of ownership at production and distribution levels, almost all the states undergoing reform have found it difficult to take the next step and to open up the markets for electricity and gas to foreign investors. The reasons for this reticence are to some extent quite understandable. On the one hand the positive economic and environmental effects of a privatisation of the electricity and gas industries with foreign participation are not disputed. On the other hand it is not possible to ignore the political and social dimension of a comprehensive privatisation of this strategic sector. There is the fear that national control might possibly be lost over a strategic sector of the economy and that, with strict management of the companies along market economy lines and an adjustment of energy prices to the markedly higher international level, serious social problems could be caused. The argument of a loss of national control contrasts markedly with the decision taken in most of the states carrying out reforms to move towards a free international movement of capital and goods.

... as for a fundamental reform of pricing structures.

On the other hand, the need for a fundamental reform of the pricing structures - in addition to the high level of investment required - does represent a serious problem in the transition to an energy supply system based on market economics. The crux is to cease using the previous purely politically motivated energy pricing system and to create the conditions for a strict, cost-oriented pricing structure. Assessed in terms of real costs, the energy prices for industry were too high under the old system and the prices for domestic customers were too low.

EU is expanding transEuropean infrastructure networks...

Using a concept formulated in certain Community documents in the early 1990's, the Maastricht Treaty gave the Community the task of creating and expanding transEuropean infrastructure networks in transport, telecommunications and energy. These networks are justified on the grounds of the general objective of economic and social cohesion and one of their most important aims is to link island, landlocked and peripheral regions with the

central regions of the Community. They are based primarily on the interconnection and the interoperability of the national networks.

The TransEuropean Networks (TEN) play a crucial role as far as the success of enlargement is concerned. In the pre-accession period progress must be made with the development of infrastructure, of which expanded TEN form a part, and with promoting access to infrastructure. In terms of TEN policy it is important that the pre-accession strategy covers all applicant countries as it only makes sense if transport, telecommunication and energy supply systems are viewed in the overall European context and if planning is geared to an integrated market based on integrated networks. As far as the energy sector is concerned the European Union will have to provide financial support to a certain extent for the diversification of energy supplies, in particular natural gas, and for safeguarding the security of supplies.

ENERGY BALANCE OF CANDIDATE COUNTRIES

Energy profile far from the European Union average...

The aggregate energy balance of all the candidate countries demonstrates major differences with that of the European Union. The population of candidate countries approximates to 45% of the EU population while the GDP of all the candidate countries reached only 6% of EU GDP and their gross inland energy consumption was 24% that of the EU. These three numbers together reveal the extreme differences still existing between candidate countries and the existing Member States of the European Union. Excluding Turkey, Cyprus and Malta, they reflect the situation of Eastern and Central countries: restructuring economies characterised by very high energy intensity as described in the relevant chapter of this Review.

Energy balance largely based on solid fuels, both at the production and consumption level...

By way of comparison with the European Union energy balance, the main differences characterising the candidate countries concern mainly:

- The higher self-sufficiency of these countries that reached 63.2% in 1997 against 51.1% in the European Union, even if this self-sufficiency has declined steadily since 1985 when it was close to 75%;
- This resulted from the importance of primary energy production, largely dominated by solid fuels. In 1997, solid fuels pro-



duction, mainly located in Poland, exceeded EU production by 23%. It represented 65% of the primary production in candidate countries against only 15% in the European Union. The rationalisation of the mining industry, started in 1985 and involving a reduction of production by about 28%, will continue in the near future leading to the continued reduction of total primary energy production;

- The contribution of other energy sources to total primary production remained marginal, below 10% of the EU levels especially for crude oil, natural gas and nuclear;
- Net imports were dominated by oil and natural gas, essentially supplied by CIS, the same profile as for the EU save for the fact that candidate countries remained net exporter of solid fuels;
- The structure of gross inland energy consumption was largely dominated by solid fuels which contributed 40% of all energy needs followed by oil with 29%, natural gas 18% and nuclear 6%. This differed markedly from the EU pattern where oil contributed 42%, natural gas 22%, solid fuels 16% and nuclear 15%. The prevalence of heavy industries largely based on coal and the still limited contribution of the transport sector to final demand explained this situation. But the restructuring and the modernisation of these economies will in the near future intensify the major role of hydrocarbons, as in the European Union;
- Thermal power generation contributed 70% of total electricity production against 52% in the European Union as a result of the limited share of nuclear. Decisions to close old units in the candidate countries will reinforce this situation. In thermal power solids fuels were the largest input with 75% of total consumption against 55% in the European Union. In particular the role played by natural gas remained quite low with only 13% of total consumption as the commissioning of new combined cycle units has been limited until now to some partnerships with foreign utilities. Additionally the average efficiency of thermal units remained close to 30%, demonstrating the urgent need for modernisation of these power plants;
- The structure of final consumption confirmed the observations made earlier. Since the early 1990's oil products have been the largest contributor with 30% of total consumption in 1997 against 45% in the European Union. Solid fuels were second with 21% against a marginal contribution of 4% in the European Union. They are followed by natural gas with 17%, a little less than the 24% in the European Union; and by electricity with 14% against 19% in the European Union. The contribution of heat, produced from combined heat and power units and centralised boilers, was 11% but only 2% in the European Union. But this contribution has been declining since 1990 (-33%) with the closure of old units.

Energy intensity four times higher than in the European Union...

One of the most significant indicators of the energy situation of the candidate countries is that for energy intensity. For all candidate countries considered as a whole the energy intensity was 5 times higher than that of the European Union in 1990. Progress made in the candidate countries reduced this divergence to 4 in 1997. But large discrepancies exist between candidate countries. The best performances were in Slovenia, Cyprus, Malta and Turkey which are close to the poorer performing EU Member States. Inside Central and Eastern Europe, Latvia and Hungary had energy intensities a little lower than the average of all the candidate countries but all the others were well above this average. Four of the larger countries, Czech Republic, Poland, Bulgaria and Romania, still had energy intensities 7 to 8 times higher than the European Union average. Since 1990, major progress has been made by the lowest performers with the exception of Bulgaria. Estonia improved its energy intensity by 5.3% per year on average, Romania and Lithuania by 3.2%, Poland by 2.9%, Slovakia by 2.7% and Czech Republic by 1.5%.

CO₂ emissions per unit of GDP five times higher than in the European Union...

As a consequence of the high energy intensity of candidate countries, coupled with the major contribution of solid fuels, CO₂ emissions were particularly high as they represented in 1998 about 29% of the EU CO₂ emissions. The carbon intensity, pushed by solid fuels, was 23% higher. The very low GDP of candidate countries, as a group, has two consequences: CO₂ emissions per capita were 33% lower than those of the European Union in 1998 but CO₂ emissions per unit of GDP were 5 times higher.

CANDIDATE COUNTRIES : SUMMARY ENERGY BALANCE

Mtoe	1980	1985	1990	1996	1997	1998(2)	85/80	90/85	96/90	97/96	98/97
	Annual % Change										
Primary Production	265.4	286.4	250.0	233.9	229.1	217.5	1.5%	-2.7%	-1.1%	-2.0%	-5.1%
Solids	187.0	196.4	167.5	155.9	151.6	142.0	1.0%	-3.1%	-1.2%	-2.7%	-6.3%
Oil	17.0	15.8	14.3	13.6	13.6	12.7	-1.4%	-2.0%	-0.8%	-0.2%	-6.3%
Natural gas	41.5	41.9	29.8	21.1	19.1	17.4	0.2%	-6.6%	-5.6%	-9.6%	-9.0%
Nuclear	2.8	11.7	19.5	19.9	20.3	20.3	33.3%	10.7%	0.4%	1.5%	0.3%
Hydro & Wind	3.6	3.4	4.2	6.3	6.4	6.5	-1.2%	4.5%	6.9%	2.1%	0.8%
Geothermal	0.0	0.0	0.1	0.2	0.2	0.2	-	76.2%	11.3%	10.5%	26.3%
Other	13.5	17.1	14.6	16.9	18.0	18.4	4.8%	-3.1%	2.5%	6.6%	2.2%
Net Imports	100.9	99.3	132.6	127.3	128.4	126.1	-0.3%	6.0%	-0.7%	0.9%	-1.8%
Solids	-10.8	-10.1	-5.4	-7.2	-4.5	-6.3	-1.4%	-11.8%	4.8%	-37.3%	40.4%
Oil	90.4	82.6	92.4	86.8	86.8	89.1	-1.8%	2.2%	-1.0%	0.0%	2.7%
Crude oil	85.8	92.0	88.0	77.0	76.5	na	1.4%	-0.9%	-2.2%	-0.6%	na
Oil products	4.6	-9.4	4.4	9.8	10.2	na	-	-	14.2%	4.7%	na
Natural gas	20.6	25.9	44.7	47.8	46.4	43.5	4.6%	11.5%	1.1%	-2.9%	-6.2%
Electricity	0.7	0.9	0.9	-0.1	-0.2	-0.2	3.9%	1.4%	-	75.8%	-24.4%
Gross Inland Consumption	365.1	387.3	380.8	357.0	350.9	341.7	1.2%	-0.3%	-1.1%	-1.7%	-2.6%
Solids	176.6	187.9	163.4	147.6	144.0	135.7	1.2%	-2.8%	-1.7%	-2.4%	-5.8%
Oil	106.3	99.3	104.4	98.3	97.7	99.6	-1.3%	1.0%	-1.0%	-0.6%	1.9%
Natural gas	61.6	67.0	73.8	68.2	64.8	60.9	1.7%	1.9%	-1.3%	-5.0%	-6.0%
Other (1)	20.6	33.0	39.3	43.0	44.4	45.5	9.9%	3.5%	1.5%	3.2%	2.6%
Electricity Generation in TWh	386.3	447.3	480.2	508.3	512.0	na	3.0%	1.4%	1.0%	0.7%	na
Nuclear	10.7	44.9	74.7	76.3	77.5	na	33.3%	10.7%	0.4%	1.6%	na
Hydro & wind	41.7	39.3	48.8	72.2	73.4	na	-1.2%	4.4%	6.7%	1.7%	na
Thermal	333.9	363.0	356.8	359.9	361.2	na	1.7%	-0.3%	0.1%	0.4%	na
Generation Capacity in GWe	68.2	85.7	123.1	129.9	131.0	na	4.7%	7.5%	0.9%	0.9%	na
Nuclear	1.8	5.6	11.1	12.6	12.6	na	26.0%	14.6%	2.1%	0.0%	na
Hydro & wind	10.4	13.9	21.7	26.5	26.5	na	6.0%	9.3%	3.4%	-0.1%	na
Thermal	56.0	66.2	90.3	90.8	92.0	na	3.4%	6.4%	0.1%	1.3%	na
Average Load Factor in %	64.7	59.6	44.5	44.7	44.6	na	-1.6%	-5.7%	0.0%	-0.1%	na
Fuel Inputs for Thermal Power Generation	97.2	113.0	113.9	106.4	103.6	na	3.1%	0.2%	-1.1%	-2.7%	na
Solids	73.1	82.7	81.6	80.0	79.0	na	2.5%	-0.3%	-0.3%	-1.2%	na
Oil	15.1	15.1	13.5	10.4	10.4	na	0.0%	-2.2%	-4.2%	0.1%	na
Gas	8.6	14.7	18.3	15.4	13.6	na	11.2%	4.6%	-2.8%	-12.0%	na
Geothermal	0.0	0.0	0.1	0.1	0.1	na	-	69.0%	0.7%	-1.4%	na
Other	0.3	0.6	0.5	0.5	0.5	na	13.0%	-4.5%	3.1%	-6.3%	na
Average Thermal Efficiency in %	29.6	27.6	26.9	29.1	30.0	na	-1.3%	-0.5%	1.3%	3.1%	na
Non-Energy Uses	12.4	13.8	16.5	17.9	18.4	na	2.1%	3.6%	1.4%	2.8%	na
Total Final Energy Demand	271.5	271.3	257.7	230.2	224.0	na	0.0%	-1.0%	-1.9%	-2.7%	na
Solids	82.5	85.1	61.7	51.4	46.3	na	0.6%	-6.2%	-3.0%	-9.9%	na
Oil	72.5	62.6	68.1	66.0	66.1	na	-2.9%	1.7%	-0.5%	0.2%	na
Gas	46.4	44.2	43.9	37.5	37.2	na	-1.0%	-0.1%	-2.6%	-0.8%	na
Electricity	25.8	29.7	32.2	31.5	31.9	na	2.8%	1.6%	-0.4%	1.3%	na
Heat	31.1	33.3	37.7	27.6	25.2	na	1.4%	2.5%	-5.1%	-8.8%	na
Other	13.2	16.5	14.2	16.3	17.4	na	4.6%	-3.0%	2.4%	6.8%	na
CO₂ Emissions in Mt of CO₂	1108.1	1136.0	1075.2	974.0	939.4	903.8	0.5%	-1.1%	-1.6%	-3.6%	-3.8%
Indicators											
Population (Million)	147.41	155.95	163.26	168.90	169.84	170.75	1.1%	0.9%	0.6%	0.6%	0.5%
GDP (index 1985=100)	87.1	100.0	120.7	130.3	136.5	139.9	2.8%	3.8%	1.3%	4.7%	2.5%
Gross Inl Cons./GDP (toe/1990 MEUR)	1590.0	1468.8	1197.0	1039.2	975.3	926.7	-1.6%	-4.0%	-2.3%	-6.2%	-5.0%
Gross Inl Cons./Capita (toe/inhabitant)	2.48	2.48	2.33	2.11	2.07	2.00	0.1%	-1.2%	-1.6%	-2.3%	-3.1%
Electricity Generated/Capita (kWh/inhabitant)	2621	2868	2942	3010	3014	na	1.8%	0.5%	0.4%	0.2%	na
CO ₂ Emissions/Capita (t of CO ₂ /inhabitant)	7.5	7.3	6.6	5.8	5.5	5.3	-0.6%	-2.0%	-2.2%	-4.1%	-4.3%
Import Dependency %	27.6	25.6	34.7	35.5	36.4	36.8	-1.5%	6.3%	0.4%	2.6%	1.0%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Estimates

CANDIDATE COUNTRIES : MAIN INDICATORS

	1980	1985	1990	1995	1996	1997	85/80	90/85	96/90	96/95	97/96
	Annual % Change										
Gross Inland Consumption (Mtoe)	365.1	387.3	380.8	338.9	357.0	350.9	1.2%	-0.3%	-1.1%	5.3%	-1.7%
Public Thermal Power Generation	83.1	97.0	99.8	91.8	96.1	93.9	3.1%	0.6%	-0.6%	4.6%	-2.3%
Autoprod. Thermal Power Generation	14.1	16.0	14.1	9.7	10.3	9.6	2.6%	-2.6%	-5.1%	6.3%	-6.7%
Energy Branch	15.7	16.8	18.2	22.0	21.9	21.9	1.3%	1.7%	3.1%	-0.5%	0.1%
Final Energy Consumption	271.5	271.3	257.7	214.9	229.7	223.2	0.0%	-1.0%	-1.9%	6.9%	-2.8%
Industry	132.0	128.8	114.2	83.7	90.3	85.5	-0.5%	-2.4%	-3.8%	7.9%	-5.4%
Transport	28.9	28.3	36.7	37.6	41.4	41.0	-0.4%	5.4%	2.0%	10.0%	-0.9%
Tertiary-Domestic	110.7	114.2	106.7	93.6	98.0	96.8	0.6%	-1.3%	-1.4%	4.7%	-1.2%
Energy Intensity (toe/1990 MEUR)	1590.0	1468.8	1197.0	1033.7	1039.2	975.3	-1.6%	-4.0%	-2.3%	0.5%	-6.2%
Public Thermal Power Generation	361.8	367.9	313.6	280.1	279.7	261.0	0.3%	-3.1%	-1.9%	-0.1%	-6.7%
Autoprod. Thermal Power Generation	61.3	60.8	44.2	29.5	30.0	26.7	-0.2%	0.9%	-1.3%	-1.4%	1.0%
Industry	574.7	488.6	358.9	255.3	262.9	237.6	-3.2%	-6.0%	-5.1%	3.0%	-9.6%
Transport	125.7	107.3	115.5	114.8	120.4	113.9	-3.1%	1.5%	0.7%	5.0%	-5.4%
Tertiary-Domestic	482.1	433.1	335.5	285.5	285.2	269.0	-2.1%	-5.0%	-2.7%	-0.1%	-5.7%
Energy per Capita (Kgoe/inhabitant)	2477	2483	2333	2017	2114	2066	0.1%	-1.2%	-1.6%	4.8%	-2.3%
Industry	895	826	699	498	535	503	-1.6%	-3.3%	-4.4%	7.3%	-5.9%
Transport	196	181	225	224	245	241	-1.5%	4.4%	1.4%	9.4%	-1.5%
Tertiary-Domestic	751	732	654	557	580	570	-0.5%	-2.2%	-2.0%	4.1%	-1.8%
Electricity Share (%)											
Final Energy Consumption	9.5%	10.9%	12.5%	13.8%	13.7%	14.3%	2.9%	2.7%	1.6%	-0.9%	4.2%
Industry	12.3%	13.6%	15.1%	16.6%	16.2%	17.8%	2.1%	2.1%	1.2%	-2.2%	9.6%
Transport	4.1%	4.8%	3.9%	3.1%	2.8%	2.7%	3.3%	-4.1%	-5.2%	-8.1%	-5.8%
Tertiary-Domestic	7.6%	9.4%	12.6%	15.7%	16.0%	16.1%	4.3%	6.1%	4.0%	1.8%	0.8%
Total Renewable Consumption (Mtoe)	17.1	20.5	18.9	21.7	23.2	24.3	3.7%	-1.6%	3.5%	6.6%	5.1%
Hydro	3.6	3.4	4.2	5.9	6.2	6.3	-1.2%	4.4%	6.7%	4.5%	1.7%
Biomass	13.5	17.1	14.6	15.6	16.7	17.7	4.8%	-3.1%	2.3%	7.0%	6.2%
Other	0.0	0.0	0.1	0.2	0.3	0.3	-	84.2%	15.5%	32.6%	17.9%
Renewable intensity (toe/1990MEUR)	74.4	77.6	59.4	66.3	67.4	67.7	0.8%	-5.2%	2.1%	1.7%	0.4%
Renewable per capita (Kgoe/inhabitant)	115.9	131.2	115.7	129.4	137.1	143.3	2.5%	-2.5%	2.9%	6.0%	4.5%
CO₂ Emissions (Mt of CO₂)	1108.1	1136.0	1075.2	920.5	974.0	939.4	0.5%	-1.1%	-1.6%	5.8%	-3.6%
Public Thermal Power Generation	303.7	350.1	357.9	337.1	351.8	345.6	2.9%	0.4%	-0.3%	4.4%	-1.7%
Autoprod. Thermal Power Generation	52.1	58.5	50.5	31.3	33.7	31.3	2.3%	-2.9%	-6.5%	7.6%	-7.1%
Energy Branch	26.5	26.4	29.8	38.3	37.5	38.7	-0.1%	2.5%	3.9%	-1.9%	3.1%
Industry	313.9	304.1	257.7	199.3	219.3	203.1	-0.6%	-3.3%	-2.7%	10.0%	-7.4%
Transport	85.7	83.2	108.8	111.8	123.3	122.4	-0.6%	5.5%	2.1%	10.3%	-0.8%
Tertiary-Domestic	264.2	250.6	195.7	156.3	156.6	153.2	-1.0%	-4.8%	-3.7%	0.2%	-2.2%
Carbon Intensity (tn of CO₂/toe)	3.0	2.9	2.8	2.7	2.7	2.7	-0.7%	-0.8%	-0.6%	0.5%	-1.9%
Public Power Generation	3.4	3.1	2.9	2.9	2.9	2.9	-1.7%	-1.5%	-0.1%	-0.6%	-0.3%
Public Thermal Power Generation	3.7	3.6	3.6	3.7	3.7	3.7	-0.3%	-0.1%	0.3%	-0.3%	0.5%
Autoprod. Power Generation	3.7	3.6	3.6	3.2	3.3	3.2	-0.3%	-0.3%	-1.6%	1.2%	-0.5%
Autoprod. Thermal Power Generation	3.7	3.7	3.6	3.2	3.3	3.3	-0.3%	-0.3%	-1.6%	1.2%	-0.4%
Energy Branch	3.5	3.5	3.4	3.2	3.2	3.2	-0.3%	-0.7%	-0.8%	0.5%	-1.8%
Industry	1.7	1.6	1.6	1.7	1.7	1.8	-1.4%	0.8%	0.8%	-1.4%	3.0%
Transport	2.4	2.4	2.3	2.4	2.4	2.4	-0.2%	-0.9%	1.2%	2.0%	-2.1%
Tertiary-Domestic	3.0	2.9	3.0	3.0	3.0	3.0	-0.2%	0.1%	0.1%	0.3%	0.2%
CO₂ per Capita (kg of CO₂/inhabitant)	7517	7284	6586	5478	5767	5531	-0.6%	-2.0%	-2.2%	5.3%	-4.1%
Industry	2129	1950	1578	1186	1298	1196	-1.7%	-4.1%	-3.2%	9.4%	-7.9%
Transport	582	533	666	665	730	721	-1.7%	4.5%	1.5%	9.7%	-1.3%
Tertiary-Domestic	1792	1607	1199	930	927	902	-2.2%	-5.7%	-4.2%	-0.3%	-2.7%
CO₂ per unit of GDP (tn of CO₂/1990 MEUR)	4826	4309	3380	2807	2835	2611	-2.2%	-4.7%	-2.9%	1.0%	-7.9%
Public Thermal Power Generation	1323	1328	1125	1028	1024	961	0.1%	-3.3%	-1.6%	-0.4%	-6.2%
Autoprod. Thermal Power Generation	227	222	159	95	98	87	-0.4%	-6.5%	-7.7%	2.7%	-11.3%
Energy Branch	270	239	235	142	151	125	-2.4%	-0.3%	-7.1%	6.5%	-16.9%
Industry	115	100	94	117	109	108	-2.8%	-1.3%	2.6%	-6.4%	-1.5%
Transport	1367	1154	810	608	638	564	-3.3%	-6.8%	-3.9%	5.0%	-11.6%
Tertiary-Domestic	373	315	342	341	359	340	-3.3%	1.6%	0.8%	5.3%	-5.2%

EUR-28 : SUMMARY ENERGY BALANCE

Mtoe	1980	1985	1990	1996	1997	1998(2)	85/80	90/85	96/90	97/96	98/97
Annual % Change											
Primary Production	871.8	1021.6	957.2	998.3	990.9	970.5	3.2%	-1.3%	0.7%	-0.7%	-2.1%
Solids	444.6	435.9	377.4	287.3	277.9	256.8	-0.4%	-2.8%	-4.4%	-3.3%	-7.6%
Oil	111.5	166.7	131.3	172.8	171.9	174.7	8.4%	-4.7%	4.7%	-0.5%	1.6%
Natural gas	174.8	173.8	162.7	209.8	201.2	198.8	-0.1%	-1.3%	4.3%	-4.1%	-1.2%
Nuclear	58.6	159.1	200.9	228.8	232.9	230.0	22.1%	4.8%	2.2%	1.8%	-1.2%
Hydro & Wind	27.5	27.8	26.6	31.5	32.5	33.8	0.2%	-0.9%	2.9%	3.1%	3.9%
Geothermal	1.9	1.8	2.3	2.9	3.0	3.2	-1.0%	5.1%	4.0%	2.9%	7.5%
Other renewable energy sources	52.9	56.5	56.1	65.2	71.6	73.2	1.3%	-0.2%	2.5%	9.8%	2.3%
Net Imports	788.9	625.6	776.3	806.2	821.0	849.1	-4.5%	4.4%	0.6%	1.8%	3.4%
Solids	54.2	64.3	82.8	88.0	94.0	94.7	3.5%	5.2%	1.0%	6.8%	0.8%
Oil	661.6	464.6	553.2	552.2	556.0	578.4	-6.8%	3.6%	0.0%	0.7%	4.0%
Crude oil	629.5	435.4	524.7	531.8	541.6	na	-7.1%	3.8%	0.2%	1.8%	na
Oil products	32.1	29.2	28.5	20.4	14.4	na	-1.9%	-0.5%	-5.4%	-29.2%	na
Natural gas	71.2	94.5	137.0	166.2	170.5	175.0	5.8%	7.7%	3.3%	2.6%	2.6%
Electricity	1.9	2.2	3.3	-0.3	0.4	1.0	2.9%	8.3%	-	-	115.6%
Gross Inland Consumption	1605.9	1628.1	1698.9	1769.7	1760.4	1777.4	0.3%	0.9%	0.7%	-0.5%	1.0%
Solids	488.6	504.1	464.6	382.5	367.5	358.4	0.6%	-1.6%	-3.2%	-3.9%	-2.5%
Oil	729.6	611.6	649.4	686.0	685.5	701.1	-3.5%	1.2%	0.9%	-0.1%	2.3%
Natural gas	244.8	265.0	295.8	373.3	367.3	376.4	1.6%	2.2%	4.0%	-1.6%	2.5%
Other (1)	142.9	247.4	289.1	328.0	340.1	341.5	11.6%	3.2%	2.1%	3.7%	0.4%
Electricity Generation in Twh	2066.9	2364.3	2635.9	2918.3	2938.1	na	2.7%	2.2%	1.7%	0.7%	na
Nuclear	222.2	619.8	794.7	927.3	937.2	na	22.8%	5.1%	2.6%	1.1%	na
Hydro & wind	327.7	338.5	325.2	386.7	396.8	na	0.7%	-0.8%	2.9%	2.6%	na
Thermal	1517.0	1405.9	1516.0	1604.3	1604.1	na	-1.5%	1.5%	0.9%	0.0%	na
Generation Capacity in GWe	484.1	566.6	646.1	679.8	689.8	na	3.2%	2.7%	0.9%	1.5%	na
Nuclear	44.5	92.6	127.7	134.0	136.7	na	15.8%	6.6%	0.8%	2.0%	na
Hydro & wind	101.0	117.4	133.4	145.6	147.0	na	3.1%	2.6%	1.5%	1.0%	na
Thermal	338.5	356.7	384.9	400.2	406.0	na	1.0%	1.5%	0.7%	1.5%	na
Average Load Factor in %	48.7	47.6	46.6	49.0	48.6	na	-0.5%	-0.4%	0.9%	-0.8%	na
Fuel Inputs for Thermal Power Generation	382.9	361.5	384.0	384.9	375.6	na	-1.1%	1.2%	0.0%	-2.4%	na
Solids	240.9	253.1	263.8	240.8	228.3	na	1.0%	0.8%	-1.5%	-5.2%	na
Oil	91.2	55.5	56.0	52.0	48.8	na	-9.5%	0.2%	-1.2%	-6.1%	na
Gas	43.6	44.8	54.9	79.3	84.3	na	0.6%	4.2%	6.3%	6.3%	na
Geothermal	1.9	1.7	1.9	2.4	2.5	na	-2.0%	2.7%	3.7%	3.7%	na
Biomass	5.3	6.4	7.4	10.4	11.6	na	3.9%	2.8%	6.0%	11.2%	na
Average Thermal Efficiency in %	34.1	33.5	34.0	35.9	36.8	na	-0.4%	0.3%	0.9%	2.5%	na
Non-Energy Uses	88.4	89.7	101.7	110.7	116.8	na	0.3%	2.5%	1.4%	5.5%	na
Total Final Energy Demand	1117.1	1093.3	1120.3	1165.8	1155.4	na	-0.4%	0.5%	0.7%	-0.9%	na
Solids	177.8	186.5	141.8	97.7	92.8	na	1.0%	-5.3%	-6.0%	-5.1%	na
Oil	505.5	436.2	464.9	496.1	495.6	na	-2.9%	1.3%	1.1%	-0.1%	na
Gas	196.7	205.6	222.1	265.2	253.9	na	0.9%	1.6%	3.0%	-4.3%	na
Electricity	147.2	166.0	188.1	205.3	208.9	na	2.4%	2.5%	1.5%	1.8%	na
Heat	42.5	49.3	54.4	48.7	46.0	na	3.0%	2.0%	-1.8%	-5.4%	na
Renewable energy sources	47.6	49.8	48.8	52.8	58.2	na	0.9%	-0.4%	1.3%	10.2%	na
CO₂ Emissions in Mt of CO₂	4444	4128	4151	4093	3983	4006	-1.5%	0.1%	-0.2%	-2.7%	0.6%
Indicators											
Population (Million)	503	515	528	542	544	546	0.5%	0.5%	0.4%	0.4%	0.3%
GDP (index 1985=100)	92.9	100.0	116.5	126.6	130.1	133.8	1.5%	3.1%	1.4%	2.8%	2.9%
Gross Inl Cons./GDP (toe/1985 MEUR)	357.5	336.8	301.6	289.1	279.9	274.7	-1.2%	-2.2%	-0.7%	-3.2%	-1.8%
Gross Inl Cons./Capita (toe/inhabitant)	3.19	3.16	3.22	3.27	3.24	3.26	-0.2%	0.4%	0.2%	-0.9%	0.6%
Electricity Generated/Capita (kWh/inhabitant)	4111	4593	4995	5385	5402	na	2.2%	1.7%	1.3%	0.3%	na
CO ₂ Emissions/Capita (t of CO ₂ /inhabitant)	8.84	8.02	7.87	7.55	7.32	7.34	-1.9%	-0.4%	-0.7%	-3.0%	0.3%
Import Dependency %	48.2	37.8	44.8	44.6	45.6	46.7	-4.8%	3.5%	-0.1%	2.2%	2.4%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Estimates



EUR-28 : MAIN INDICATORS

	1980	1985	1990	1996	1997	1998	85/80	90/85	96/90	97/96	98/97
	Annual % Change										
Gross Inland Consumption (Mtoe)	1605.9	1628.1	1698.9	1769.7	1760.4	1777.4	0.3%	0.9%	0.7%	-0.5%	1.0%
Power Generation	370.0	508.6	565.2	593.7	588.2	na	6.6%	2.1%	0.8%	-0.9%	na
Energy Branch	77.9	77.1	81.5	92.7	91.3	na	-0.2%	1.1%	2.2%	-1.5%	na
Final Energy Consumption	1117.2	1093.3	1119.9	1164.9	1154.2	na	-0.4%	0.5%	0.7%	-0.9%	na
Industry	442.7	392.9	379.4	349.9	348.1	na	-2.4%	-0.7%	-1.3%	-0.5%	na
Transport	218.1	231.1	290.6	324.8	329.7	na	1.2%	4.7%	1.9%	1.5%	na
Tertiary-Domestic	455.6	469.2	449.9	490.2	476.4	na	0.6%	-0.8%	1.4%	-2.8%	na
Energy Intensity (toe/1990 MEUR)	357.5	336.8	301.6	289.1	279.9	274.7	-1.2%	-2.2%	-0.7%	-3.2%	-1.8%
Power Generation	82.4	105.2	100.3	97.0	93.5	na	5.0%	-0.9%	-0.6%	-3.6%	na
Final Energy Consumption	248.7	226.2	198.8	190.3	183.5	na	-1.9%	-2.5%	-0.7%	-3.6%	na
Industry	98.5	81.3	67.4	57.2	55.3	na	-3.8%	-3.7%	-2.7%	-3.2%	na
Transport	48.6	47.8	51.6	53.1	52.4	na	-0.3%	1.5%	0.5%	-1.2%	na
Tertiary-Domestic	101.4	97.1	79.9	80.1	75.7	na	-0.9%	-3.8%	0.0%	-5.4%	na
Energy per capita (Kgoe/inhabitant)	3194	3163	3219	3265	3237	3257	-0.2%	0.4%	0.2%	-0.9%	0.6%
Power Generation	736	988	1071	1095	1081	na	6.1%	1.6%	0.4%	-1.3%	na
Final Energy Consumption	2222	2124	2122	2149	2122	na	-0.9%	0.0%	0.2%	-1.3%	na
Industry	880	763	719	646	640	na	-2.8%	-1.2%	-1.8%	-0.9%	na
Transport	434	449	551	599	606	na	0.7%	4.2%	1.4%	1.2%	na
Tertiary-Domestic	906	912	852	905	876	na	0.1%	-1.3%	1.0%	-3.2%	na
Electricity Share (%)											
Final Energy Consumption	13.2%	15.2%	16.8%	17.6%	18.1%	na	2.9%	2.0%	0.8%	2.7%	na
Industry	17.1%	20.2%	22.8%	24.7%	25.7%	na	3.4%	2.4%	1.3%	4.1%	na
Transport	1.9%	2.1%	1.9%	1.8%	1.8%	na	1.1%	-1.9%	-0.2%	-1.9%	na
Tertiary-Domestic	14.7%	17.4%	21.4%	23.0%	23.8%	na	3.4%	4.2%	1.3%	3.4%	na
Total Renewable consumption (Mtoe)	82.3	85.9	84.7	99.2	106.1	na	0.9%	-0.3%	2.7%	7.0%	na
Hydro	27.5	27.8	26.5	31.0	31.8	na	0.2%	-1.0%	2.7%	2.4%	na
Biomass	52.9	56.2	55.7	64.5	70.3	na	1.2%	-0.2%	2.5%	9.0%	na
Other renewable energy source	1.9	1.9	2.5	3.7	4.1	na	0.0%	6.2%	6.5%	9.4%	na
Renewable Intensity (toe/1990 MEUR)	18.3	17.8	15.0	16.2	16.9	na	-0.6%	-3.3%	1.3%	4.1%	na
Renewable per capita (kgoe/inhabitant)	163.7	166.9	160.5	183.1	195.1	na	0.4%	-0.8%	2.2%	6.6%	na
CO₂ Emissions (Mt of CO₂)	4444	4128	4151	4093	3983	4006	-1.5%	0.1%	-0.2%	-2.7%	0.6%
Power Generation	1392	1302	1370	1321	1273	na	-1.3%	1.0%	-0.6%	-3.6%	na
Energy Branch	171	66	67	52	48	na	-17.3%	0.3%	-4.0%	-8.0%	na
Final Energy Consumption	2806	2573	2512	2521	2474	na	-1.7%	-0.5%	0.1%	-1.9%	na
Industry	1069	917	826	728	713	na	-3.0%	-2.1%	-2.1%	-2.1%	na
Transport	686	671	847	949	964	na	-0.4%	4.8%	1.9%	1.6%	na
Tertiary-Domestic	1051	985	838	845	797	na	-1.3%	-3.2%	0.1%	-5.6%	na
Carbon (tn of CO₂/toe)	2.8	2.5	2.4	2.3	2.3	2.3	-1.7%	-0.7%	-0.9%	-2.2%	-0.4%
Power Generation	3.8	2.6	2.4	2.2	2.2	na	-7.4%	-1.1%	-1.4%	-2.7%	na
Energy Branch	2.2	0.9	0.8	0.6	0.5	na	-17.2%	-0.8%	-6.1%	-6.6%	na
Final Energy Consumption	2.5	2.4	2.2	2.2	2.1	na	-1.3%	-1.0%	-0.6%	-1.0%	na
Industry	2.4	2.3	2.2	2.1	2.0	na	-0.7%	-1.4%	-0.8%	-1.6%	na
Transport	3.1	2.9	2.9	2.9	2.9	na	-1.6%	0.1%	0.0%	0.1%	na
Tertiary-Domestic	2.3	2.1	1.9	1.7	1.7	na	-1.9%	-2.3%	-1.3%	-2.9%	na
CO₂ per capita (kg of CO₂/inhabitant)	8838	8020	7866	7553	7323	7342	-1.9%	-0.4%	-0.7%	-3.0%	0.3%
Final Energy Consumption	5580	4999	4759	4652	4548	na	-2.2%	-1.0%	-0.4%	-2.2%	na
Industry	2126	1782	1565	1342	1310	na	-3.5%	-2.6%	-2.5%	-2.4%	na
Transport	1364	1304	1605	1751	1773	na	-0.9%	4.2%	1.5%	1.2%	na
Tertiary-Domestic	2090	1913	1589	1558	1465	na	-1.8%	-3.6%	-0.3%	-6.0%	na
CO₂ per unit of GDP (tn of CO₂/1990 MEUR)	989	854	737	669	633	619	-2.9%	-2.9%	-1.6%	-5.3%	-2.2%
Power Generation	310	269	243	216	202	na	-2.8%	-2.0%	-2.0%	-6.2%	na
Public Thermal Power Generation	281	230	212	194	181	na	-3.9%	-1.6%	-1.5%	-6.7%	na
Autoprod. Thermal Power Generation	29	39	31	22	22	na	6.3%	-4.6%	-5.5%	-1.8%	na
Energy Branch	38	14	12	9	8	na	-18.5%	-2.8%	-5.4%	-10.4%	na
Final Energy Consumption	625	532	446	412	393	na	-3.1%	-3.5%	-1.3%	-4.5%	na
Industry	238	190	147	119	113	na	-4.4%	-5.0%	-3.4%	-4.7%	na
Transport	153	139	150	155	153	na	-1.9%	1.6%	0.5%	-1.1%	na
Tertiary-Domestic	234	204	149	138	127	na	-2.7%	-6.1%	-1.3%	-8.2%	na





Other OECD countries: Major trends (1980-1998)

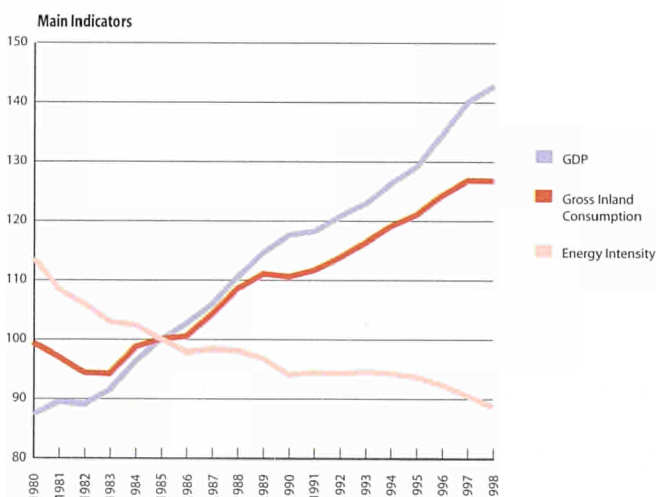
- Sustained economic growth since 1996 driven by the United States while Japan was deeply affected by the Asian crisis...
- Final energy demand demonstrated an accelerating growth rate since 1994 but slowed down in 1997
- Since 1980, electricity covered about 70% of incremental total final demand
- Transport contributed 40% of final energy demand and about 80% of final oil consumption
- Electricity's share has continued to increase regularly, but with wide regional differences
- Gross inland energy use stagnated in 1998, interrupting the regular increase registered since 1985
- All fossil fuels and nuclear covered incremental gross inland consumption since 1985, but oil dominated
- Indigenous energy production increased at the same rate as gross inland consumption since 1990
- Gas infrastructure in the NAFTA region continued to increase rapidly to meet the demand
- Increasing coal production will be challenged by the Kyoto emissions targets
- Nuclear production fell in Canada, stabilised in the US but increased in Japan
- Renewable energy contribution increased as fast as fossil fuels since 1990
- The whole region represented 25% of the world's fossil fuel reserves, principally solid fuels
- Since 1995, thermal units covered all the incremental electricity demand
- Solid fuels defended their major share in thermal power stations, but oil and gas grew faster in 1997 and 1998
- Generalised deregulation of electricity markets, responsible for increasing mergers and acquisitions in US
- NAFTA refinery capacity is well adapted to the regional markets, unlike the Japanese
- Energy intensity improved at about -1.3% per year on average in the last five years, and accelerated
- All final energy demand sectors have contributed to the reduction of energy intensity since 1980
- Energy consumption per capita peaked in the United States, at twice the Japanese level
- The United States had, by far, the lowest energy prices in OECD, helped by low tax levels
- CO₂ emissions have increased by 13% since 1990
- Transport and power generation sectors were responsible for about 65% of CO₂ emissions
- The region remained a net importer of hydrocarbons but a net exporter of solid fuels

"Other OECD countries" is a global heading embracing: the NAFTA region of the USA, Canada and Mexico; the EFTA region comprising Norway, Switzerland and Iceland; the OECD Pacific region covering Australia, Japan and New Zealand; and Turkey. However, the new members (the Czech Republic, Hungary, Poland and South Korea) are examined in their original region to improve the coher-

ence of the analysis. Each of these groups is rather heterogeneous from a sociological, political and macro-economic point of view.

Sustained economic growth since 1996 driven by the United States while Japan was deeply affected by the Asian crisis...

The GDP in these countries increased by about 3% during the eighties, falling under 2% on average between 1990 and 1995 as a consequence of the short recession experienced in the NAFTA region in 1991, to rebound well above 3% in 1996 and 1997 and finally slowed down to about 2% in 1998 caused by the Japanese recession. The economic activity of the NAFTA region is largely dominated by the United States contributing up to 88% of the region's GDP in 1998, with only 8% by Canada and 4% by Mexico. This region was characterised by a very long-term growth cycle producing an average growth of 3% per year on average since 1982 and only a single recession year in 1991. In the last three years, the region's economic growth increased by 4.0%, 5.2% and 3.8% respectively. Given the size of its economy, population and energy needs, Japan dominated the OECD Pacific region. In 1998, Japan contributed 88% of this region's GDP. Japanese GDP growth, above 4% per year on average during the 80's, was hit by



REGIONAL GDP EVOLUTION

Billions 1990 EUR	1980	1985	1990	1996	1997	1998	85/80	90/85	97/96	98/97	98/90
Annual % Change											
EFTA	221.8	244.7	275.0	299.3	306.5	313.0	2.0%	2.4%	2.4%	2.1%	1.6%
NAFTA	3887.3	4387.8	5019.2	5783.4	6085.5	6319.5	2.5%	2.7%	5.2%	3.8%	2.9%
OECD Pacific	1774.8	2092.7	2599.2	2951.6	2997.6	2936.6	3.3%	4.4%	1.6%	-2.0%	1.5%
Turkey	71.2	90.3	118.4	148.3	159.5	164.0	4.9%	5.6%	7.5%	2.8%	4.2%
Total	5955.1	6815.5	8011.8	9182.6	9549.1	9733.1	2.7%	3.3%	4.0%	1.9%	2.5%

a severe slowdown since 1991. During the first part of the 1990's Japanese economic growth was only 1.6% per year on average. The recent Asian financial crisis cut Japanese economic growth to just 0.8% in 1997 and additional internal reasons (over-regulation, bribery and corruption, weak domestic demand, a large budget deficit, a shortage of credit, bad loans, troubled financial institutions) induced a decline by 2.8% in 1998. Throughout 1998, the Japanese government used a policy of fiscal expansion, largely aimed at stimulating domestic demand and stabilizing the banking sector. The economic links with the developing Asian countries and China have strong impacts on Japan's economy and energy sector. The economic environment of the EFTA region was marked by GDP growth on average of 2.2% in the last five years, led by Norway which increased by 4.1% per year in the same period - benefiting from the increasing production of hydrocarbons in the North Sea. Turkey, which had remarkable annual GDP growth above 7% since 1995, rebounded successfully after the 1994 recession caused by internal political problems, and experienced a 6.1% per year increase over the last four years.

ENERGY OUTLOOK

Final energy demand demonstrated an accelerating growth rate since 1994 but slowed down in 1997...

Final energy demand, mainly driven by the NAFTA region absorbing 77% of consumption in 1998 (81% in 1980), demonstrated an accelerating growth rate since 1980: stable between 1980 and 1995, increasing by 1.0% on average between 1985 and 1990, and growing by 1.6% on average between 1990 and 1996. But the last two years were marked by a pronounced slowdown: +0.4% in 1997 and -0.2% in 1998. The NAFTA region followed this evolution closely but the profile was quite different for the OECD Pacific region where the increase peaked during the second part of the 80's but slowed down during the 90's due to the poor performance of the Japanese economy. Between 1990 and 1993, a general slowdown was observed in all regions as a result of the

Main items

The 'Other OECD' countries, as defined in this report, comprise virtually all the most advanced industrialised economies outside the European Union. Together with the EU these economies dominate overseas direct investment and the world's currency and financial markets. As a result they are vulnerable to any major global financial or trade disruptions although, with the exception of Japan, this region has been largely unaffected by the recent economic crises. They also undertake much of the total global research and development and thereby influence the pace and direction of technological change. With some of the highest average incomes and amongst the largest per capita levels of energy consumption, these OECD countries accounted for 34% of total world energy consumption and 36% of global CO₂ emissions in 1998. Key current policy issues include: continued liberalisation and structural reform of their energy sectors, especially gas and electricity; implementing effective responses to a range of environmental issues, especially greenhouse gas emissions; introducing measures to curb sustained growth in transportation and its associated impacts; and - as overall regional import dependency increases - ensuring adequate energy supply security in the future. Given their economic maturity, the growth rates for most of these countries will remain relatively modest. Thus the 'Other OECD' countries' share of global economic activity, energy use and environmental emissions will continue to decline steadily in the longer term as the world's developing grow at a much faster overall rate.

weakness of the OECD economies. The 1994 economic resurgence induced a rebound of final energy consumption growth that peaked with a 2.8% increase, boosted by the cold weather conditions in the Western Hemisphere in 1996. In 1997, all regions benefited from warmer climatic conditions resulting in reduced heating requirements of more than 2% that limited the growth of



FINAL ENERGY DEMAND BY REGION

Mtoe	1980	1985	1990	1996	1997	1998	85/80	90/85	97/96	98/97	98/90
Annual % Change											
EFTA	33.0	35.7	37.0	39.6	39.2	40.8	1.6%	0.7%	-1.0%	3.9%	1.2%
NAFTA	1445.1	1413.8	1440.0	1562.0	1566.2	1560.8	-0.4%	0.4%	0.3%	-0.3%	1.0%
OECD Pacific	274.0	288.0	338.5	383.4	387.0	386.8	1.0%	3.3%	0.9%	0.0%	1.7%
Turkey	26.3	30.4	38.5	48.9	50.6	50.1	3.0%	4.8%	3.4%	-1.0%	3.3%
Total	1778.3	1768.0	1854.0	2034.0	2043.0	2038.5	-0.1%	1.0%	0.4%	-0.2%	1.2%

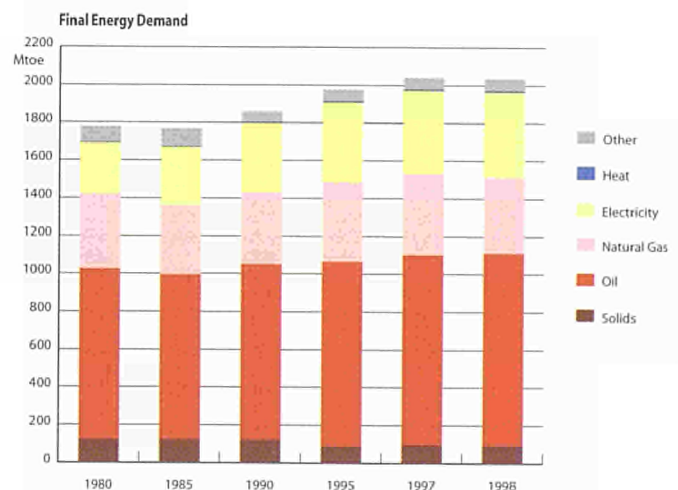
final energy demand to 0.6% for the region as a whole. Similarly, warmer climatic conditions, coupled with the low economic activity in the OECD Pacific region, resulted in a decrease by 0.2% of total final demand in this region.

Some disruption of statistical series has complicated the analysis of consumption. In the USA's statistics before 1988, electricity generated by autoproducers, mainly combined heat and power production, was accounted for at the final consumption stage in terms of fuel inputs, rather than as generated electricity and heat. Between 1989 and 1993 these inputs were progressively better identified statistically and allocated to electricity production and consequently production of heat and electricity have been registered at the final stage. This means that final energy demand in the United States was over-estimated (by up to 15-20 Mtoe) before 1993 and, as a consequence, the growth rate of final energy demand was under-estimated mainly during the transition period between 1989 and 1993. This treatment of data before 1993 also perturbed the structure of fuel consumption, mainly for solid fuels, heat and electricity consumption.

Since 1980, electricity covered about 70% of incremental total final demand...

Final energy demand is largely dominated by hydrocarbons. Since 1980, the oil products and gas contributions have decreased slowly: from 51% to 50% for oil and 22% to 20% for gas. The share of oil products in total final demand remained stable in the NAFTA region, which absorbed more than 75% of oil consumption. The share of oil remained stable at around 50% in the United States accounting for 85% of the region's consumption, and the decline in oil's share in Canada (from 49% in 1980 to 39% in 1998) was compensated by some gains in Mexico (62% in 1998 against 60% in 1980). In other regions oil's share remained substantially above 50%. In the OECD Pacific region it declined from 57% in 1980 to 53% in 1998 under the pressure of Japan where it represented only 45% in 1998 against 58% in 1980. In the EFTA region it diminished from 60% in 1980 to 50% in 1998 as a conse-

quence of the stabilisation of oil consumption in all countries even though total final consumption continued to grow. The gas market share declined slowly in NAFTA, from 26.4% to 23.4% despite the 1992 liberalisation of the gas market in the United States. From 1990 to 1996, natural gas consumption in the United States increased by 12%. Lower costs resulting from greater competition and deregulation in the gas industry and an expanding transmission and distribution network have helped expand its use. In 1997 and 1998, natural gas consumption fell substantially to equal the 1990 level. Relatively mild weather throughout these years was the primary cause for the reduced demand in the residential and commercial sectors. The net consumption falloff, along with abundant foreign supplies to the United States and competition driven by the overall slump in petroleum prices, resulted in a significant drop in natural gas prices during 1998. A similar evolution of consumption occurred in Canada but the consumption falloff was less marked over the last two years. This contrasts with the evolution in the OECD Pacific region where the gas market is still under development. The gas share in this region reached only 8.3% of total final demand in 1997 (5.5% in 1980). But, in the main markets, Japan and Australia, gas competition



was affected by the additional costs related to LNG infrastructures. Electricity consumption grew by about 2.9% per year on average since 1980, the growth rate being more sustained in the OECD Pacific region (+3.4% on average) than in NAFTA (+2.7%) or EFTA (+2.1%). Thus about 70% of the incremental demand for energy was covered by electricity alone; this results from the high level of industrialisation of these regions. Solid fuels and biomass covered the rest of the consumption but their contributions remained quite marginal, declining from 11.7% in 1980 to only 8% in 1998. As these fuels are mainly consumed in the United States by industrial electricity autoproducers, the modification of statistical allocations pushed down their apparent consumption between 1991 and 1993. Excluding this effect, the consumption of solid fuels remained relatively stable since 1980.

Transport contributed 40% of final energy demand and about 80% of final oil consumption...

Industry made the major contribution to final energy demand in 1980 with a 35% share, but this declined regularly to reach only 27% in 1998 even though the absolute level of consumption remained unchanged since 1990. But industrial shares varied significantly from region to region: 23.8% in NAFTA with a minimum of 21.8% in the United States, 26.5% in EFTA and 36.7% in OECD Pacific. Despite sustained economic activity except in Japan, industrial energy consumption declined by 0.2% in 1997 and 0.9% in 1998 - the major gains being located in the NAFTA region. The increasing predominance of less energy-intensive and high technology industries contributed to this evolution as well as the declining trend of energy intensities in many heavy industrial sectors. Over the same period, transport climbed from 33% of final energy consumption in 1980 to 40% in 1998, becoming by far the major energy-consuming sector in this region. This was mainly under the pressure of NAFTA, where transport represented 43% of total final demand in 1998 against 32% in OECD Pacific and only 29% in EFTA. Per capita energy use in the North American transportation sector is among the highest in the world. Canada and the United States are large geographic areas, where goods and people are often transported over long distances. Oil consumption for transportation uses in 1997 averaged about 18 bbl per capita in the United States and 13 bbl in Canada, as compared with about 6 bbl per person per year in Western Europe and industrialised Asia. Vehicle ownership is also very high: in 1997, 773 vehicles per thousand persons in the United States, 631 in the OECD Pacific region and 509 in Western Europe. Pushed by the economic growth and increasing living standards car ownership is continuing to grow. In the OECD Pacific region, in particular Japan, a recent switch to larger cars has been observed. The share of Japanese passenger cars with an engine capacity greater than

2000cc increased from 4% in 1980 to 21% in 1996. This phenomenon also occurred in Western Europe, somewhat offsetting the impact of the introduction on the market of more fuel-efficient cars. As a consequence, the increasing contribution of transport to oil consumption by final consumers reached 79% in the OECD region as a whole in 1998 with a maximum of 85% in NAFTA compared to only 58-59% in both OECD Pacific and EFTA. The share of the tertiary and domestic sector was essentially unchanged, at between 32% and 34% of the total over the whole period. The highest contribution occurred in EFTA for climatic reasons (44% of final consumption in 1998) and the lowest in the OECD Pacific region (31% of final consumption) due to the limited size of households.

Electricity's share has continued to increase regularly, but with wide regional differences...

Electricity's share in final consumption reached 20% in 1990 from 15% in 1980 and continued to increase slowly to reach 22% in 1998. EFTA, benefiting from much low-cost hydro power, had the largest contribution of electricity with about 35%, followed by the OECD Pacific region with 25% and finally NAFTA with only 21% (as a result of the larger contribution of the transport sector). On a sectoral basis the highest contributions of electricity occurred in the EFTA region with 56% in industry and 43% in the tertiary-domestic sector respectively as a result of low electricity prices and the predominance of electrical heating. The two other regions were relatively homogeneous: about 30%-32% for industry and 41%-43% for tertiary-domestic. The increasing contribution of electricity in industry resulted from improved automation and control, development of electro-technologies and an industrial production more oriented to high added-value products. In the tertiary-domestic sector, driven by high living standards, electricity's contribution continued to grow because - even though the market for classical appliances was close to saturation - other markets such as air conditioning and microcomputers were developing rapidly.

Gross inland energy use stagnated in 1998, interrupting the regular increase registered since 1985...

Gross inland energy consumption showed a steady annual increase of about 1.9% from 1985 to 1997 after the recession observed during the first part of the 80's; but it stagnated in 1998. The United States, the largest economy in the world with about 23% of world energy consumption and 66% of the region's energy consumption, largely dictated this evolution. Furthermore, this development was not equally spread over all primary fuels and regions. Since 1985 the lowest growth occurred in the EFTA

GROSS INLAND CONSUMPTION BY REGION

Mtoe	1980	1985	1990	1996	1997	1998	85/80	90/85	97/96	98/97	98/90
Annual % Change											
EFTA	41.1	45.1	48.6	51.0	52.9	54.7	1.9%	1.5%	3.8%	3.3%	1.5%
NAFTA	2103.6	2086.5	2258.8	2514.1	2562.0	2564.0	-0.2%	1.6%	1.9%	0.1%	1.6%
OECD Pacific	430.4	452.4	540.1	628.9	639.8	632.3	1.0%	3.6%	1.7%	-1.2%	2.0%
Turkey	31.3	38.9	52.5	67.7	71.3	72.5	4.4%	6.2%	5.4%	1.7%	4.1%
Total	2606.4	2622.8	2900.0	3261.7	3325.9	3323.4	0.1%	2.0%	2.0%	-0.1%	1.7%

region, at only 1.5% per year, but it increased by as much as 3.8% in 1997 and 3.3% in 1998, well above the GDP growth. The major energy sources in this region were oil (42% in 1998) and hydro (24%) but the major increase concerned gas: +8% per year on average since 1985. The NAFTA region followed, with growth of its gross inland energy consumption of 1.6% per year on average since 1985 even though it stagnated in 1998 given the favourable climatic conditions which reduced the demand for heating by about 4%. Even Mexico, which can still be associated with developing countries, limited its growth to an average of 2.2% per year despite an increase by 3.5% in 1997 and 4.4% in 1998. Gross inland energy consumption of the NAFTA region was dominated by oil products (40% in 1998), followed by solid fuels and natural gas (both with 23%). Remarkably, these three fuels demonstrated the same growth rate over the period 1990-1998: 1.5% per year on average. In the OECD Pacific, where industrial development continued to increase sharply during the 1980's, accompanied by improving living standards, the increase reached 2.6% per year over the same period. But the Japanese economic recession reduced Japanese gross inland energy consumption by 1.5% in 1998 and that of the OECD Pacific by 1.3%. Oil (48% in 1998) and solid fuels (21%) dominated the energy market in this region, but the major growth since 1985 was experienced by nuclear energy (5.8% per year on average) and natural gas (4.0%). Finally Turkey, a country still under rapid development, increased its consumption by about 86% since 1985 or an annual average growth of about 5% with all kinds of energy, excepting nuclear, contributing to this growth.

All fossil fuels and nuclear covered incremental gross inland consumption since 1985, but oil dominated...

Solid fuel demand, which increased by about 3.0% in the first part of the 80's, continued to grow by 1.6% per year on average since then. Nevertheless there were large variations in the last three years: a jump by 4.8% in 1996 and by 6.3% in 1997 followed by a fall of 2.1% in 1998. This recent evolution resulted from increasing demand from the US power sector. Solid fuels represented about 21% of total gross inland consumption, a constant share since

1990. Coal consumption is concentrated in the United States, which accounted for about three-quarters of the regional total since 1980. With its substantial reserves, the United States has come to rely heavily on coal for electricity generation and will continue to do so in the near future. Although there was a drop in demand for oil and gas between 1980 and 1985, the use of both these energy sources has increased regularly since then. Oil demand grew on average by 1.5% per year since 1985 to contribute 42% of total consumption in 1998 (49% in 1980) under the pressure of OECD Pacific region (+2.0% per year on average) despite a decline in absolute terms in the last two years caused by the reduction of consumption in Japan (-5% in two years). Since 1985, the annual growth of gas consumption reached an average of 2.0% with a peak of 4.0% in the OECD Pacific where gas use increased both for final energy uses (4.0% per year) and power generation (3.5% per year). In the United States, which absorbed about 72% of the whole region's gas consumption and 26% of total world consumption in 1998, gas use grew by 2.1% per year on average between 1985 and 1995, remained stable between 1995 and 1997 and fell by 2.4% in 1998 given favourable climatic conditions that reduced the demand of the tertiary-domestic sector by as much as 15 Mtoe. Non-fossil fuels grew continuously to reach 16% of total consumption in 1998 against 10% in 1980 but the fortunes of particular non-fossil fuels varied markedly: geothermal increased by 95% since 1985, nuclear by 77%, biomass by 17% and hydro by only 12%. Although nuclear output fluctuated around its 1995 peak in the NAFTA region, it continued to grow steadily in the OECD Pacific region: +5.6% in 1997 and +4.1% in 1998. Since 1985, incremental gross inland consumption has been covered as follows: 35% by oil, 22% by gas, 19% by solid fuels, 19% by nuclear and 5% by other renewable sources.

Indigenous energy production increased at the same rate as gross inland consumption since 1990...

Indigenous **energy production**, showing significant improvement in the three main regions, increased at the same rate as gross inland consumption since 1990. **Oil** contributed 876 Mtoe or 30% of all energy produced in the whole region in 1998, a 1.2%





reduction on the 1997 peak. In absolute terms, oil production in the NAFTA region peaked in 1985 at 757 Mtoe but declined substantially over the following five years as a result of lower oil prices to reach only 680 Mtoe in 1990. Since 1990 oil production fluctuated between 675 Mtoe and 691 Mtoe. In fact, the United States' production has fallen by 16% between 1985 and 1990 due to the closure of numerous small independent producers whose profitability was threatened by declining oil prices. After 1990 the reduction of US production (-46 Mtoe) was largely compensated by Canada (+30 Mtoe, or a 33% increase since 1990), and Mexico (+20 Mtoe) which both saw peaks in their production in 1998. In EFTA, the major evolution occurred in Norway where oil production has quadrupled since 1985, making it the eighth largest world producer. Oil production in the OECD Pacific region, mainly located in Australia, remained marginal.

Gas infrastructure in the NAFTA region continued to increase rapidly to meet the demand...

Natural gas production fell between 1980 and 1985 by 1.9% per year on average but since then it has increased continuously to reach a peak of 687 Mtoe in 1998. Gas production was mainly located in the United States (440 Mtoe) and Canada (142 Mtoe), the second and third largest world producers respectively. 74% of the incremental production since 1990 came from NAFTA, of which two thirds was from Canada which has doubled its production since 1985. Infrastructure expansion is underway and expected to continue throughout North America to facilitate trans-national exchanges to meet increasing gas demand. In 1998, approximately 55% of Canada's natural gas production was exported to the United States, and Canadian gas accounted for about 14% of total US consumption. Currently, significant pipeline construction both within Canada and between the United States and Canada is underway to accommodate US import demand. By the end of 2000, five major new natural gas pipeline projects and an upgrade on a sixth are expected to be complete, allowing a considerable increase in trade between the two countries. Considerable pipeline construction is also underway within the United States. Several major projects will provide access to new sources of both supply and demand and increase capacity along pipeline routes where utilisation rates are already high during peak periods. Although Mexico has considerable gas resources that could be developed, production is not expected to keep pace with rising internal demand, and Mexico is expected to remain a net importer of natural gas. As in the United States and Canada, most of the projected growth in Mexican demand is for electricity generation. Australian and Norwegian gas production also continued to grow: Australian production steadily increased at an average rate of 6.9% per year; Norwegian production only grew since 1990 with spectacular jumps by 32% in 1996 and 10%

in 1997 followed by a stabilisation in 1998. The Norwegian export market is totally oriented towards the European Union. Japan relied heavily on natural gas to cover its energy needs but 97% of the gas is imported. As not only the largest but also the first LNG importer in Asia, Japan has several major contracts that end over the next 5 to 10 years. Whether or not Japanese utilities seek to renew those contracts and/or secure LNG from other suppliers could have a major impact on the gas industry in the region.

Increasing coal production will be challenged by the Kyoto emissions targets...

Solid fuel production grew on average by 2% per year since 1985 but the growth rate slowed down to 1.7% during the 90s. Additional contributions came mainly from the United States (+104 Mtoe since 1985) and Australia (+67 Mtoe), the second and the fourth world producers respectively. The United States, after relative stagnation between 1990 and 1995, again increased its production by 2.9% in 1996, 2.6% in 1997 and 1.6% in 1998 to cover additional demand from electricity generation. Australian production increased on average by 4.7% per year since 1985. These two countries were both net exporters of solids fuels. Exports represented 7.2% of US production and 70.7% of Australian production. In the future, environmental regulation, in particular the application of the Kyoto Protocol in industrialised countries, will represent a major challenge for coal markets in many areas of the world, especially in the OECD countries that have agreed to reduce their greenhouse gas emissions. Between 2008 and 2012, the United States must reduce its emissions by 8% from 1990 levels, and Japan by 6%. Compared to the level of CO₂ emissions registered in 1998 this means a reduction of emissions by 18% in the United States and by 14% in Japan.

Nuclear production fell in Canada, stabilised in the US but increased in Japan...

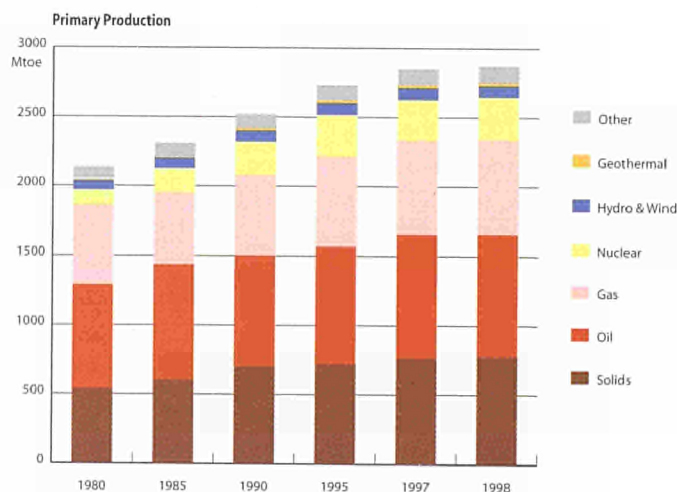
Nuclear energy accounted for 10.5% of total production in 1998 against 5% in 1980. Nuclear output grew in the United States and Japan during the 80's showing a 8.5% annual increase in its contribution. Since 1990 its use has increased at about 6.4% per year in Japan but by only 1.1% per year in the NAFTA region caused by a continuous decline in Canada, -34% since 1994, and a first significant decrease of 6.9% in the United States in 1997 followed by a 4.7% rebound in 1998. Japan has ambitious plans for further nuclear expansion, mainly to help achieve greater energy independence and to limit emissions of greenhouse gases. However, the uncertainties surrounding financial markets in Asia, as well as increased public opposition to nuclear power, will affect new construction decisions. The deregulation of the electricity industry in the United States is affecting the nuclear industry in different



ways: some units have been shut down prematurely; others have been sold; and still others are expected to continue operating beyond current retirement dates. In 1998 three reactors were shut down permanently. Plant sales could lead to a consolidation of the US nuclear electricity industry, with a few large companies owning and operating many nuclear plants. As a result, better management could lower operating costs and make nuclear plants more competitive in the deregulated electricity market. In Canada, Ontario Hydro, the utility owning the majority of the nuclear units, has begun an extensive programme to improve the performance of its nuclear plants. Seven of the oldest units have been shut down, five of them in 1997 and two in 1998. The units may be refurbished and brought back on line eventually.

Renewable energy contribution increased as fast as fossil fuels since 1990...

Renewable energy contribution increased regularly since 1980 but their share has remained stable since then. Hydro and wind grew very slowly since 1985, despite the impressive development of wind energy in the United States, especially in California. In the United States, hydroelectricity has become more controversial in



recent years, with fears about environmental damage. Removing some limited-size dams has been decided. On the other hand, wind made dramatic gains in the United States in 1998 and early 1999, for the most part because wind energy producers rushed to install wind facilities before the expiry of the Federal production tax credit for installed wind turbines. Plans for wind projects have been hampered in Australia by complaints and protests from local residents who dislike the noise and visual intrusion of wind farms. In Japan, the installed wind capacity reached only 200 MW in 1998, one quarter of the capacity installed in the US during 1998. The contribution of geothermal energy multiplied by three during the 80's but has grown very slowly since then. Other sources, mainly biomass, increased more rapidly since 1980 at about 1.6% per year on average. Biomass production was mainly located in the United States and is used to supply electricity producers.

The whole region represented 25% of the world's fossil fuel reserves, principally solid fuels...

In late 1998, all these regions' oil reserves amounted to about 9.3% of world reserves, mostly (8.6%) located in the NAFTA region but the oil reserves/production ratio was only 16 years, significantly below the world average. The situation for gas reserves was quite similar, with about 7.4% of world reserves, also concentrated in the NAFTA region (5.7%). Finally, coal reserves, mainly located in the United States (23.7%), and Australia (9.1%), accounted for 33.9% of world reserves. As a result of this, the region represented 24.8% of total world fossil fuel reserves.

Since 1995, thermal units covered all the incremental electricity demand...

Electricity generation grew at an annual average rate of 3.0% since 1985. But the growth declined from 3.9% per year on average during the second part of the 1980's to 2.4% during the 1990's. Thermal power stations covered 65% of the production in 1998 (68% in 1980) with nuclear and hydro accounting for 19% and 16% of total production respectively. These shares have remained stable since 1990, with nuclear becoming more impor-

PRIMARY ENERGY PRODUCTION BY REGION

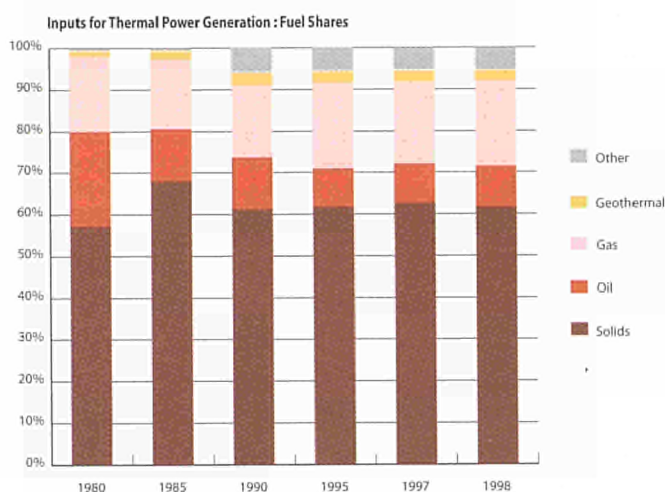
Mtoe	1980	1985	1990	1996	1997	1998	85/80	90/85	97/96	98/97	98/90
							Annual % Change				
EFTA	63.6	83.4	131.2	220.0	225.2	219.6	5.6%	9.5%	2.4%	-2.5%	6.6%
NAFTA	1910.0	2005.5	2117.0	2260.3	2273.9	2289.3	1.0%	1.1%	0.6%	0.7%	1.0%
OECD Pacific	139.1	201.9	244.9	306.1	322.7	335.8	7.7%	3.9%	5.4%	4.0%	4.0%
Turkey	17.2	21.7	25.7	26.8	27.6	28.6	4.7%	3.5%	2.9%	4.0%	1.4%
Total	2129.9	2312.5	2518.8	2813.2	2849.4	2873.3	1.7%	1.7%	1.3%	0.8%	1.7%



tant than hydro in the late 80's. Since 1985, thermal units have covered 69% of the incremental production, nuclear 26% and hydro only 5%. But since 1995, all the production growth (375 TWh) was covered by thermal, the limited fall in hydro and wind being barely compensated by growth in nuclear production. The installed capacity reached 1306 GWe in 1998 compared to 917 GWe in 1980 and 1164 GWe in 1990. Since 1980 nuclear capacity has doubled but, for the first time, total installed nuclear capacity declined in 1998 as new commissioning in Japan did not compensate for plant closures in Canada. Hydro capacity expanded by 2% per year on average between 1985 and 1995 but has increased only marginally since then. In particular the development of wind power in the United States, the largest world market, has slowed since 1996 despite the increasing cumulative impact of new commissioning with new plants being partly offset by the closure of old or inefficient units. On the other hand, thermal power increased by 1.2% per year on average since 1985. But this growth was accelerating during the 90's due to the limited investment in nuclear and hydro combined with the growing demand. The growth of power capacity is not uniform across the whole region. The fastest increase occurred in Turkey with about 7.1% per year on average since 1985, the bulk of it being concentrated during the second part of the 1980's. OECD Pacific, largely dominated by Japan, grew at 2.6% per year and NAFTA at only 1.0% with two extremes: Mexico at 3.9% since 1985 and the United States at only 0.9%. The EFTA region grew at the same rate as the NAFTA region.

Solid fuels defended their major share in thermal power stations, but oil and gas grew faster in 1997 and 1998...

Solid fuels remain the main energy source for thermal power stations (62% of thermal input in 1998 versus 57% in 1980) as a result of the fuel preferences of US electricity producers. The contribution of oil (10% in 1998) fluctuated under the pressure of oil price competitiveness and environmental considerations. It declined by about 45% during the oil crisis in the early 1980's, to the benefit of other fossil fuels; demonstrated some signs of recovery during the second part of the 80s and the beginning of the 90's; dropped again in 1995 with the increasing environmental concerns but increased again by 9.9% in 1997 and 7.7% in 1998 given lower oil prices. The development of gas use has indeed been very important since 1985. Gas consumption increased by about 100% since 1985 to reach 203 Mtoe in 1998, and growth was also accelerating in the last two years. Growth in gas consumption occurred mainly in the NAFTA region where it represented about 19% of all fuel inputs thanks to the large indigenous production and the liberalisation of the gas market in the United States at the beginning of the 1990's. Since 1990 it increased by 27% in the



OECD Pacific region despite the lack of competitiveness of imported LNG on the Japanese electricity market. But environmental concerns sustained gas use when oil consumption by the Japanese electricity sector declined by 12% in 1997 and 19% in 1998. For the other OECD countries as a whole, the share of gas in thermal power stations reached about 21% in 1998, against 17% in 1990, making it the second largest energy source in this market but far behind solid fuels.

Generalised deregulation of electricity markets, responsible for increasing mergers and acquisitions in US ...

Electric utility regulatory reform is underway throughout North America. In the United States and Canada the driving force for reform is the expectation that increased competition will lower costs of electricity supply. In the United States, reforms are being carried out at both the federal and state levels. The latest regulations concern open access, additional guidelines for the recovery of stranded costs and the establishment of electronic systems on the availability of transmission capacity. The reforms should also serve to integrate more closely the US and Canadian electricity markets. A corporate response to this deregulation was an acceleration of mergers and acquisitions between electric but also gas companies, as also occurred in the United Kingdom after the privatisation and deregulation of its electricity market. Another corporate response to policy changes has been the creation of a rapidly growing independent power industry, which has made for a more competitive environment in generation. In 1998, there were 109 independent power producers active in the United States, accounting for about 7% of existing capacity. About half of all new capacity additions in the United States are currently being supplied by independent power producers. In May 1997, the Japanese Cabinet approved an Action Plan for Economic



Structure Reform, in which deregulation measures were proposed as a means of promoting market mechanisms. The Action Plan aimed to ensure, through competition, that the electricity, gas and petroleum industries provide services at an international standard of performance, including costs, by 2001.

NAFTA refinery capacity is well adapted to the regional markets, unlike the Japanese...

The **refinery capacity** increased slowly in the whole region since 1985. In the NAFTA region, the refining capacity, principally in the United States, was stable since 1985 and accounted for 24% of world capacity in 1998 against 26% in 1985. But this capacity was just sufficient to cover the needs of the region. Regional utilisation rates increased regularly from 78% in 1985 to 86% in 1990 and 93% in 1998. The United States has experienced a steep decline in refining capacity since 1980. Between 1980 and 1989, the number of U.S. refineries fell from 324 to 204, representing a loss of 3 million bbl/d in operable capacity, and a concomitant increase in refining capacity utilization from 69% to 86%. Much of this decline resulted from the 1981 deregulation (elimination of price controls and allocations), which effectively removed the major prop from underneath many marginally profitable, often smaller, refineries. Between 1989 and 1992, refining capacity remained roughly stable. Since 1992, over 30 additional, mainly small U.S. refineries have shut down, for a wide variety of reasons (including environmental regulations to a minor extent). This, combined with higher refinery runs, raised average weekly capacity utilization to 96% in 1998. Although financial, environmental, and legal considerations make it unlikely that new refineries will be built in the United States, expansion at existing refineries is

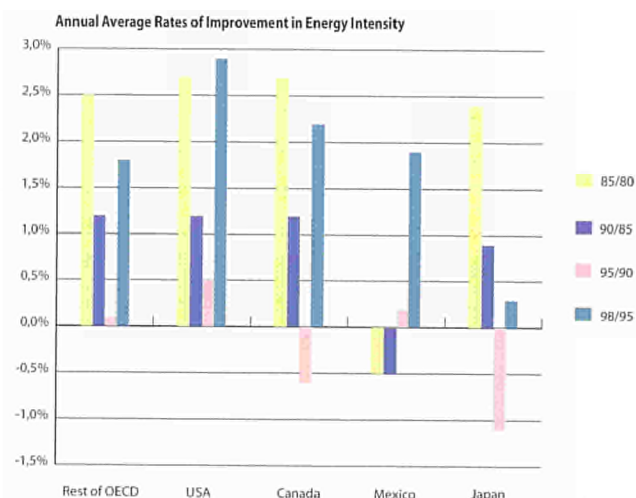
likely to increase total U.S. refining capacity in the long run. On the other hand, Japanese refinery capacity increased by 2.0% per year on average during the 1990's and accounted for about 6% of world capacity in 1998, but it has not yet adapted fully to the changes in product markets even though its utilisation rate increased from 63% in 1985 to 83% in 1998. As oil product consumption has declined in recent years, the country's refining industry now suffers from overcapacity. This has put additional pressure on Japanese refiners to cut costs and become internationally competitive.

COMPETITIVENESS

Energy intensity improved at about -1.3% per year on average over the last five years, and accelerated...

The **energy intensity** of the region as a whole improved significantly (-1.9% per year on average) during the 80's, remained stable between 1990 and 1993 due to the economic slowdown, and improved again after this. This gain averaged -1.3% per year over the last five years, accelerated to reach -1.9% in 1997 and -2.0% in 2000. Since 1990, however, this is the result of very contrasting regional trends. Since 1993, energy intensity improved in the NAFTA region by 2.2% per year on average under the lead of the United States (-2.4%) and Canada (-1.5%) and even Mexico contributed (-0.7%) although it was still a country undergoing rapid development. The recent high economic growth favoured replacement of obsolete equipment, investment in new technologies, improvement of production processes, construction of new houses... that all involved a better use of energy. The EFTA region, already characterised by a low level of energy intensity, still improved its performance by 0.7% per year on average. On the other hand, energy intensity increased in the OECD Pacific region by 0.7% per year on average since 1993 under Japan's leadership. The depressed economic climate since the early 90's led to lower utilisation rates of industrial capacities and limited new gross fixed capital formation. This induced increasing specific energy consumption per unit of production and less investment in the rational use of energy. Consequently energy intensity has increased by 6% since 1991 and in 1998 demonstrated a 1.4% growth. Over the same period energy intensity has declined by 2% in New Zealand and by 8% in Australia. Finally it must be noted that in the last two years Turkey reduced its energy intensity by respectively 2% and 1%.

Compared to other OECD countries, the United States and Canada have high energy intensity, 70-85% higher than the EU average.





ENERGY INTENSITY BY REGION

toe/1990 MEUR	1980	1985	1990	1996	1997	1998	85/80	90/85	97/96	98/97	98/90
Annual % Change											
EFTA	185.4	184.2	176.6	170.3	172.7	174.6	-0.1%	-0.8%	1.4%	1.1%	-0.1%
NAFTA	541.1	475.5	450.0	434.7	421.0	405.7	-2.6%	-1.1%	-3.2%	-3.6%	-1.3%
OECD Pacific	242.5	216.2	207.8	213.1	213.4	215.3	-2.3%	-0.8%	0.2%	0.9%	0.4%
Turkey	439.6	430.4	443.6	456.1	446.8	442.3	-0.4%	0.6%	-2.0%	-1.0%	0.0%
Total	437.7	384.8	362.0	355.2	348.3	341.5	-2.5%	-1.2%	-1.9%	-2.0%	-0.7%

This is due to many factors. Amongst the most important are low energy prices, high incomes per capita, large distances between centres of population and extreme climatic conditions in both winter and summer. In contrast, Japan has a low energy intensity, some 20% lower than that of the EU partly due to the higher contribution of energy-efficient industry in final energy consumption, limited size of dwellings, the country's limited energy resources and traditionally high energy prices.

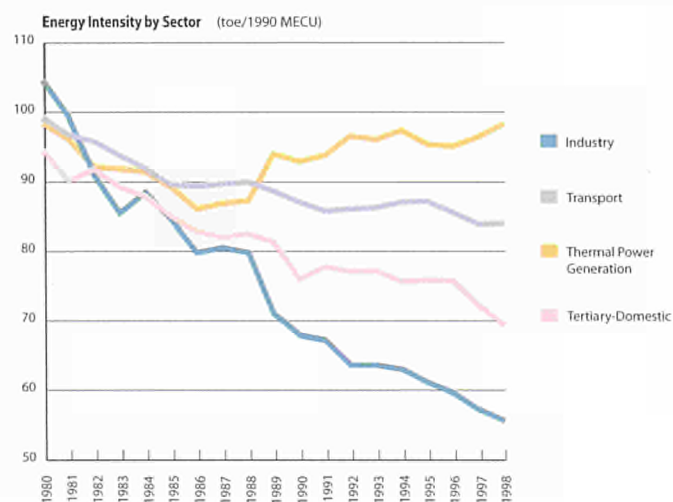
All final energy demand sectors contributed to the reduction of energy intensity since 1980...

By sector, the energy intensity of industry has been continuously improving since 1980, falling about 47% for the region as a whole. The best performance occurred in the United States where the intensity that continued to improve at a sustained rate during the 1990's has fallen by 57% since 1980. The improvement of the Japanese industrial energy intensity, limited to 34% since 1980, reflected the stability observed since 1992. In Canada, the gain was limited to 32% due to the stabilisation of energy intensity between 1990 and 1996 but it improved again by respectively 3.1% and 2.9% in 1997 and 1998. It is only in Turkey, characterised by rapid industrialisation, that energy intensity in industry has increased since 1980. The tertiary-domestic sector also improved its energy intensity by about 20% during the 1980's despite the improvement in living standards and the development of new appliances such as air conditioning. Between 1990 and 1996, it has fluctuated around the 1990 level, with improvements in Turkey (-5%) and in the United States (-2%) being compensated by poorer performance in Canada (+3%) and Japan (+8%). But, in 1997 and 1998, characterised by favourable climatic conditions, it improved respectively by 4.6% and 4.1% as a whole: -5.1% in the EFTA region in two years, -6% in Turkey, -12.3% in the NAFTA region and remained stable in the OECD Pacific region. Even the transport sector improved its energy intensity by about 12% during the 80's and by 3.5% since 1990, driven by the Canadian (-23% since 1980) and the US (-18%) performance while energy intensi-

ty was stable in Japan and increased in the EFTA region (9% since 1980). In contrast, the energy intensity of power generation, driven by the increasing contribution of electricity to final energy demand, has grown by about 10% since 1985.

Energy consumption per capita peaked in the United States, at twice the Japanese level...

The **gross inland consumption per capita** increased slowly by 0.7% since 1985 to reach an average value of 5.3 toe/inhabitant in 1998. But it reflected large variations between regions and countries depending mainly upon living standards and, to a less extent, the industrialisation level. Absolute values varied from 1.1 toe/inhabitant in Turkey, to 4.2 in the OECD Pacific, 4.6 in EFTA, and 6.5 toe/inhabitant in NAFTA, with a peak of 8.1 toe/inhabitant in the United States, the highest per capita consumption in the world. The energy consumption per inhabitant was twice as high in the United States as in Japan, the first and the second industrialised countries in the world respectively. Although per capita consumption remained stable in NAFTA since 1980, it increased in all the other regions since 1980: by 60% in Turkey, 32% in the



OECD Pacific region and 21% in EFTA. This was a consequence of increasing living standards and also industrial development in the case of Turkey.

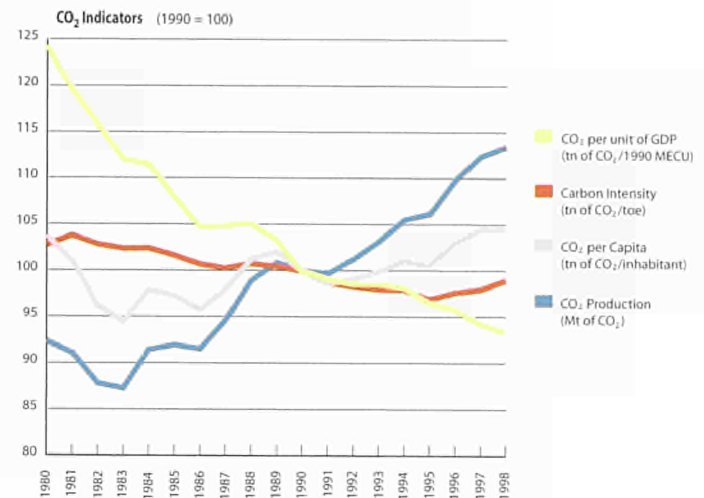
The United States had, by far, the lowest energy prices in OECD, helped by low tax levels...

If energy efficiency is a major factor influencing competitiveness, energy prices are even more important, to the exclusion of any consideration of labour costs, fiscal systems and regulation. Comparing energy prices within the main competitors inside the OECD - the United States, Japan and the European Union - it is clear that US prices are the lowest, followed by the European and the Japanese. In 1997, the latest year for which complete data were available, prices of industrial heavy fuel oil ranged from 79 EUR90/toe in the United States, to 115 EUR90/toe in Japan and 123 EUR90/toe for the European average. For natural gas deliveries to industry the respective prices were 87 EUR90/toe in US, 119 EUR90/toe in the European Union and 280 EUR90/toe in Japan. Finally, for electricity the prices were 28 EUR90/MWh in the United States, 44 EUR90/MWh in European Union and 90 EUR90/MWh in Japan. As a first approximation, it can be considered that US prices reflect low prices observed in liberalised and competitive markets, especially for gas and electricity. Additionally, tax levels are also considerably lower in the USA.

ENVIRONMENT

CO₂ emissions increased by 13% since 1990...

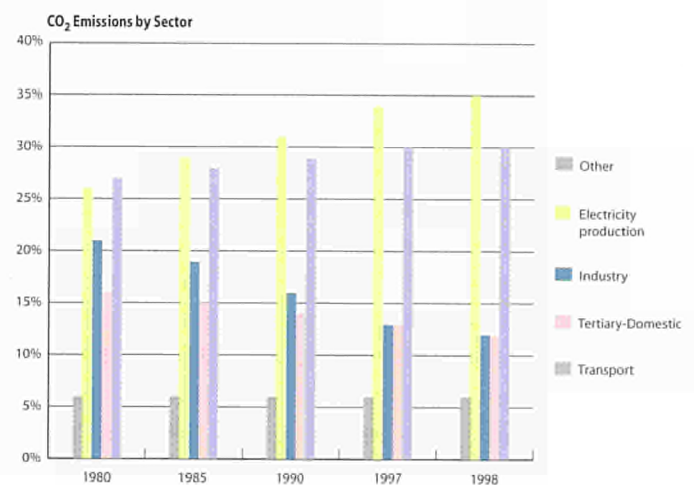
CO₂ emissions have increased continuously since 1985 (+23% since 1985) driven by the OECD Pacific (+32% since 1985) and the NAFTA region (+20% since 1985). Since 1990 CO₂ emissions for the region as a whole have grown by 13% despite a continuous slow decline until 1995 of the carbon intensity of the fuel mix due to the increasing contribution of non-fossil fuels and switching from solids fuels and oil products to natural gas. Over the last three years this indicator has been negatively influenced by the reduced contribution of non-fossil fuels, mainly compensated by coal in the United States, and the increased competitiveness of oil products due to depressed prices on the international market. It must be stressed that CO₂ emissions by unit of GDP, generally slowing down in other parts of the world, were only declining by 0.9% per year in this region since 1990. They were declining in the NAFTA region (-1.3% per year) but stable in both the EFTA and OECD Pacific regions. The level of CO₂ emissions per capita reflects living standards and the industrialisation levels as well as the efforts to reduce energy intensity. The range was very large



inside the region with 2800 kg of CO₂/capita in Turkey, 3773 in Mexico, 8877 in Japan, 16553 in Canada and 20680 in the United States.

Transport and power generation were responsible for about 65% of CO₂ emissions...

Since 1990 the main contributor to CO₂ emissions has been power generation. Its share of total emissions grew from 27% in 1980 to 35% in 1998. In the last three years, the large increase of solid fuel consumption by US electricity producers, and to a less extent of oil products, induced a jump of about 15% in power generation CO₂ emissions. The second contributor by far was the transport sector with a share of about 30% in 1998 against 27% in 1980. Emissions from the tertiary and domestic sectors (12% of total emissions in 1998 against 16% in 1980) remained almost constant since 1980, fluctuating in accordance with climatic con-





ditions. Finally, CO₂ emissions from industry, still declining substantially over the last two years, have fallen by about 28% since 1980, their share in total CO₂ emissions being reduced from 20% in 1980 to only 12% in 1997.

GLOBAL MARKETS

The region remained a net importer of hydrocarbons but a net exporter of solid fuels...

The region is a net importer of energy. Although its import dependency index dropped to 11% in 1985, it has increased since then to reach 16% in 1990, and has subsequently fluctuated between 14% and 16%. The region imported mainly crude oil and oil products, covering almost all of its total fuel imports. Although the NAFTA region diversified its suppliers between Latin America (142 Mtoe), the Middle East (109 Mtoe), Africa (90 Mtoe) and the North Sea (49 Mtoe), the OECD Pacific region relied almost entirely on the Middle East (218 Mtoe). Japan also imported some LNG. The EFTA region remained a net exporter of both crude oil (133 Mtoe) and natural gas (35 Mtoe). On the other hand, the region remained a net coal exporter, the main volumes being exported by Australia (105 Mtoe), the United States (42 Mtoe) and Canada (12 Mtoe).

The situation differs between regions and countries. Inside NAFTA, the United States was the only net importer of oil (517 Mtoe in 1998), the two other members being net exporters (Mexico with 82 Mtoe and Canada with 42 Mtoe). The United States remained the largest world importer of oil, absorbing 26% of interregional exchanges, just ahead of Western Europe. NAFTA countries are self-sufficient in natural gas even though significant trade took place between Canada and the United States. The import dependency of NAFTA remained limited to about 13%, but increased regularly since 1990. Conversely, the OECD Pacific region depended for 46% on energy imports in 1997 (70% in 1980), declining regularly since 1990 due to the increasing exports from Australia and the increasing contribution of non-fossil fuels, mainly nuclear, in Japan. But Japan's import dependency was still 78% in 1998 against 88% in 1980, as it is totally dependent on imports for all fossil fuels consumed in the country. At the same time, Australia, one of the world's largest solid fuel producers, exported about 51% of its total primary energy production. Finally the EFTA region, led by Norway, became a larger net exporter of energy. In 1997, about 85% of both crude oil and natural gas produced in the region were exported, mainly to the European Union.

OTHER OECD COUNTRIES: SUMMARY ENERGY BALANCE

Mtoe	1980	1985	1990	1996	1997	1998	85/80	90/85	97/96	97/98	98/90
Annual % Change											
Primary Production	2129.9	2312.5	2518.8	2813.2	2849.4	2873.3	1.7%	1.7%	1.3%	0.8%	1.7%
Solids	541.2	605.6	705.0	741.7	767.6	782.3	2.3%	3.1%	3.5%	1.9%	1.3%
Oil	746.8	828.5	798.8	874.5	887.2	876.2	2.1%	-0.7%	1.4%	-1.2%	1.2%
Natural gas	572.7	519.7	577.6	672.0	681.8	687.1	-1.9%	2.1%	1.5%	0.8%	2.2%
Nuclear	105.0	169.8	238.4	298.0	287.7	300.5	10.1%	7.0%	-3.4%	4.4%	2.9%
Hydro & Wind	68.6	75.8	77.6	89.8	88.9	84.8	2.0%	0.5%	-1.0%	-4.6%	1.1%
Geothermal	7.8	13.0	22.9	25.2	24.5	25.3	10.9%	11.9%	-2.8%	3.4%	1.3%
Other	87.8	100.2	98.4	112.0	111.7	117.1	2.7%	-0.4%	-0.3%	4.8%	2.2%
Net Imports	544.4	304.7	469.8	479.7	507.5	515.5	-11.0%	9.0%	5.8%	1.6%	1.2%
Solids	-35.2	-53.5	-70.1	-68.3	-63.2	-65.5	8.7%	5.6%	-7.5%	3.6%	-0.8%
Oil	580.9	347.8	519.0	526.1	550.3	560.0	-9.8%	8.3%	4.6%	1.8%	1.0%
Crude oil	501.0	271.7	429.9	458.5	486.4	490.9	-11.5%	9.6%	6.1%	0.9%	1.7%
Oil products	79.9	76.1	89.1	67.6	63.9	69.1	-1.0%	3.2%	-5.4%	8.1%	-3.1%
Natural gas	-0.6	11.0	22.5	21.2	20.5	20.9	-	15.4%	-3.2%	1.7%	-0.9%
Electricity	-0.6	-0.6	-1.6	0.7	-0.1	0.1	-1.8%	22.9%	-	-	-
Gross Inland Consumption	2606.4	2622.8	2900.0	3261.7	3325.9	3323.4	0.1%	2.0%	2.0%	-0.1%	1.7%
Solids	496.2	572.5	612.4	676.5	719.1	703.9	2.9%	1.4%	6.3%	-2.1%	1.8%
Oil	1268.7	1154.9	1266.2	1367.1	1392.7	1398.9	-1.9%	1.9%	1.9%	0.4%	1.3%
Natural gas	572.9	537.2	585.6	692.4	701.5	692.8	-1.3%	1.7%	1.3%	-1.2%	2.1%
Other (1)	268.6	358.3	435.8	525.7	512.7	527.8	5.9%	4.0%	-2.5%	2.9%	2.4%
Electricity Generation in TWh	3724.8	4184.7	5061.8	5860.8	5946.3	6111.0	2.4%	3.9%	1.5%	2.8%	2.4%
Nuclear	401.2	649.4	913.4	1143.2	1103.9	1153.1	10.1%	7.1%	-3.4%	4.5%	3.0%
Hydro & wind	797.8	880.3	901.4	1041.9	1031.0	983.1	2.0%	0.5%	-1.0%	-4.6%	1.1%
Thermal	2525.9	2655.0	3247.0	3675.7	3811.4	3974.8	1.0%	4.1%	3.7%	4.3%	2.6%
Generation Capacity in GWe	916.8	1083.2	1163.9	1279.1	1299.7	1306.2	3.4%	1.4%	1.6%	0.5%	1.5%
Nuclear	80.0	120.3	148.5	163.1	165.0	163.5	8.5%	4.3%	1.2%	-0.9%	1.2%
Hydro & wind	204.3	232.7	255.4	281.0	282.1	285.7	2.6%	1.9%	0.4%	1.3%	1.4%
Thermal	632.6	730.2	760.0	835.0	852.6	857.0	2.9%	0.8%	2.1%	0.5%	1.5%
Average Load Factor in %	46.4	44.1	49.6	52.3	52.2	53.4	-1.0%	2.4%	-0.2%	2.3%	0.9%
Fuel Inputs for Thermal Power Generation	593.6	620.9	766.5	897.6	945.0	982.0	0.9%	4.3%	5.3%	3.9%	3.1%
Solids	339.8	422.6	468.9	565.4	592.9	605.7	4.5%	2.1%	4.9%	2.2%	3.3%
Oil	136.6	78.6	97.4	82.0	90.0	96.9	-10.5%	4.4%	9.9%	7.7%	-0.1%
Gas	107.7	103.9	133.8	176.6	188.9	203.1	-0.7%	5.2%	6.9%	7.6%	5.4%
Geothermal	7.3	12.4	22.0	24.0	23.3	24.0	11.3%	12.2%	-3.1%	3.3%	1.1%
Other	2.2	3.4	44.3	49.6	50.0	52.2	9.3%	67.2%	0.7%	4.5%	2.1%
Average Thermal Efficiency in %	36.6	36.8	36.4	35.2	34.7	34.8	0.1%	-0.2%	-1.5%	0.4%	-0.6%
Non-Energy Uses	147.8	141.0	172.6	214.7	219.9	214.3	-0.9%	4.1%	2.4%	-2.5%	2.7%
Total Final Energy Demand	1778.3	1768.0	1854.0	2034.0	2043.0	2038.5	-0.1%	1.0%	0.4%	-0.2%	1.2%
Solids	122.9	122.9	123.4	91.9	98.6	96.2	0.0%	0.1%	7.3%	-2.4%	-3.1%
Oil	900.6	869.8	925.4	997.1	1002.3	1013.2	-0.7%	1.2%	0.5%	1.1%	1.1%
Gas	398.1	367.7	380.5	440.5	429.8	403.6	-1.6%	0.7%	-2.4%	-6.1%	0.7%
Electricity	269.2	307.5	366.2	430.7	439.2	449.2	2.7%	3.6%	2.0%	2.3%	2.6%
Heat	1.8	3.2	3.8	10.4	10.4	10.5	12.3%	3.3%	0.4%	0.8%	13.6%
Other	85.7	96.9	54.7	63.4	62.7	65.8	2.5%	-10.8%	-1.1%	5.0%	2.3%
CO₂ Emissions in Mt of CO₂	6654.2	6624.7	7203.7	7912.6	8096.4	8172.0	-0.1%	1.7%	2.3%	0.9%	1.6%
Indicators											
Population (Million)	508.88	540.17	571.76	609.68	614.68	620.68	1.2%	1.1%	0.8%	1.0%	1.0%
GDP (index 1985=100)	87.4	100.0	117.6	134.7	140.1	142.8	2.7%	3.3%	4.0%	1.9%	2.5%
Gross Inl Cons./GDP (toe/1990 MEUR)	437.7	384.8	362.0	355.2	348.3	341.5	-2.5%	-1.2%	-1.9%	-2.0%	-0.7%
Gross Inl Cons./Capita (toe/inhabitant)	5.12	4.86	5.07	5.35	5.41	5.35	-1.1%	0.9%	1.1%	-1.0%	0.7%
Electricity Generated/Capita (kWh/inhabitant)	7320	7747	8853	9613	9674	9846	1.1%	2.7%	0.6%	1.8%	1.3%
CO ₂ Emissions/Capita (t of CO ₂ /inhabitant)	13.1	12.3	12.6	13.0	13.2	13.2	-1.3%	0.5%	1.5%	0.0%	0.6%
Import Dependency %	20.5	11.5	16.0	14.6	15.1	15.4	-11.0%	6.8%	3.9%	1.6%	-0.5%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

OTHER OECD COUNTRIES : MAIN INDICATORS

	1980	1985	1990	1996	1997	1998	85/80	90/85	97/96	98/97	98/90
	Annual % Change										
Gross Inland Consumption (Mtoe)	2606.4	2622.8	2900.0	3261.7	3325.9	3323.4	0.1%	2.0%	2.0%	-0.1%	1.7%
Public Thermal Power Generation	568.6	594.5	660.2	720.4	745.4	770.7	0.9%	2.1%	3.5%	3.4%	2.0%
Autoprod. Thermal Power Generation	17.7	14.0	84.5	153.7	176.7	187.6	-4.6%	43.3%	15.0%	6.2%	10.5%
Energy Branch	154.8	159.2	187.4	203.2	206.1	210.8	0.6%	3.3%	1.5%	2.3%	1.5%
Final Energy Consumption	1778.3	1768.0	1853.4	2032.3	2041.2	2036.8	-0.1%	0.9%	0.4%	-0.2%	1.2%
Industry	623.5	576.6	545.1	548.1	547.2	542.2	-1.6%	-1.1%	-0.2%	-0.9%	-0.1%
Transport	591.4	611.1	698.5	787.1	802.3	818.1	0.7%	2.7%	1.9%	2.0%	2.0%
Tertiary-Domestic	563.4	580.3	609.7	697.1	691.7	676.5	0.6%	1.0%	-0.8%	-2.2%	1.3%
Energy Intensity (toe/1990 MEUR)	437.7	384.8	362.0	355.2	348.3	341.5	-2.5%	-1.2%	-1.9%	-2.0%	-0.7%
Public Thermal Power Generation	95.5	87.2	82.4	78.4	78.1	79.2	-1.8%	-1.1%	-0.5%	1.4%	-0.5%
Autoprod. Thermal Power Generation	3.0	2.0	10.5	16.7	18.5	19.3	-7.2%	38.8%	10.6%	4.2%	7.8%
Industry	104.7	84.6	68.0	59.7	57.3	55.7	-4.2%	-4.3%	-4.0%	-2.8%	-2.5%
Transport	99.3	89.7	87.2	85.7	84.0	84.1	-2.0%	-0.6%	-2.0%	0.0%	-0.5%
Tertiary-Domestic	94.6	85.1	76.1	75.9	72.4	69.5	-2.1%	-2.2%	-4.6%	-4.1%	-1.1%
Energy per Capita (Kgoe/inhabitant)	5122	4856	5072	5350	5411	5354	-1.1%	0.9%	1.1%	-1.0%	0.7%
Industry	1225	1067	953	899	890	873	-2.7%	-2.2%	-1.0%	-1.9%	-1.1%
Transport	1162	1131	1222	1291	1305	1318	-0.5%	1.6%	1.1%	1.0%	1.0%
Tertiary-Domestic	1107	1074	1066	1143	1125	1090	-0.6%	-0.1%	-1.6%	-3.2%	0.3%
Electricity Share (%)											
Final Energy Consumption	15.1%	17.4%	19.8%	21.2%	21.5%	22.1%	2.8%	2.6%	1.5%	2.5%	1.4%
Industry	18.6%	21.1%	25.7%	30.0%	30.5%	31.2%	2.6%	4.0%	1.9%	2.2%	2.5%
Transport	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	1.7%	1.1%	0.7%	1.6%	-0.1%
Tertiary-Domestic	26.9%	31.6%	36.6%	37.8%	38.9%	40.9%	3.3%	3.0%	2.9%	5.2%	1.4%
Total Renewable Consumption (Mtoe)	164.2	189.0	198.9	227.0	225.0	227.1	2.9%	1.0%	-0.9%	0.9%	1.7%
Hydro	68.6	75.7	77.3	89.2	88.3	84.2	2.0%	0.4%	-1.0%	-4.6%	1.1%
Biomass	87.8	100.2	98.4	112.0	111.7	117.1	2.7%	-0.4%	-0.3%	4.8%	2.2%
Other	7.8	13.1	23.3	25.7	25.0	25.9	11.0%	12.2%	-2.7%	3.2%	1.3%
Renewable intensity (toe/1990MEUR)	27.6	27.7	24.8	24.7	23.6	23.3	0.1%	-2.2%	-4.7%	-1.0%	-0.8%
Renewable per capita (Kgoe/inhabitant)	322.7	349.9	347.9	372.3	366.1	365.9	1.6%	-0.1%	-1.7%	0.0%	0.6%
CO₂ Emissions (Mt of CO₂)	6654.2	6624.7	7203.7	7912.6	8096.4	8172.0	-0.1%	1.7%	2.3%	0.9%	1.6%
Public Thermal Power Generation	1708.2	1870.1	2092.6	2312.8	2379.3	2434.4	1.8%	2.3%	2.9%	2.3%	1.9%
Autoprod. Thermal Power Generation	51.1	37.7	117.3	317.3	393.9	420.4	-5.9%	25.5%	24.1%	6.7%	17.3%
Energy Branch	378.2	381.6	440.4	462.7	467.6	477.6	0.2%	2.9%	1.1%	2.1%	1.0%
Industry	1409.7	1229.9	1177.7	1052.8	1040.9	1017.3	-2.7%	-0.9%	-1.1%	-2.3%	-1.8%
Transport	1799.4	1860.4	2124.6	2390.4	2434.9	2483.7	0.7%	2.7%	1.9%	2.0%	2.0%
Tertiary-Domestic	1038.6	986.6	979.1	1085.0	1068.1	1001.1	-1.0%	-0.2%	-1.6%	-6.3%	0.3%
Carbon Intensity (tn of CO₂/toe)	2.6	2.5	2.5	2.4	2.4	2.5	-0.2%	-0.3%	0.3%	1.0%	-0.1%
Public Power Generation	2.3	2.2	2.1	2.1	2.1	2.1	-0.8%	-0.8%	1.6%	-0.7%	-0.2%
Public Thermal Power Generation	3.0	3.1	3.2	3.2	3.2	3.2	0.9%	0.2%	-0.6%	-1.0%	0.0%
Autoprod. Power Generation	2.3	2.0	1.2	1.9	2.1	2.1	-2.6%	-9.4%	9.7%	0.9%	6.9%
Autoprod. Thermal Power Generation	2.9	2.7	1.4	2.1	2.2	2.2	-1.3%	-12.5%	7.9%	0.5%	6.2%
Energy Branch	0.0	2.5	2.1	3.0	3.0	2.9	-	-3.9%	-0.1%	-2.2%	4.5%
Industry	2.4	2.4	2.4	2.3	2.3	2.3	-0.4%	-0.4%	-0.4%	-0.1%	-0.5%
Transport	2.3	2.1	2.2	1.9	1.9	1.9	-1.2%	0.3%	-1.0%	-1.4%	-1.7%
Tertiary-Domestic	3.0	3.0	3.0	3.0	3.0	3.0	0.0%	0.0%	-0.1%	0.0%	0.0%
CO₂ per Capita (kg of CO₂/inhabitant)	1307.6	1226.4	1259.9	1297.8	1317.2	1316.6	-1.3%	0.5%	1.5%	0.0%	0.6%
Industry	2770	2277	2060	1727	1693	1639	-3.8%	-2.0%	-1.9%	-3.2%	-2.8%
Transport	3536	3444	3716	3921	3961	4002	-0.5%	1.5%	1.0%	1.0%	0.9%
Tertiary-Domestic	2041	1826	1712	1780	1738	1613	-2.2%	-1.3%	-2.4%	-7.2%	-0.7%
CO₂ per unit of GDP (tn of CO₂/1990 MEUR)	1117	972	899	862	848	840	-2.7%	-1.5%	-1.6%	-1.0%	-0.9%
Public Thermal Power Generation	287	274	261	252	249	250	-0.9%	-1.0%	-1.1%	0.4%	-0.5%
Autoprod. Thermal Power Generation	9	6	15	35	41	43	-8.4%	21.5%	19.4%	4.7%	14.5%
Energy Branch	0	0	0	1	1	1	-	2.4%	10.8%	-35.7%	34.9%
Industry	64	56	55	50	49	49	-2.5%	-0.4%	-2.8%	0.2%	-1.4%
Transport	237	180	147	115	109	105	-5.3%	-4.0%	-4.9%	-4.1%	-4.2%
Tertiary-Domestic	302	273	265	260	255	255	-2.0%	-0.6%	-2.1%	0.1%	-0.5%

NAFTA : SUMMARY ENERGY BALANCE

Mtoe	1980	1985	1990	1996	1997	1998	85/80	90/85	97/96	97/98	98/90
Annual % Change											
Primary Production	1910.0	2005.5	2117.0	2260.3	2273.9	2289.3	1.0%	1.1%	0.6%	0.7%	1.0%
Solids	470.2	502.5	580.2	593.6	609.2	616.3	1.3%	2.9%	2.6%	1.2%	0.8%
Oil	697.2	757.1	679.5	679.1	691.1	684.9	1.7%	-2.1%	1.8%	-0.9%	0.1%
Natural gas	539.7	480.0	530.5	603.0	608.3	612.5	-2.3%	2.0%	0.9%	0.7%	1.8%
Nuclear	79.8	122.3	179.5	212.7	197.9	207.2	8.9%	8.0%	-6.9%	4.7%	1.8%
Hydro & Wind	47.0	52.8	51.3	63.8	61.2	56.2	2.3%	-0.6%	-4.2%	-8.1%	1.2%
Geothermal	5.4	9.9	18.2	18.5	17.5	18.1	13.0%	12.9%	-5.1%	3.2%	-0.1%
Other	70.7	80.9	77.9	89.6	88.7	94.0	2.8%	-0.8%	-1.0%	6.0%	2.4%
Net Imports	246.0	68.9	215.6	274.1	307.4	338.8	-22.5%	25.6%	12.1%	10.2%	5.8%
Solids	-56.0	-64.9	-76.5	-65.9	-60.4	-51.5	3.0%	3.3%	-8.4%	-14.7%	-4.8%
Oil	301.1	134.8	291.0	339.6	367.3	391.9	-14.8%	16.6%	8.2%	6.7%	3.8%
Crude oil	265.3	108.3	269.1	329.6	354.6	367.5	-16.4%	20.0%	7.6%	3.6%	4.0%
Oil products	35.9	26.5	21.9	10.1	12.7	24.4	-5.9%	-3.7%	26.1%	92.6%	1.4%
Natural gas	0.9	-1.0	1.0	0.3	0.5	-1.7	-	-	39.2%	-	-
Electricity	0.0	0.0	0.0	0.0	0.0	0.1	41.3%	-11.8%	-	-	15.1%
Gross Inland Consumption	2103.6	2086.5	2258.8	2514.1	2562.0	2564.0	-0.2%	1.6%	1.9%	0.1%	1.6%
Solids	399.9	454.5	484.1	529.8	563.6	549.6	2.6%	1.3%	6.4%	-2.5%	1.6%
Oil	959.3	880.5	930.6	996.9	1025.0	1043.0	-1.7%	1.1%	2.8%	1.8%	1.4%
Natural gas	541.5	485.5	517.2	602.8	608.0	595.8	-2.2%	1.3%	0.9%	-2.0%	1.8%
Other (1)	202.9	266.0	326.9	384.7	365.3	375.6	5.6%	4.2%	-5.0%	2.8%	1.7%
Electricity Generation in TWh	2867.6	3173.8	3786.2	4386.6	4418.2	4547.8	2.1%	3.6%	0.7%	2.9%	2.3%
Nuclear	304.2	467.2	687.5	815.9	759.3	794.9	9.0%	8.0%	-6.9%	4.7%	1.8%
Hydro & wind	546.8	613.9	596.4	742.4	711.5	653.6	2.3%	-0.6%	-4.2%	-8.1%	1.2%
Thermal	2016.5	2092.7	2502.3	2828.3	2947.3	3099.2	0.7%	3.6%	4.2%	5.2%	2.7%
Generation Capacity in GWe	701.6	823.3	866.0	932.4	944.0	942.9	3.3%	1.0%	1.3%	-0.1%	1.1%
Nuclear	62.4	92.7	113.9	118.1	119.3	115.2	8.3%	4.2%	1.0%	-3.4%	0.1%
Hydro & wind	130.5	147.3	159.6	174.6	175.4	178.2	2.5%	1.6%	0.5%	1.6%	1.4%
Thermal	508.7	583.3	592.5	639.7	649.4	649.6	2.8%	0.3%	1.5%	0.0%	1.2%
Average Load Factor in %	46.7	44.0	49.9	53.7	53.4	55.1	-1.2%	2.6%	-0.5%	3.1%	1.2%
Fuel Inputs for Thermal Power Generation	476.5	498.3	609.1	714.0	760.4	796.7	0.9%	4.1%	6.5%	4.8%	3.4%
Solids	307.1	374.1	408.9	485.5	509.4	516.8	4.0%	1.8%	4.9%	1.5%	3.0%
Oil	73.5	39.3	46.9	36.0	49.4	63.3	-11.8%	3.6%	37.4%	28.1%	3.8%
Gas	90.2	74.3	95.1	130.0	139.9	152.1	-3.8%	5.0%	7.6%	8.7%	6.1%
Geothermal	5.4	9.9	18.2	18.5	17.5	18.1	13.0%	12.9%	-5.1%	3.2%	-0.1%
Other	0.3	0.7	40.0	44.0	44.1	46.4	15.5%	124.7%	0.3%	5.0%	1.9%
Average Thermal Efficiency in %	36.4	36.1	35.3	34.0	33.3	33.4	-0.2%	-0.4%	-2.1%	0.4%	-0.7%
Non-Energy Uses	112.6	105.3	125.8	159.1	162.1	158.0	-1.3%	3.6%	1.9%	-2.5%	2.9%
Total Final Energy Demand	1445.1	1413.8	1440.0	1562.0	1566.2	1560.8	-0.4%	0.4%	0.3%	-0.3%	1.0%
Solids	74.8	71.5	68.1	37.7	42.5	42.2	-0.9%	-1.0%	12.5%	-0.7%	-5.8%
Oil	711.5	680.7	705.6	746.4	753.3	765.3	-0.9%	0.7%	0.9%	1.6%	1.0%
Gas	382.2	347.2	354.5	404.3	392.7	365.5	-1.9%	0.4%	-2.9%	-6.9%	0.4%
Electricity	205.2	232.0	271.1	319.0	324.3	331.3	2.5%	3.2%	1.7%	2.2%	2.5%
Heat	1.0	2.2	2.3	8.3	8.2	8.2	16.3%	1.0%	-0.6%	0.0%	17.2%
Other	70.3	80.2	38.4	46.4	45.3	48.3	2.7%	-13.7%	-2.3%	6.7%	2.9%
CO₂ Emissions in Mt of CO₂	5414.6	5336.1	5681.6	6178.8	6349.8	6427.4	-0.3%	1.3%	2.8%	1.2%	1.6%
Indicators											
Population (Million)	319.10	339.13	360.29	387.39	390.74	395.07	1.2%	1.2%	0.9%	1.1%	1.2%
GDP (index 1985=100)	88.6	100.0	114.4	131.8	138.7	144.0	2.5%	2.7%	5.2%	3.8%	2.9%
Gross Inl Cons./GDP (toe/1990 MEUR)	541.1	475.5	450.0	434.7	421.0	405.7	-2.6%	-1.1%	-3.2%	-3.6%	-1.3%
Gross Inl Cons./Capita (toe/inhabitant)	6.59	6.15	6.27	6.49	6.56	6.49	-1.4%	0.4%	1.0%	-1.0%	0.4%
Electricity Generated/Capita (kWh/inhabitant)	8986	9359	10509	11323	11307	11511	0.8%	2.3%	-0.1%	1.8%	1.1%
CO ₂ Emissions/Capita (t of CO ₂ /inhabitant)	17.0	15.7	15.8	15.9	16.3	16.3	-1.5%	0.0%	1.9%	0.1%	0.4%
Import Dependency %	11.5	3.3	9.4	10.8	11.9	13.1	-22.3%	23.5%	10.2%	10.1%	4.2%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.



NAFTA : MAIN INDICATORS

	1980	1985	1990	1996	1997	1998	85/80	90/85	97/96	98/97	98/90
	Annual % Change										
Gross Inland Consumption (Mtoe)	2103.6	2086.5	2258.8	2514.1	2562.0	2564.0	-0.2%	1.6%	1.9%	0.1%	1.6%
Public Thermal Power Generation	470.1	487.1	526.2	568.1	594.1	620.6	0.7%	1.6%	4.6%	4.5%	2.1%
Autoprod. Thermal Power Generation	1.0	1.3	64.9	127.8	149.1	158.3	5.7%	118.1%	16.6%	6.2%	11.8%
Energy Branch	130.6	132.1	155.9	166.0	166.9	170.6	0.2%	3.4%	0.6%	2.2%	1.1%
Final Energy Consumption	1445.1	1413.8	1439.5	1560.4	1564.5	1559.2	-0.4%	0.4%	0.3%	-0.3%	1.0%
Industry	478.1	431.4	385.5	378.9	375.3	371.5	-2.0%	-2.2%	-0.9%	-1.0%	-0.5%
Transport	502.2	515.5	577.7	642.2	655.1	670.7	0.5%	2.3%	2.0%	2.4%	1.9%
Tertiary-Domestic	464.7	467.0	476.3	539.3	534.2	517.0	0.1%	0.4%	-1.0%	-3.2%	1.0%
Energy Intensity (toe/1990 MEUR)	541.1	475.5	450.0	434.7	421.0	405.7	-2.6%	-1.1%	-3.2%	-3.6%	-1.3%
Public Thermal Power Generation	120.9	111.0	104.8	98.2	97.6	98.2	-1.7%	-1.1%	-0.6%	0.6%	-0.8%
Autoprod. Thermal Power Generation	0.3	0.3	12.9	22.1	24.5	25.0	3.2%	112.3%	10.9%	2.2%	8.6%
Industry	123.0	98.3	76.8	65.5	61.7	58.8	-4.4%	-4.8%	-5.9%	-4.7%	-3.3%
Transport	129.2	117.5	115.1	111.1	107.6	106.1	-1.9%	-0.4%	-3.1%	-1.4%	-1.0%
Tertiary-Domestic	119.5	106.4	94.9	93.3	87.8	81.8	-2.3%	-2.3%	-5.9%	-6.8%	-1.8%
Energy per Capita (Kgoe/inhabitant)	6592	6153	6269	6490	6557	6490	-1.4%	0.4%	1.0%	-1.0%	0.4%
Industry	1498	1272	1070	978	960	940	-3.2%	-3.4%	-1.8%	-2.1%	-1.6%
Transport	1574	1520	1603	1658	1677	1698	-0.7%	1.1%	1.1%	1.3%	0.7%
Tertiary-Domestic	1456	1377	1322	1392	1367	1309	-1.1%	-0.8%	-1.8%	-4.3%	-0.1%
Electricity Share (%)											
Final Energy Consumption	14.2%	16.4%	18.8%	20.4%	20.7%	21.2%	2.9%	2.8%	1.4%	2.5%	1.5%
Industry	16.4%	19.3%	24.3%	30.0%	30.7%	31.5%	3.3%	4.6%	2.3%	2.5%	3.3%
Transport	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	4.3%	-0.1%	5.2%	6.1%	0.9%
Tertiary-Domestic	27.2%	31.7%	37.1%	37.9%	39.0%	41.3%	3.1%	3.2%	2.8%	6.0%	1.3%
Total Renewable Consumption (Mtoe)	123.1	143.6	147.3	172.0	167.4	168.3	3.1%	0.5%	-2.7%	0.5%	1.7%
Hydro	47.0	52.8	51.0	63.5	60.8	55.9	2.3%	-0.7%	-4.2%	-8.1%	1.1%
Biomass	70.7	80.9	77.9	89.7	88.7	94.0	2.8%	-0.8%	-1.1%	6.0%	2.4%
Other	5.4	9.9	18.4	18.8	17.9	18.4	13.0%	13.2%	-5.1%	2.9%	0.0%
Renewable intensity (toe/1990MEUR)	31.7	32.7	29.4	29.7	27.5	26.6	0.7%	-2.2%	-7.5%	-3.2%	-1.2%
Renewable per capita (Kgoe/inhabitant)	385.7	423.6	408.9	443.9	428.5	426.1	1.9%	-0.7%	-3.5%	-0.6%	0.5%
CO₂ Emissions (Mt of CO₂)	5414.6	5336.1	5681.6	6178.8	6349.8	6427.4	-0.3%	1.3%	2.8%	1.2%	1.6%
Public Thermal Power Generation	1433.2	1592.0	1752.6	1924.2	1995.1	2054.4	2.1%	1.9%	3.7%	3.0%	2.0%
Autoprod. Thermal Power Generation	2.1	2.6	63.6	245.7	317.7	338.3	4.7%	89.0%	29.3%	6.5%	23.2%
Energy Branch	315.8	313.9	365.2	376.5	376.6	384.4	-0.1%	3.1%	0.0%	2.1%	0.6%
Industry	1057.3	882.4	809.0	673.0	656.4	639.3	-3.6%	-1.7%	-2.5%	-2.6%	-2.9%
Transport	1530.7	1572.4	1760.4	1953.3	1990.6	2039.0	0.5%	2.3%	1.9%	2.4%	1.9%
Tertiary-Domestic	850.2	787.8	754.9	828.3	818.3	754.3	-1.5%	-0.9%	-1.2%	-7.8%	0.0%
Carbon Intensity (tn of CO₂/toe)	2.6	2.6	2.5	2.5	2.5	2.5	-0.1%	-0.3%	0.8%	1.1%	0.0%
Public Power Generation	2.4	2.4	2.3	2.3	2.3	2.3	-0.1%	-0.8%	2.7%	-0.7%	0.1%
Public Thermal Power Generation	3.0	3.3	3.3	3.4	3.4	3.3	1.4%	0.4%	-0.9%	-1.4%	-0.1%
Autoprod. Power Generation	0.6	0.7	0.9	1.7	2.0	2.0	3.3%	4.9%	12.9%	0.8%	11.1%
Autoprod. Thermal Power Generation	2.1	2.0	1.0	1.9	2.1	2.1	-1.0%	-13.3%	10.9%	0.3%	10.3%
Energy Branch	0.0	0.0	0.0	3.1	3.1	3.1	-	-	0.0%	0.0%	-
Industry	2.4	2.4	2.3	2.3	2.3	2.3	-0.4%	-0.3%	-0.5%	-0.2%	-0.5%
Transport	2.2	2.0	2.1	1.8	1.7	1.7	-1.5%	0.5%	-1.5%	-1.6%	-2.4%
Tertiary-Domestic	3.0	3.1	3.0	3.0	3.0	3.0	0.0%	0.0%	-0.1%	0.0%	0.0%
CO₂ per Capita (kg of CO₂/inhabitant)	16969	15735	15769	15950	16251	16269	-1.5%	0.0%	1.9%	0.1%	0.4%
Industry	3313	2602	2245	1737	1680	1618	-4.7%	-2.9%	-3.3%	-3.7%	-4.0%
Transport	4797	4637	4886	5042	5094	5161	-0.7%	1.1%	1.0%	1.3%	0.7%
Tertiary-Domestic	2664	2323	2095	2138	2094	1909	-2.7%	-2.0%	-2.1%	-8.8%	-1.2%
CO₂ per unit of GDP (tn of CO₂/1990 MEUR)	1393	1216	1132	1068	1043	1017	-2.7%	-1.4%	-2.3%	-2.5%	-1.3%
Public Thermal Power Generation	369	363	349	333	328	325	-0.3%	-0.8%	-1.5%	-0.8%	-0.9%
Autoprod. Thermal Power Generation	1	1	13	42	52	54	2.2%	84.0%	22.9%	2.5%	19.7%
Energy Branch	0	0	0	2	2	1	-	-	11.0%	-40.7%	-
Industry	81	72	73	65	62	61	-2.5%	0.3%	-4.9%	-1.7%	-2.2%
Transport	272	201	161	116	108	101	-5.9%	-4.3%	-7.3%	-6.2%	-5.7%
Tertiary-Domestic	394	358	351	338	327	323	-1.9%	-0.4%	-3.2%	-1.4%	-1.0%

UNITED STATES : SUMMARY ENERGY BALANCE

Mtoe	1980	1985	1990	1995	1996	1997	1998	85/80	90/85	97/96	97/98	98/90
Annual % Change												
Primary Production	1553.3	1570.2	1648.8	1663.6	1688.5	1686.0	1695.4	0.2%	1.0%	-0.2%	0.6%	0.3%
Solids	447.9	465.9	539.1	531.5	547.1	561.2	570.2	0.8%	3.0%	2.6%	1.6%	0.7%
Oil	498.3	514.3	431.2	399.6	398.7	396.6	384.9	0.6%	-3.5%	-0.5%	-3.0%	-1.4%
Natural gas	454.6	385.9	419.2	435.7	440.2	442.1	439.7	-3.2%	1.7%	0.4%	-0.5%	0.6%
Nuclear	69.4	106.0	159.4	186.0	186.4	173.7	186.1	8.8%	8.5%	-6.8%	7.2%	2.0%
Hydro & Wind	24.0	24.4	23.7	27.4	30.6	28.7	25.5	0.4%	-0.6%	-5.9%	-11.1%	0.9%
Geothermal	4.6	8.5	13.8	12.8	13.5	12.8	13.2	13.1%	10.1%	-5.3%	3.1%	-0.5%
Other	54.5	65.1	62.3	70.5	72.0	70.8	75.8	3.6%	-0.9%	-1.7%	7.0%	2.5%
Net Imports	307.3	201.8	344.7	438.6	470.4	509.7	547.2	-8.1%	11.3%	8.4%	7.3%	5.9%
Solids	-57.0	-57.3	-64.8	-49.4	-51.3	-46.0	-41.2	0.1%	2.5%	-10.3%	-10.4%	-5.5%
Oil	340.3	235.3	376.2	422.5	453.8	486.9	516.6	-7.1%	9.8%	7.3%	6.1%	4.0%
Crude oil	299.0	202.9	350.2	419.3	440.0	475.4	495.8	-7.5%	11.5%	8.0%	4.3%	4.4%
Oil products	41.3	32.4	26.0	3.2	13.8	11.5	20.8	-4.7%	-4.3%	-16.8%	80.8%	-2.7%
Natural gas	21.7	20.3	33.2	62.2	64.6	65.9	69.5	-1.3%	10.3%	2.0%	5.5%	9.7%
Electricity	2.3	3.5	0.2	3.2	3.3	2.9	2.3	8.9%	-45.4%	-10.4%	-21.4%	38.4%
Gross Inland Consumption	1811.7	1781.7	1925.6	2089.7	2140.1	2180.9	2181.8	-0.3%	1.6%	1.9%	0.0%	1.6%
Solids	376.2	425.7	456.7	475.3	497.5	529.5	514.0	2.5%	1.4%	6.4%	-2.9%	1.5%
Oil	803.9	736.8	770.2	805.8	832.5	854.5	868.9	-1.7%	0.9%	2.6%	1.7%	1.5%
Natural gas	476.8	411.7	439.4	508.5	504.3	508.0	496.0	-2.9%	1.3%	0.7%	-2.4%	1.5%
Other (1)	154.7	207.5	259.3	300.1	305.8	288.9	302.9	6.0%	4.6%	-5.5%	4.8%	2.0%
Electricity Generation in TWh	2427.3	2621.9	3181.5	3558.4	3651.2	3669.5	3803.7	1.6%	3.9%	0.5%	3.7%	2.3%
Nuclear	266.2	406.7	611.6	713.8	715.2	666.4	714.1	8.8%	8.5%	-6.8%	7.2%	2.0%
Hydro & wind	278.8	284.0	273.2	314.1	350.9	330.1	293.2	0.4%	-0.8%	-5.9%	-11.2%	0.9%
Thermal	1882.4	1931.3	2296.8	2530.5	2585.1	2673.1	2796.4	0.5%	3.5%	3.4%	4.6%	2.5%
Generation Capacity in GWe	603.1	701.9	733.3	771.4	778.3	788.3	791.0	3.1%	0.9%	1.3%	0.3%	1.0%
Nuclear	56.5	81.6	99.6	99.1	100.4	101.6	100.5	7.6%	4.1%	1.1%	-1.1%	0.1%
Hydro & wind	76.7	85.0	92.4	100.2	100.3	99.9	101.4	2.1%	1.7%	-0.4%	1.6%	1.2%
Thermal	470.0	535.3	541.3	572.0	577.6	586.9	589.1	2.6%	0.2%	1.6%	0.4%	1.1%
Average Load Factor in %	45.9	42.6	49.5	52.7	53.6	53.1	54.9	-1.5%	3.0%	-0.8%	3.3%	1.3%
Fuel Inputs for Thermal Power Generation	442.9	458.8	558.1	632.1	655.9	695.8	725.2	0.7%	4.0%	6.1%	4.2%	3.3%
Solids	292.0	353.7	387.6	435.8	460.2	482.4	488.1	3.9%	1.9%	4.8%	1.2%	2.9%
Oil	60.6	25.1	27.3	15.2	16.9	26.7	37.4	-16.2%	1.7%	57.5%	40.0%	4.0%
Gas	85.6	71.2	89.7	127.2	121.8	130.4	140.7	-3.6%	4.7%	7.1%	7.9%	5.8%
Geothermal	4.6	8.5	13.8	12.8	13.5	12.8	13.2	13.1%	10.1%	-5.3%	3.1%	-0.5%
Other	0.1	0.4	39.7	41.1	43.5	43.6	45.8	26.6%	157.0%	0.2%	5.1%	1.8%
Average Thermal Efficiency in %	36.6	36.2	35.4	34.4	33.9	33.0	33.1	-0.2%	-0.5%	-2.5%	0.4%	-0.8%
Non-Energy Uses	96.2	82.4	101.5	125.5	132.7	135.5	131.6	-3.0%	4.3%	2.1%	-2.9%	3.3%
Total Final Energy Demand	1235.1	1203.1	1213.2	1273.1	1310.6	1311.9	1306.3	-0.5%	0.2%	0.1%	-0.4%	0.9%
Solids	67.5	64.2	62.7	32.7	31.7	36.3	36.0	-1.0%	-0.5%	14.5%	-0.9%	-6.7%
Oil	601.5	582.4	596.3	614.8	632.2	636.1	645.5	-0.6%	0.5%	0.6%	1.5%	1.0%
Gas	337.4	296.6	303.0	326.4	340.8	330.9	306.9	-2.5%	0.4%	-2.9%	-7.2%	0.2%
Electricity	174.2	193.8	226.5	261.6	269.0	273.0	279.7	2.2%	3.2%	1.5%	2.5%	2.7%
Heat	0.0	1.4	1.7	7.5	7.6	7.6	7.5	-	3.9%	0.5%	-1.2%	20.7%
Other	54.4	64.7	23.1	30.2	29.3	27.9	30.6	3.6%	-18.6%	-4.6%	9.6%	3.6%
CO₂ Emissions in Mt of CO₂	4765.3	4677.5	4954.0	5191.7	5373.3	5515.2	5564.9	-0.4%	1.2%	2.6%	0.9%	1.5%
Indicators												
Population (Million)	227.73	238.47	249.91	263.17	265.56	266.79	269.09	0.9%	0.9%	0.5%	0.9%	0.9%
GDP (index 1985=100)	88.6	100.0	114.6	127.5	132.9	139.9	145.4	2.4%	2.8%	5.3%	3.9%	3.0%
Gross Inl Cons./GDP (toe/1990 MEUR)	537.0	468.0	441.3	430.5	423.1	409.5	394.3	-2.7%	-1.2%	-3.2%	-3.7%	-1.4%
Gross Inl Cons./Capita (toe/inhabitant)	7.96	7.47	7.70	7.94	8.06	8.17	8.11	-1.2%	0.6%	1.4%	-0.8%	0.6%
Electricity Generated/Capita (kWh/inhabitant)	10659	10995	12731	13521	13749	13754	14135	0.6%	3.0%	0.0%	2.8%	1.3%
CO ₂ Emissions/Capita (t of CO ₂ /inhabitant)	20.9	19.6	19.8	19.7	20.2	20.7	20.7	-1.3%	0.2%	2.2%	0.0%	0.5%
Import Dependency %	16.7	11.2	17.6	20.7	21.7	23.1	24.8	-7.7%	9.5%	6.5%	7.3%	4.4%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

OECD PACIFIC : SUMMARY ENERGY BALANCE

Mtoe	1980	1985	1990	1996	1997	1998	85/80	90/85	97/96	97/98	98/90
Annual % Change											
Primary Production	2129.9	2312.5	2518.8	2813.2	2849.4	2873.3	1.7%	1.7%	1.3%	0.8%	1.7%
Solids	541.2	605.6	705.0	741.7	767.6	782.3	2.3%	3.1%	3.5%	1.9%	1.3%
Oil	746.8	828.5	798.8	874.5	887.2	876.2	2.1%	-0.7%	1.4%	-1.2%	1.2%
Natural gas	572.7	519.7	577.6	672.0	681.8	687.1	-1.9%	2.1%	1.5%	0.8%	2.2%
Nuclear	105.0	169.8	238.4	298.0	287.7	300.5	10.1%	7.0%	-3.4%	4.4%	2.9%
Hydro & Wind	68.6	75.8	77.6	89.8	88.9	84.8	2.0%	0.5%	-1.0%	-4.6%	1.1%
Geothermal	7.8	13.0	22.9	25.2	24.5	25.3	10.9%	11.9%	-2.8%	3.4%	1.3%
Other	87.8	100.2	98.4	112.0	111.7	117.1	2.7%	-0.4%	-0.3%	4.8%	2.2%
Net Imports	544.4	304.7	469.8	479.7	507.5	515.5	-11.0%	9.0%	5.8%	1.6%	1.2%
Solids	-35.2	-53.5	-70.1	-68.3	-63.2	-65.5	8.7%	5.6%	-7.5%	3.6%	-0.8%
Oil	580.9	347.8	519.0	526.1	550.3	560.0	-9.8%	8.3%	4.6%	1.8%	1.0%
Crude oil	501.0	271.7	429.9	458.5	486.4	490.9	-11.5%	9.6%	6.1%	0.9%	1.7%
Oil products	79.9	76.1	89.1	67.6	63.9	69.1	-1.0%	3.2%	-5.4%	8.1%	-3.1%
Natural gas	-0.6	11.0	22.5	21.2	20.5	20.9	-	15.4%	-3.2%	1.7%	-0.9%
Electricity	-0.6	-0.6	-1.6	0.7	-0.1	0.1	-1.8%	22.9%	-	-	-
Gross Inland Consumption	2606.4	2622.8	2900.0	3261.7	3325.9	3323.4	0.1%	2.0%	2.0%	-0.1%	1.7%
Solids	496.2	572.5	612.4	676.5	719.1	703.9	2.9%	1.4%	6.3%	-2.1%	1.8%
Oil	1268.7	1154.9	1266.2	1367.1	1392.7	1398.9	-1.9%	1.9%	1.9%	0.4%	1.3%
Natural gas	572.9	537.2	585.6	692.4	701.5	692.8	-1.3%	1.7%	1.3%	-1.2%	2.1%
Other (1)	268.6	358.3	435.8	525.7	512.7	527.8	5.9%	4.0%	-2.5%	2.9%	2.4%
Electricity Generation in TWh	3724.8	4184.7	5061.8	5860.8	5946.3	6111.0	2.4%	3.9%	1.5%	2.8%	2.4%
Nuclear	401.2	649.4	913.4	1143.2	1103.9	1153.1	10.1%	7.1%	-3.4%	4.5%	3.0%
Hydro & wind	797.8	880.3	901.4	1041.9	1031.0	983.1	2.0%	0.5%	-1.0%	-4.6%	1.1%
Thermal	2525.9	2655.0	3247.0	3675.7	3811.4	3974.8	1.0%	4.1%	3.7%	4.3%	2.6%
Generation Capacity in GWe	916.8	1083.2	1163.9	1279.1	1299.7	1306.2	3.4%	1.4%	1.6%	0.5%	1.5%
Nuclear	80.0	120.3	148.5	163.1	165.0	163.5	8.5%	4.3%	1.2%	-0.9%	1.2%
Hydro & wind	204.3	232.7	255.4	281.0	282.1	285.7	2.6%	1.9%	0.4%	1.3%	1.4%
Thermal	632.6	730.2	760.0	835.0	852.6	857.0	2.9%	0.8%	2.1%	0.5%	1.5%
Average Load Factor in %	46.4	44.1	49.6	52.3	52.2	53.4	-1.0%	2.4%	-0.2%	2.3%	0.9%
Fuel Inputs for Thermal Power Generation	593.6	620.9	766.5	897.6	945.0	982.0	0.9%	4.3%	5.3%	3.9%	3.1%
Solids	339.8	422.6	468.9	565.4	592.9	605.7	4.5%	2.1%	4.9%	2.2%	3.3%
Oil	136.6	78.6	97.4	82.0	90.0	96.9	-10.5%	4.4%	9.9%	7.7%	-0.1%
Gas	107.7	103.9	133.8	176.6	188.9	203.1	-0.7%	5.2%	6.9%	7.6%	5.4%
Geothermal	7.3	12.4	22.0	24.0	23.3	24.0	11.3%	12.2%	-3.1%	3.3%	1.1%
Other	2.2	3.4	44.3	49.6	50.0	52.2	9.3%	67.2%	0.7%	4.5%	2.1%
Average Thermal Efficiency in %	36.6	36.8	36.4	35.2	34.7	34.8	0.1%	-0.2%	-1.5%	0.4%	-0.6%
Non-Energy Uses	147.8	141.0	172.6	214.7	219.9	214.3	-0.9%	4.1%	2.4%	-2.5%	2.7%
Total Final Energy Demand	1778.3	1768.0	1854.0	2034.0	2043.0	2038.5	-0.1%	1.0%	0.4%	-0.2%	1.2%
Solids	122.9	122.9	123.4	91.9	98.6	96.2	0.0%	0.1%	7.3%	-2.4%	-3.1%
Oil	900.6	869.8	925.4	997.1	1002.3	1013.2	-0.7%	1.2%	0.5%	1.1%	1.1%
Gas	398.1	367.7	380.5	440.5	429.8	403.6	-1.6%	0.7%	-2.4%	-6.1%	0.7%
Electricity	269.2	307.5	366.2	430.7	439.2	449.2	2.7%	3.6%	2.0%	2.3%	2.6%
Heat	1.8	3.2	3.8	10.4	10.4	10.5	12.3%	3.3%	0.4%	0.8%	13.6%
Other	85.7	96.9	54.7	63.4	62.7	65.8	2.5%	-10.8%	-1.1%	5.0%	2.3%
CO₂ Emissions in Mt of CO₂	6654.2	6624.7	7203.7	7912.6	8096.4	8172.0	-0.1%	1.7%	2.3%	0.9%	1.6%
Indicators											
Population (Million)	508.88	540.17	571.76	609.68	614.68	620.68	1.2%	1.1%	0.8%	1.0%	1.0%
GDP (index 1985=100)	87.4	100.0	117.6	134.7	140.1	142.8	2.7%	3.3%	4.0%	1.9%	2.5%
Gross Inl Cons./GDP (toe/1990 MEUR)	437.7	384.8	362.0	355.2	348.3	341.5	-2.5%	-1.2%	-1.9%	-2.0%	-0.7%
Gross Inl Cons./Capita (toe/inhabitant)	5.12	4.86	5.07	5.35	5.41	5.35	-1.1%	0.9%	1.1%	-1.0%	0.7%
Electricity Generated/Capita (kWh/inhabitant)	7320	7747	8853	9613	9674	9846	1.1%	2.7%	0.6%	1.8%	1.3%
CO ₂ Emissions/Capita (t of CO ₂ /inhabitant)	13.1	12.3	12.6	13.0	13.2	13.2	-1.3%	0.5%	1.5%	0.0%	0.6%
Import Dependency %	20.5	11.5	16.0	14.6	15.1	15.4	-11.0%	6.8%	3.9%	1.6%	-0.5%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.



OECD PACIFIC : MAIN INDICATORS

	1980	1985	1990	1996	1997	1998	85/80	90/85	97/96	98/97	98/90
	Annual % Change										
Gross Inland Consumption (Mtoe)	2606.4	2622.8	2900.0	3261.7	3325.9	3323.4	0.1%	2.0%	2.0%	-0.1%	1.7%
Public Thermal Power Generation	568.6	594.5	660.2	720.4	745.4	770.7	0.9%	2.1%	3.5%	3.4%	2.0%
Autoprod. Thermal Power Generation	17.7	14.0	84.5	153.7	176.7	187.6	-4.6%	43.3%	15.0%	6.2%	10.5%
Energy Branch	154.8	159.2	187.4	203.2	206.1	210.8	0.6%	3.3%	1.5%	2.3%	1.5%
Final Energy Consumption	1778.3	1768.0	1853.4	2032.3	2041.2	2036.8	-0.1%	0.9%	0.4%	-0.2%	1.2%
Industry	623.5	576.6	545.1	548.1	547.2	542.2	-1.6%	-1.1%	-0.2%	-0.9%	-0.1%
Transport	591.4	611.1	698.5	787.1	802.3	818.1	0.7%	2.7%	1.9%	2.0%	2.0%
Tertiary-Domestic	563.4	580.3	609.7	697.1	691.7	676.5	0.6%	1.0%	-0.8%	-2.2%	1.3%
Energy Intensity (toe/1990 MEUR)	437.7	384.8	362.0	355.2	348.3	341.5	-2.5%	-1.2%	-1.9%	-2.0%	-0.7%
Public Thermal Power Generation	95.5	87.2	82.4	78.4	78.1	79.2	-1.8%	-1.1%	-0.5%	1.4%	-0.5%
Autoprod. Thermal Power Generation	3.0	2.0	10.5	16.7	18.5	19.3	-7.2%	38.8%	10.6%	4.2%	7.8%
Industry	104.7	84.6	68.0	59.7	57.3	55.7	-4.2%	-4.3%	-4.0%	-2.8%	-2.5%
Transport	99.3	89.7	87.2	85.7	84.0	84.1	-2.0%	-0.6%	-2.0%	0.0%	-0.5%
Tertiary-Domestic	94.6	85.1	76.1	75.9	72.4	69.5	-2.1%	-2.2%	-4.6%	-4.1%	-1.1%
Energy per Capita (Kgoe/inhabitant)	5122	4856	5072	5350	5411	5354	-1.1%	0.9%	1.1%	-1.0%	0.7%
Industry	1225	1067	953	899	890	873	-2.7%	-2.2%	-1.0%	-1.9%	-1.1%
Transport	1162	1131	1222	1291	1305	1318	-0.5%	1.6%	1.1%	1.0%	1.0%
Tertiary-Domestic	1107	1074	1066	1143	1125	1090	-0.6%	-0.1%	-1.6%	-3.2%	0.3%
Electricity Share (%)											
Final Energy Consumption	15.1%	17.4%	19.8%	21.2%	21.5%	22.1%	2.8%	2.6%	1.5%	2.5%	1.4%
Industry	18.6%	21.1%	25.7%	30.0%	30.5%	31.2%	2.6%	4.0%	1.9%	2.2%	2.5%
Transport	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	1.7%	1.1%	0.7%	1.6%	-0.1%
Tertiary-Domestic	26.9%	31.6%	36.6%	37.8%	38.9%	40.9%	3.3%	3.0%	2.9%	5.2%	1.4%
Total Renewable Consumption (Mtoe)	164.2	189.0	198.9	227.0	225.0	227.1	2.9%	1.0%	-0.9%	0.9%	1.7%
Hydro	68.6	75.7	77.3	89.2	88.3	84.2	2.0%	0.4%	-1.0%	-4.6%	1.1%
Biomass	87.8	100.2	98.4	112.0	111.7	117.1	2.7%	-0.4%	-0.3%	4.8%	2.2%
Other	7.8	13.1	23.3	25.7	25.0	25.9	11.0%	12.2%	-2.7%	3.2%	1.3%
Renewable intensity (toe/1990MEUR)	27.6	27.7	24.8	24.7	23.6	23.3	0.1%	-2.2%	-4.7%	-1.0%	-0.8%
Renewable per capita (Kgoe/inhabitant)	322.7	349.9	347.9	372.3	366.1	365.9	1.6%	-0.1%	-1.7%	0.0%	0.6%
CO₂ Emissions (Mt of CO₂)	6654.2	6624.7	7203.7	7912.6	8096.4	8172.0	-0.1%	1.7%	2.3%	0.9%	1.6%
Public Thermal Power Generation	1708.2	1870.1	2092.6	2312.8	2379.3	2434.4	1.8%	2.3%	2.9%	2.3%	1.9%
Autoprod. Thermal Power Generation	51.1	37.7	117.3	317.3	393.9	420.4	-5.9%	25.5%	24.1%	6.7%	17.3%
Energy Branch	378.2	381.6	440.4	462.7	467.6	477.6	0.2%	2.9%	1.1%	2.1%	1.0%
Industry	1409.7	1229.9	1177.7	1052.8	1040.9	1017.3	-2.7%	-0.9%	-1.1%	-2.3%	-1.8%
Transport	1799.4	1860.4	2124.6	2390.4	2434.9	2483.7	0.7%	2.7%	1.9%	2.0%	2.0%
Tertiary-Domestic	1038.6	986.6	979.1	1085.0	1068.1	1001.1	-1.0%	-0.2%	-1.6%	-6.3%	0.3%
Carbon Intensity (tn of CO₂/toe)	2.6	2.5	2.5	2.4	2.4	2.5	-0.2%	-0.3%	0.3%	1.0%	-0.1%
Public Power Generation	2.3	2.2	2.1	2.1	2.1	2.1	-0.8%	-0.8%	1.6%	-0.7%	-0.2%
Public Thermal Power Generation	3.0	3.1	3.2	3.2	3.2	3.2	0.9%	0.2%	-0.6%	-1.0%	0.0%
Autoprod. Power Generation	2.3	2.0	1.2	1.9	2.1	2.1	-2.6%	-9.4%	9.7%	0.9%	6.9%
Autoprod. Thermal Power Generation	2.9	2.7	1.4	2.1	2.2	2.2	-1.3%	-12.5%	7.9%	0.5%	6.2%
Energy Branch	0.0	2.5	2.1	3.0	3.0	2.9	-	-3.9%	-0.1%	-2.2%	4.5%
Industry	2.4	2.4	2.4	2.3	2.3	2.3	-0.4%	-0.4%	-0.4%	-0.1%	-0.5%
Transport	2.3	2.1	2.2	1.9	1.9	1.9	-1.2%	0.3%	-1.0%	-1.4%	-1.7%
Tertiary-Domestic	3.0	3.0	3.0	3.0	3.0	3.0	0.0%	0.0%	-0.1%	0.0%	0.0%
CO₂ per Capita (kg of CO₂/inhabitant)	13076	12264	12599	12978	13172	13166	-1.3%	0.5%	1.5%	0.0%	0.6%
Industry	2770	2277	2060	1727	1693	1639	-3.8%	-2.0%	-1.9%	-3.2%	-2.8%
Transport	3536	3444	3716	3921	3961	4002	-0.5%	1.5%	1.0%	1.0%	0.9%
Tertiary-Domestic	2041	1826	1712	1780	1738	1613	-2.2%	-1.3%	-2.4%	-7.2%	-0.7%
CO₂ per unit of GDP (tn of CO₂/1990 MEUR)	1117	972	899	862	848	840	-2.7%	-1.5%	-1.6%	-1.0%	-0.9%
Public Thermal Power Generation	287	274	261	252	249	250	-0.9%	-1.0%	-1.1%	0.4%	-0.5%
Autoprod. Thermal Power Generation	9	6	15	35	41	43	-8.4%	21.5%	19.4%	4.7%	14.5%
Energy Branch	0	0	0	1	1	1	-	2.4%	10.8%	-35.7%	34.9%
Industry	64	56	55	50	49	49	-2.5%	-0.4%	-2.8%	0.2%	-1.4%
Transport	237	180	147	115	109	105	-5.3%	-4.0%	-4.9%	-4.1%	-4.2%
Tertiary-Domestic	302	273	265	260	255	255	-2.0%	-0.6%	-2.1%	0.1%	-0.5%

JAPAN : SUMMARY ENERGY BALANCE

Mtoe	1980	1985	1990	1995	1996	1997	1998	85/80	90/85	97/96	97/98	98/90
Annual % Change												
Primary Production	47.5	67.7	75.6	99.1	102.5	107.0	110.0	7.3%	2.2%	4.5%	2.8%	4.8%
Solids	10.9	9.6	4.6	3.5	3.6	2.4	2.0	-2.5%	-13.8%	-34.0%	-14.3%	-9.7%
Oil	0.5	0.6	0.6	0.8	0.8	0.8	0.8	2.5%	0.8%	0.5%	-5.7%	2.7%
Natural gas	1.9	2.0	1.8	1.9	2.0	2.0	2.0	0.3%	-1.7%	2.2%	1.0%	1.5%
Nuclear	21.5	41.6	52.7	75.9	78.8	83.2	86.6	14.1%	4.9%	5.6%	4.1%	6.4%
Hydro & Wind	7.6	7.1	7.7	7.1	6.9	7.7	8.0	-1.3%	1.5%	11.4%	3.1%	0.4%
Geothermal	0.8	1.3	1.5	2.9	3.4	3.5	3.3	10.7%	3.1%	2.6%	-5.6%	10.3%
Other	4.3	5.5	6.7	7.0	7.0	7.5	7.3	5.2%	4.1%	6.0%	-2.2%	1.1%
Net Imports	318.8	308.4	369.3	405.2	416.3	419.3	401.0	-0.7%	3.7%	0.7%	-4.4%	1.0%
Solids	47.5	63.4	69.0	79.0	81.5	83.2	82.7	5.9%	1.7%	2.1%	-0.6%	2.3%
Oil	251.7	212.1	258.7	276.3	280.5	280.8	260.7	-3.4%	4.1%	0.1%	-7.2%	0.1%
Crude oil	223.0	172.2	198.5	232.8	229.7	236.7	221.9	-5.0%	2.9%	3.0%	-6.3%	1.4%
Oil products	28.7	39.9	60.2	43.5	50.8	44.1	38.9	6.8%	8.6%	-13.2%	-12.0%	-5.3%
Natural gas	19.5	33.0	41.7	50.0	54.3	55.3	57.6	11.0%	4.8%	1.9%	4.2%	4.1%
Electricity	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-
Gross Inland Consumption	350.8	367.0	438.8	497.7	511.0	517.7	510.1	0.9%	3.6%	1.3%	-1.5%	1.9%
Solids	59.6	73.0	74.0	82.6	84.6	86.5	84.6	4.1%	0.3%	2.2%	-2.2%	1.7%
Oil	235.6	203.6	252.9	270.2	274.2	272.1	260.8	-2.9%	4.4%	-0.8%	-4.2%	0.4%
Natural gas	21.4	35.0	43.3	52.0	56.1	57.2	59.6	10.3%	4.3%	2.1%	4.1%	4.1%
Other (1)	34.2	55.5	68.6	92.9	96.1	101.9	105.2	10.2%	4.3%	6.0%	3.3%	5.5%
Electricity Generation in TWh	581.0	666.9	850.8	980.8	1000.4	1027.3	1036.2	2.8%	5.0%	2.7%	0.9%	2.5%
Nuclear	82.6	159.6	202.3	291.3	302.2	319.2	332.3	14.1%	4.9%	5.6%	4.1%	6.4%
Hydro & wind	88.3	82.9	89.3	82.1	80.5	89.8	92.5	-1.3%	1.5%	11.5%	3.1%	0.4%
Thermal	410.2	424.5	559.2	607.4	617.7	618.3	611.4	0.7%	5.7%	0.1%	-1.1%	1.1%
Generation Capacity in GWe	143.7	169.4	194.7	226.5	231.2	236.5	245.2	3.3%	2.8%	2.3%	3.7%	2.9%
Nuclear	15.7	24.7	31.6	40.5	41.9	42.7	45.2	9.5%	5.1%	2.0%	5.9%	4.6%
Hydro & wind	29.8	34.3	37.8	43.8	43.8	43.8	43.9	2.9%	2.0%	0.2%	0.1%	1.9%
Thermal	98.3	110.3	125.3	142.3	145.5	149.9	156.0	2.3%	2.6%	3.0%	4.1%	2.8%
Average Load Factor in %	46.1	45.0	49.9	49.4	49.4	49.6	48.2	-0.5%	2.1%	0.4%	-2.7%	-0.4%
Fuel Inputs for Thermal Power Generation	88.7	85.9	110.0	120.5	125.2	122.8	118.6	-0.6%	5.1%	-2.0%	-3.4%	0.9%
Solids	10.5	20.5	25.3	34.6	36.9	38.2	39.9	14.3%	4.3%	3.5%	4.5%	5.9%
Oil	60.3	36.4	48.4	43.3	43.3	38.0	30.7	-9.6%	5.9%	-12.2%	-19.2%	-5.5%
Gas	15.6	25.7	31.8	36.4	38.2	39.4	41.0	10.5%	4.4%	3.1%	4.0%	3.2%
Geothermal	0.8	1.3	1.5	2.7	3.2	3.2	3.0	10.7%	3.1%	2.2%	-6.0%	9.2%
Other	1.5	2.1	3.0	3.5	3.6	3.9	3.9	6.8%	7.9%	7.6%	0.7%	3.4%
Average Thermal Efficiency in %	39.8	42.5	43.7	43.3	42.4	43.3	44.3	1.3%	0.6%	2.1%	2.4%	0.2%
Non-Energy Uses	29.1	28.0	36.8	42.8	43.0	45.0	43.0	-0.7%	5.6%	4.7%	-4.4%	2.0%
Total Final Energy Demand	220.8	232.2	274.0	302.9	309.7	311.6	310.2	1.0%	3.4%	0.6%	-0.5%	1.6%
Solids	35.4	36.7	38.8	37.6	37.3	38.0	36.0	0.7%	1.1%	1.8%	-5.3%	-0.9%
Oil	128.6	129.3	151.5	167.4	171.2	170.0	169.2	0.1%	3.2%	-0.7%	-0.5%	1.4%
Gas	9.7	11.8	14.7	19.1	20.5	20.7	21.2	3.9%	4.6%	1.4%	2.3%	4.7%
Electricity	44.1	50.8	65.1	74.8	76.6	78.6	79.6	2.9%	5.1%	2.5%	1.3%	2.6%
Heat	0.1	0.1	0.2	0.6	0.6	0.7	0.7	6.2%	7.9%	8.4%	4.7%	17.4%
Other	2.8	3.4	3.7	3.5	3.4	3.6	3.4	4.3%	1.5%	4.3%	-5.2%	-1.1%
CO₂ Emissions in Mt of CO₂	867.6	875.7	1031.1	1122.6	1150.8	1143.9	1122.9	0.2%	3.3%	-0.6%	-1.8%	1.1%
Indicators												
Population (Million)	116.80	120.75	123.61	125.57	125.86	126.17	126.49	0.7%	0.5%	0.2%	0.3%	0.3%
GDP (index 1985=100)	84.7	100.0	125.4	134.7	141.5	143.5	139.5	3.4%	4.6%	1.4%	-2.8%	1.3%
Gross Inl Cons./GDP (toe/1990 MEUR)	222.5	197.2	188.1	198.6	194.1	193.9	196.6	-2.4%	-0.9%	-0.1%	1.4%	0.6%
Gross Inl Cons./Capita (toe/inhabitant)	3.00	3.04	3.55	3.96	4.06	4.10	4.03	0.2%	3.2%	1.1%	-1.7%	1.6%
Electricity Generated/Capita (kWh/inhabitant)	4975	5523	6883	7811	7949	8142	8192	2.1%	4.5%	2.4%	0.6%	2.2%
CO ₂ Emissions/Capita (t of CO ₂ /inhabitant)	7.4	7.3	8.3	8.9	9.1	9.1	8.9	-0.5%	2.8%	-0.8%	-2.1%	0.8%
Import Dependency %	88.0	82.4	83.2	80.4	80.8	80.2	77.8	-1.3%	0.2%	-0.7%	-3.0%	-0.8%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

EFTA : SUMMARY ENERGY BALANCE

Mtoe	1980	1985	1990	1995	1996	1997	1998	85/80	90/85	97/96	97/98	98/90
	Annual % Change											
Primary Production	63,6	83,4	131,2	194,7	220,0	225,2	219,6	5,6%	9,5%	2,4%	-2,5%	6,6%
Solids	0,2	0,4	0,2	0,2	0,2	0,3	0,2	11,9%	-10,6%	68,2%	-15,1%	1,0%
Oil	25,0	39,5	84,4	142,3	161,1	160,8	153,9	9,6%	16,4%	-0,2%	-4,3%	7,8%
Natural gas	22,8	23,4	24,1	28,3	36,8	41,0	41,3	0,6%	0,6%	11,6%	0,8%	7,0%
Nuclear	3,7	5,9	6,2	6,5	6,6	6,6	6,8	9,5%	1,0%	1,1%	1,7%	1,1%
Hydro & Wind	10,3	11,9	13,3	13,9	11,8	12,9	13,3	2,9%	2,3%	9,2%	3,5%	0,0%
Geothermal	0,6	0,8	1,0	1,0	1,0	1,0	1,3	8,0%	2,8%	4,0%	21,7%	3,4%
Other	1,1	1,5	2,0	2,6	2,6	2,6	2,8	7,7%	5,7%	0,2%	6,1%	4,1%
Net Imports	-21,4	-38,5	-80,4	-142,9	-166,6	-171,6	-164,2	12,4%	15,9%	3,0%	-4,3%	9,3%
Solids	1,3	1,3	1,1	1,1	1,0	0,9	1,0	0,2%	-4,2%	-9,9%	4,9%	-1,2%
Oil	-1,0	-18,0	-59,4	-120,2	-136,9	-137,5	-130,3	79,6%	26,9%	0,5%	-5,2%	10,3%
Crude oil	-11,4	-26,9	-65,2	-122,9	-139,0	-140,5	-133,4	18,8%	19,4%	1,1%	-5,0%	9,4%
Oil products	10,4	8,9	5,8	2,7	2,1	3,0	3,1	-3,2%	-8,0%	44,0%	4,2%	-7,5%
Natural gas	-21,0	-21,0	-20,5	-22,6	-31,4	-34,8	-34,7	-0,1%	-0,4%	10,8%	-0,3%	6,8%
Electricity	-0,7	-0,8	-1,5	-1,2	0,7	-0,3	-0,2	1,4%	14,3%	-	-21,0%	-22,6%
Gross Inland Consumption	41,1	45,1	48,6	50,8	51,0	52,9	54,7	1,9%	1,5%	3,8%	3,3%	1,5%
Solids	1,4	1,7	1,3	1,3	1,2	1,2	1,2	5,2%	-5,9%	-1,5%	2,8%	-0,6%
Oil	23,1	21,5	22,7	21,2	21,8	22,6	22,9	-1,4%	1,1%	4,0%	1,1%	0,1%
Natural gas	1,7	2,4	3,6	5,7	5,4	6,2	6,7	7,1%	8,1%	16,0%	7,3%	8,0%
Other (1)	14,9	19,3	21,0	22,7	22,7	22,9	23,9	5,4%	1,6%	1,1%	4,3%	1,7%
Electricity Generation in TWh	135,1	162,2	180,7	189,3	165,2	178,0	184,1	3,7%	2,2%	7,7%	3,4%	0,2%
Nuclear	14,3	22,6	23,6	24,9	25,1	25,4	25,8	9,5%	0,9%	1,1%	1,7%	1,1%
Hydro & wind	119,5	138,1	155,1	161,2	136,8	149,3	154,5	2,9%	2,3%	9,2%	3,5%	-0,1%
Thermal	1,3	1,5	2,0	3,2	3,3	3,2	3,8	3,2%	5,9%	-0,7%	16,5%	8,6%
Generation Capacity in GWe	34,8	39,8	43,7	45,4	44,8	44,8	45,5	2,7%	1,9%	0,1%	1,7%	0,5%
Nuclear	1,9	2,9	3,0	3,1	3,1	3,1	3,1	8,5%	0,2%	0,0%	0,0%	0,5%
Hydro & wind	31,8	35,6	39,3	40,9	40,2	40,2	40,9	2,3%	2,0%	0,1%	1,7%	0,5%
Thermal	1,1	1,2	1,5	1,5	1,5	1,5	1,6	2,0%	4,2%	-0,1%	3,4%	0,9%
Average Load Factor in %	44,3	46,6	47,2	47,6	42,1	45,3	46,1	1,0%	0,3%	7,7%	1,8%	-0,3%
Fuel Inputs for Thermal Power Generation	0,5	0,9	1,1	1,5	1,6	1,5	1,9	11,6%	3,9%	-2,0%	21,8%	7,2%
Solids	0,0	0,1	0,1	0,0	0,0	0,0	0,0	15,8%	0,0%	-14,6%	-2,9%	-4,7%
Oil	0,2	0,2	0,1	0,1	0,1	0,0	0,1	2,8%	-10,7%	-48,1%	192,5%	1,6%
Gas	0,1	0,1	0,1	0,2	0,2	0,2	0,2	-1,4%	1,0%	5,6%	-2,9%	9,0%
Geothermal	0,1	0,2	0,4	0,4	0,5	0,5	0,7	23,3%	10,6%	8,3%	42,5%	8,8%
Other	0,2	0,3	0,5	0,8	0,8	0,8	0,8	17,7%	6,0%	-4,8%	7,4%	7,3%
Average Thermal Efficiency in %	21,0	14,2	15,6	18,9	17,9	18,1	17,3	-7,5%	1,9%	1,4%	-4,4%	1,3%
Non-Energy Uses	2,2	2,5	2,5	2,6	2,5	2,4	2,4	2,1%	0,0%	-0,9%	-2,9%	-0,5%
Total Final Energy Demand	33,0	35,7	37,0	38,6	39,6	39,2	40,8	1,6%	0,7%	-1,0%	3,9%	1,2%
Solids	1,3	1,6	1,2	1,2	1,2	1,1	1,2	4,8%	-5,1%	-3,5%	7,2%	-0,1%
Oil	19,7	19,3	19,0	19,0	19,9	19,5	20,2	-0,5%	-0,2%	-2,0%	3,6%	0,7%
Gas	0,7	1,1	1,5	2,1	2,2	2,1	2,2	9,4%	5,9%	-4,4%	3,3%	4,6%
Electricity	9,7	11,7	12,7	13,5	13,5	13,5	14,1	3,8%	1,6%	0,7%	4,3%	1,3%
Heat	0,7	0,9	1,0	1,1	1,1	1,1	1,1	5,6%	2,3%	1,5%	0,6%	1,5%
Other	0,9	1,2	1,6	1,8	1,8	1,9	2,0	5,5%	5,6%	2,4%	5,6%	3,2%
CO₂ Emissions in Mt of CO₂	72,5	74,3	75,9	80,8	83,2	83,9	87,9	0,5%	0,4%	0,9%	4,8%	1,9%
Indicators												
Population (Million)	10,70	10,93	11,21	11,66	11,71	11,75	11,80	0,4%	0,5%	0,4%	0,4%	0,6%
GDP (index 1985=100)	90,6	100,0	112,4	119,5	122,3	125,3	127,9	2,0%	2,4%	2,4%	2,1%	1,6%
Gross Inl Cons./GDP (toe/1990 MEUR)	185,4	184,2	176,6	173,8	170,3	172,7	174,6	-0,1%	-0,8%	1,4%	1,1%	-0,1%
Gross Inl Cons./Capita (toe/inhabitant)	3,84	4,12	4,33	4,36	4,35	4,50	4,63	1,4%	1,0%	3,5%	2,9%	0,8%
Electricity Generated/Capita (kWh/inhabitant)	12628	14839	16126	16243	14105	15141	15602	3,3%	1,7%	7,3%	3,0%	-0,4%
CO ₂ Emissions/Capita (t of CO ₂ /inhabitant)	6,8	6,8	6,8	6,9	7,1	7,1	7,5	0,1%	-0,1%	0,6%	4,4%	1,2%
Import Dependency %	-51,7	-84,7	-163,8	-277,0	-321,5	-318,1	-295,2	10,4%	14,1%	-1,1%	-7,2%	7,6%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.



EFTA : MAIN INDICATORS

	1980	1985	1990	1996	1997	1998	85/80	90/85	97/96	98/97	98/90
	Annual % Change										
Gross Inland Consumption (Mtoe)	41.1	45.1	48.6	51.0	52.9	54.7	1.9%	1.5%	3.8%	3.3%	1.5%
Public Thermal Power Generation	0.3	0.5	0.6	0.8	0.8	0.9	10.1%	1.5%	-3.3%	15.6%	6.3%
Autoprod. Thermal Power Generation	0.1	0.1	0.1	0.3	0.2	0.2	5.3%	0.4%	-15.0%	0.4%	6.4%
Energy Branch	1.8	2.2	3.4	4.5	5.6	6.0	4.4%	8.8%	24.0%	7.3%	7.4%
Final Energy Consumption	33.0	35.7	36.9	39.5	39.1	40.7	1.6%	0.7%	-1.0%	3.9%	1.2%
Industry	10.8	11.4	9.9	10.1	10.2	10.8	1.0%	-2.7%	0.8%	6.2%	1.2%
Transport	7.8	8.9	10.8	11.5	11.7	12.0	2.5%	4.0%	2.4%	2.5%	1.3%
Tertiary-Domestic	14.4	15.5	16.2	18.0	17.2	17.8	1.5%	0.9%	-4.2%	3.6%	1.2%
Energy Intensity (toe/1990 MEUR)	185.4	184.2	176.6	170.3	172.7	174.6	-0.1%	-0.8%	1.4%	1.1%	-0.1%
Public Thermal Power Generation	1.5	2.2	2.1	2.8	2.6	3.0	8.0%	-0.8%	-5.5%	13.2%	4.6%
Autoprod. Thermal Power Generation	0.5	0.6	0.5	1.0	0.8	0.8	3.2%	-1.9%	-17.0%	-1.7%	4.7%
Industry	48.6	46.4	36.0	33.9	33.3	34.6	-0.9%	-5.0%	-1.6%	4.0%	-0.5%
Transport	35.4	36.2	39.3	38.3	38.3	38.4	0.5%	1.6%	0.0%	0.3%	-0.3%
Tertiary-Domestic	64.9	63.4	59.0	60.0	56.1	56.9	-0.5%	-1.4%	-6.4%	1.4%	-0.5%
Energy per Capita (Kgoe/inhabitant)	3844	4125	4334	4353	4503	4632	1.4%	1.0%	3.5%	2.9%	0.8%
Industry	1008	1039	882	865	869	919	0.6%	-3.2%	0.4%	5.8%	0.5%
Transport	733	811	964	978	998	1019	2.0%	3.5%	2.0%	2.1%	0.7%
Tertiary-Domestic	1345	1420	1449	1533	1463	1510	1.1%	0.4%	-4.5%	3.2%	0.5%
Electricity Share (%)											
Final Energy Consumption	29.4%	32.8%	34.4%	34.0%	34.6%	34.7%	2.2%	1.0%	1.7%	0.3%	0.1%
Industry	42.9%	48.5%	57.0%	54.0%	55.1%	56.0%	2.5%	3.3%	1.9%	1.7%	-0.2%
Transport	3.0%	2.8%	2.7%	3.2%	3.1%	3.1%	-1.5%	-0.8%	-2.1%	0.3%	1.8%
Tertiary-Domestic	33.7%	38.3%	41.7%	42.4%	43.9%	43.1%	2.6%	1.7%	3.5%	-1.9%	0.4%
Total Renewable Consumption (Mtoe)	11.9	14.2	16.3	15.4	16.5	17.3	3.7%	2.8%	7.3%	5.0%	0.8%
Hydro	10.3	11.9	13.3	11.8	12.8	13.3	2.9%	2.3%	9.2%	3.5%	-0.1%
Biomass	1.1	1.5	2.0	2.6	2.6	2.8	7.6%	5.7%	0.2%	6.1%	4.1%
Other	0.6	0.8	1.0	1.0	1.1	1.3	8.0%	2.8%	4.1%	21.5%	3.6%
Renewable intensity (toe/1990MEUR)	53.7	58.2	59.3	51.4	53.9	55.4	1.6%	0.4%	4.8%	2.8%	-0.9%
Renewable per capita (Kgoe/inhabitant)	1113.0	1303.9	1456.3	1314.2	1405.2	1470.1	3.2%	2.2%	6.9%	4.6%	0.1%
CO₂ Emissions (Mt of CO₂)	72.5	74.3	75.9	83.2	83.9	87.9	0.5%	0.4%	0.9%	4.8%	1.9%
Public Thermal Power Generation	0.4	0.5	0.4	0.2	0.1	0.3	3.3%	-6.8%	-36.7%	208.1%	-1.0%
Autoprod. Thermal Power Generation	0.3	0.4	0.3	0.6	0.5	0.5	4.8%	-3.3%	-15.2%	-2.5%	5.6%
Energy Branch	4.2	5.1	8.2	11.1	13.6	14.8	3.8%	9.8%	22.6%	8.5%	7.7%
Industry	18.6	17.3	11.8	12.1	11.7	12.1	-1.5%	-7.4%	-3.4%	3.6%	0.4%
Transport	23.3	26.4	32.2	34.0	34.9	35.7	2.5%	4.1%	2.4%	2.5%	1.3%
Tertiary-Domestic	25.5	24.5	23.0	25.0	22.9	24.3	-0.8%	-1.3%	-8.2%	6.0%	0.7%
Carbon Intensity (tn of CO₂/toe)	1.8	1.6	1.6	1.6	1.6	1.6	-1.3%	-1.1%	-2.8%	1.5%	0.4%
Public Power Generation	0.0	0.0	0.0	0.0	0.0	0.0	-2.1%	-8.8%	-40.2%	195.3%	-1.7%
Public Thermal Power Generation	1.4	1.0	0.7	0.2	0.1	0.4	-6.2%	-8.2%	-34.5%	166.6%	-6.8%
Autoprod. Power Generation	0.2	0.3	0.2	0.4	0.3	0.3	3.5%	-3.3%	-17.0%	-5.3%	5.1%
Autoprod. Thermal Power Generation	2.8	2.7	2.2	2.2	2.2	2.1	-0.4%	-3.6%	-0.2%	-2.9%	-0.7%
Energy Branch	0.0	0.1	0.1	1.1	0.7	1.0	-	-0.1%	-30.9%	31.1%	28.4%
Industry	2.4	2.3	2.4	2.5	2.4	2.5	-0.5%	1.0%	-1.2%	1.2%	0.2%
Transport	1.7	1.5	1.2	1.2	1.1	1.1	-2.5%	-4.8%	-4.2%	-2.5%	-0.8%
Tertiary-Domestic	3.0	3.0	3.0	3.0	3.0	3.0	0.0%	0.0%	0.1%	0.0%	-0.1%
CO₂ per Capita (kg of CO₂/inhabitant)	6773	6803	6775	7101	7140	7453	0.1%	-0.1%	0.6%	4.4%	1.2%
Industry	1738	1581	1049	1036	997	1028	-1.9%	-7.9%	-3.8%	3.2%	-0.2%
Transport	2181	2419	2877	2906	2967	3029	2.1%	3.5%	2.1%	2.1%	0.6%
Tertiary-Domestic	2381	2245	2052	2134	1952	2060	-1.2%	-1.8%	-8.5%	5.5%	0.0%
CO₂ per unit of GDP (tn of CO₂/1990 MEUR)	327	304	276	278	274	281	-1.4%	-1.9%	-1.5%	2.6%	0.2%
Public Thermal Power Generation	2	2	1	1	0	1	1.3%	-8.9%	-38.1%	201.7%	-2.5%
Autoprod. Thermal Power Generation	1	2	1	2	2	2	2.8%	-5.5%	-17.2%	-4.6%	3.9%
Energy Branch	0	0	0	0	0	0	-	23.9%	-35.3%	46.2%	35.2%
Industry	19	21	30	37	44	47	1.8%	7.3%	19.7%	6.2%	6.0%
Transport	84	71	43	41	38	39	-3.4%	-9.5%	-5.7%	1.4%	-1.2%
Tertiary-Domestic	105	108	117	114	114	114	0.5%	1.7%	0.0%	0.3%	-0.3%

NORWAY : SUMMARY ENERGY BALANCE

Mtoe	1980	1985	1990	1996	1997	1998	85/80	90/85	97/96	97/98	98/90
	Annual % Change										
Primary Production	55,7	72,8	120,1	208,1	212,7	206,7	5,5%	10,5%	2,2%	-2,8%	7,0%
Solids	0,2	0,4	0,2	0,2	0,3	0,2	11,9%	-10,6%	68,2%	-15,1%	1,0%
Oil	25,0	39,5	84,4	161,1	160,8	153,9	9,6%	16,4%	-0,2%	-4,3%	7,8%
Natural gas	22,8	23,4	24,1	36,8	41,0	41,3	0,5%	0,6%	11,6%	0,8%	7,0%
Nuclear	0,0	0,0	0,0	0,0	0,0	0,0	-	-	-	-	-
Hydro & Wind	7,2	8,8	10,4	8,9	9,5	9,9	4,1%	3,4%	6,2%	4,8%	-0,6%
Geothermal	0,0	0,0	0,0	0,0	0,0	0,0	-	-	-	-	-
Other	0,6	0,8	1,0	1,2	1,2	1,3	5,7%	5,9%	4,0%	4,5%	2,6%
Net Imports	-36,2	-52,4	-96,3	-182,6	-187,5	-180,8	7,7%	12,9%	2,7%	-3,6%	8,2%
Solids	0,8	0,9	0,7	0,9	0,8	0,8	2,0%	-5,2%	-6,9%	5,7%	2,9%
Oil	-15,1	-31,1	-73,5	-150,5	-151,6	-144,9	15,5%	18,8%	0,7%	-4,4%	8,9%
Crude oil	-16,1	-31,2	-68,4	-144,5	-145,7	-138,7	14,1%	17,0%	0,8%	-4,8%	9,2%
Oil products	1,0	0,2	-5,1	-6,0	-5,9	-6,2	-29,4%	-	-1,3%	4,7%	2,6%
Natural gas	-21,9	-22,2	-22,2	-33,8	-37,1	-37,0	0,3%	0,0%	9,8%	-0,1%	6,6%
Electricity	0,0	0,0	-1,4	0,8	0,3	0,3	3,3%	96,2%	-57,4%	-4,9%	-
Gross Inland Consumption	18,8	20,3	21,5	23,1	24,4	25,4	1,5%	1,2%	5,6%	4,3%	2,1%
Solids	1,0	1,2	0,9	1,0	1,0	1,1	3,0%	-5,9%	2,5%	4,1%	2,8%
Oil	9,2	8,4	8,6	8,3	8,4	8,5	-1,7%	0,4%	2,2%	1,4%	0,0%
Natural gas	0,9	1,2	2,0	3,0	3,9	4,3	6,3%	10,9%	31,4%	9,8%	10,2%
Other (1)	7,7	9,5	10,1	10,8	11,0	11,5	4,3%	1,1%	1,5%	4,5%	1,7%
Electricity Generation in TWh	83,8	102,7	121,6	104,4	110,7	116,1	4,2%	3,4%	6,1%	4,8%	-0,6%
Nuclear	0,0	0,0	0,0	0,0	0,0	0,0	-	-	-	-	-
Hydro & wind	83,6	102,4	121,1	103,6	110,0	115,4	4,1%	3,4%	6,2%	4,8%	-0,6%
Thermal	0,1	0,3	0,5	0,8	0,7	0,7	20,4%	6,1%	-14,1%	0,8%	5,7%
Generation Capacity in GWe	20,0	23,7	27,1	27,7	27,7	28,4	3,4%	2,8%	0,2%	2,3%	0,6%
Nuclear	0,0	0,0	0,0	0,0	0,0	0,0	-	-	-	-	-
Hydro & wind	19,8	23,4	26,9	27,4	27,4	28,1	3,4%	2,8%	0,2%	2,4%	0,6%
Thermal	0,2	0,3	0,3	0,3	0,3	0,3	1,5%	-0,3%	0,0%	-6,5%	1,2%
Average Load Factor in %	47,8	49,6	51,2	43,1	45,6	46,7	0,7%	0,6%	5,9%	2,4%	-1,1%
Fuel Inputs for Thermal Power Generation	0,0	0,1	0,1	0,2	0,1	0,1	22,9%	1,3%	-12,7%	3,6%	3,6%
Solids	0,0	0,0	0,0	0,0	0,0	0,0	20,1%	12,5%	-14,6%	-2,9%	-0,7%
Oil	0,0	0,1	0,0	0,0	0,0	0,0	19,8%	-50,7%	-	-	-100,0%
Gas	0,0	0,0	0,0	0,0	0,0	0,0	-	-	-16,1%	-7,7%	-
Geothermal	0,0	0,0	0,0	0,0	0,0	0,0	-	-	-	-	-
Other	0,0	0,0	0,1	0,1	0,1	0,1	-	42,3%	-10,5%	10,4%	2,5%
Average Thermal Efficiency in %	32,7	29,5	37,1	45,2	44,4	43,2	-2,1%	4,7%	-1,8%	-2,7%	1,9%
Non-Energy Uses	1,6	1,9	1,8	1,9	1,9	1,8	4,1%	-1,0%	-1,6%	-6,0%	-0,6%
Total Final Energy Demand	14,8	15,9	16,3	17,7	17,7	18,5	1,4%	0,5%	-0,2%	4,4%	1,6%
Solids	0,9	1,1	0,8	1,0	1,0	1,1	2,5%	-4,9%	0,1%	9,1%	3,3%
Oil	6,9	6,2	6,1	6,7	6,5	6,7	-2,1%	-0,2%	-2,4%	3,0%	1,2%
Gas	0,0	0,0	0,0	0,0	0,0	0,0	-100,0%	-	-	-	-
Electricity	6,4	7,9	8,3	8,9	8,9	9,4	4,1%	1,2%	0,7%	5,0%	1,5%
Heat	0,0	0,0	0,1	0,1	0,1	0,1	-	14,3%	-0,9%	6,1%	6,3%
Other	0,6	0,8	1,0	1,1	1,1	1,2	5,3%	4,7%	5,2%	4,3%	2,7%
CO₂ Emissions in Mt of CO₂	28,4	28,0	29,9	34,9	36,9	38,9	-0,3%	1,3%	5,8%	5,6%	3,4%
Indicators											
Population (Million)	4,09	4,15	4,24	4,37	4,39	4,42	0,3%	0,4%	0,5%	0,6%	0,5%
GDP (index 1985=100)	85,7	100,0	108,6	137,3	142,0	145,0	3,1%	1,7%	3,4%	2,1%	3,7%
Gross Inl Cons./GDP (toe/1990 MEUR)	262,6	243,0	236,8	201,3	205,6	209,9	-1,5%	-0,5%	2,1%	2,1%	-1,5%
Gross Inl Cons./Capita (toe/inhabitant)	4,60	4,88	5,06	5,28	5,55	5,75	1,2%	0,7%	5,1%	3,7%	1,6%
Electricity Generated/Capita (kWh/inhabitant)	20497	24736	28675	23896	25210	26275	3,8%	3,0%	5,5%	4,2%	-1,1%
CO ₂ Emissions/Capita (t of CO ₂ /inhabitant)	7,0	6,7	7,0	8,0	8,4	8,8	-0,6%	0,9%	5,2%	5,0%	2,8%
Import Dependency %	-190,0	-254,4	-439,4	-765,6	-740,1	-686,8	6,0%	11,5%	-3,3%	-7,2%	5,7%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.



TURKEY : SUMMARY ENERGY BALANCE

Mtoe	1980	1985	1990	1996	1997	1998	85/80	90/85	97/96	97/98	98/90
Annual % Change											
Primary Production	17.2	21.7	25.7	26.8	27.6	28.6	4.7%	3.5%	2.9%	4.0%	1.4%
Solids	6.2	10.7	12.4	12.3	13.1	13.9	11.6%	3.1%	6.9%	6.3%	1.5%
Oil	2.4	2.2	3.8	3.6	3.5	3.3	-2.0%	12.0%	-1.5%	-6.6%	-1.8%
Natural gas	0.0	0.1	0.2	0.2	0.2	0.5	-	26.0%	22.4%	123.6%	13.0%
Nuclear	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-
Hydro & Wind	1.0	1.0	2.0	3.5	3.5	3.7	1.2%	14.2%	-1.2%	6.5%	8.0%
Geothermal	0.0	0.0	0.1	0.2	0.2	0.2	-	76.2%	10.5%	26.3%	13.0%
Other	7.7	7.7	7.2	7.0	7.0	7.0	0.2%	-1.4%	-0.3%	-0.5%	-0.4%
Net Imports	14.2	17.2	27.8	41.5	43.3	44.1	3.9%	10.1%	4.4%	1.7%	5.9%
Solids	0.5	1.6	4.2	6.2	7.5	7.8	25.7%	20.6%	21.5%	4.5%	8.1%
Oil	13.5	15.3	20.9	28.5	27.5	27.5	2.5%	6.4%	-3.7%	0.1%	3.5%
Crude oil	10.7	15.8	20.5	24.8	23.8	24.3	8.1%	5.4%	-3.7%	1.7%	2.1%
Oil products	2.8	-0.5	0.4	3.8	3.6	3.2	-	-	-3.8%	-10.3%	28.8%
Natural gas	0.0	0.0	2.7	6.8	8.2	8.5	-	-	19.5%	3.5%	15.4%
Electricity	0.1	0.2	-0.1	0.0	0.2	0.3	9.9%	-	-	35.1%	-
Gross Inland Consumption	31.3	38.9	52.5	67.7	71.3	72.5	4.4%	6.2%	5.4%	1.7%	4.1%
Solids	7.0	12.1	16.9	18.9	21.2	22.0	11.5%	7.0%	12.0%	3.9%	3.3%
Oil	15.6	17.8	23.5	31.0	30.9	30.4	2.7%	5.7%	-0.5%	-1.6%	3.3%
Natural gas	0.0	0.1	2.9	7.0	8.3	8.9	-	120.3%	19.4%	7.3%	15.3%
Other (1)	8.8	9.0	9.2	10.7	10.9	11.2	0.5%	0.6%	1.4%	2.8%	2.4%
Electricity Generation in TWh	23.3	34.2	57.5	94.9	103.3	111.0	8.0%	11.0%	8.9%	7.5%	8.6%
Nuclear	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-
Hydro & wind	11.3	12.0	23.1	40.5	39.8	42.2	1.2%	14.0%	-1.6%	6.1%	7.8%
Thermal	11.9	22.2	34.4	54.4	63.5	68.8	13.2%	9.2%	16.7%	8.4%	9.1%
Generation Capacity in GWe	5.1	9.1	16.3	21.3	21.6	22.2	12.2%	12.3%	1.4%	3.0%	3.9%
Nuclear	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-
Hydro & wind	2.1	3.9	6.8	9.9	9.9	10.1	12.7%	11.8%	0.7%	1.7%	5.1%
Thermal	3.0	5.2	9.6	11.4	11.6	12.1	11.9%	12.7%	2.0%	4.1%	3.0%
Average Load Factor in %	51.9	42.8	40.3	50.9	54.6	57.0	-3.8%	-1.2%	7.4%	4.4%	4.5%
Fuel Inputs for Thermal Power Generation	3.4	6.0	9.1	14.2	15.9	17.3	12.4%	8.5%	11.5%	8.9%	8.4%
Solids	1.9	4.2	5.7	8.5	9.4	10.2	17.4%	6.4%	10.4%	8.3%	7.6%
Oil	1.5	1.8	1.2	1.9	2.0	2.3	4.3%	-8.2%	7.4%	14.0%	8.6%
Gas	0.0	0.0	2.1	3.5	4.2	4.6	-	169.4%	17.9%	10.5%	10.2%
Geothermal	0.0	0.0	0.1	0.1	0.1	0.1	-	69.0%	-1.4%	2.8%	0.7%
Other	0.0	0.0	0.0	0.2	0.2	0.1	-	-	-14.9%	-50.6%	-
Average Thermal Efficiency in %	30.6	31.6	32.6	32.8	34.4	34.2	0.7%	0.6%	4.7%	-0.5%	0.6%
Non-Energy Uses	0.9	1.4	2.8	4.0	4.3	4.9	10.9%	14.8%	7.2%	13.0%	7.0%
Total Final Energy Demand	26.3	30.4	38.5	48.9	50.6	50.1	3.0%	4.8%	3.4%	-1.0%	3.3%
Solids	4.8	6.9	8.7	9.1	10.3	10.3	7.6%	4.7%	12.9%	-0.4%	2.1%
Oil	12.1	13.2	18.1	23.9	22.9	21.6	1.8%	6.5%	-3.9%	-5.8%	2.2%
Gas	0.0	0.1	0.5	2.8	3.4	3.6	14.3%	48.4%	23.8%	6.0%	26.8%
Electricity	1.7	2.4	3.9	6.1	6.9	7.4	7.8%	9.6%	11.6%	7.6%	8.4%
Heat	0.0	0.0	0.0	0.1	0.1	0.2	-	-	20.0%	41.7%	32.6%
Other	7.7	7.7	7.2	6.9	6.9	7.0	0.2%	-1.4%	0.4%	1.0%	-0.4%
CO₂ Emissions in Mt of CO₂	71.3	94.1	127.6	170.6	180.0	181.4	5.7%	6.3%	5.6%	0.8%	4.5%
Indicators											
Population (Million)	44.44	50.31	56.20	62.70	63.75	64.79	2.5%	2.2%	1.7%	1.6%	1.8%
GDP (index 1985=100)	78.9	100.0	131.1	164.2	176.6	181.5	4.9%	5.6%	7.5%	2.8%	4.2%
Gross Inl Cons./GDP (toe/1990 MEUR)	439.6	430.4	443.6	456.1	446.8	442.3	-0.4%	0.6%	-2.0%	-1.0%	0.0%
Gross Inl Cons./Capita (toe/inhabitant)	0.70	0.77	0.93	1.08	1.12	1.12	1.9%	3.9%	3.6%	0.1%	2.3%
Electricity Generated/Capita (kWh/inhabitant)	524	680	1024	1513	1620	1714	5.4%	8.5%	7.1%	5.7%	6.6%
CO ₂ Emissions/Capita (t of CO ₂ /inhabitant)	1.6	1.9	2.3	2.7	2.8	2.8	3.1%	4.0%	3.8%	-0.9%	2.7%
Import Dependency %	45.2	44.0	52.7	61.3	60.7	60.6	-0.5%	3.7%	-1.0%	-0.1%	1.8%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.







The partition of Central and Eastern European countries into two groups does not accurately reflect the geographical and political situation. It originates purely from statistical conventions and practices. The geographical grouping of the Baltic States is introduced to complete the energy presentation to cover all regions of the world. Given the complexities and differences between national, OECD and SOEC statistical conventions, attempts to integrate Estonian, Latvian and Lithuanian energy statistics prior to 1991 into the CEEC summary sheet gave unsatisfactory results, thus necessitating the current ad hoc solution.

A major characteristic of these countries is the fact that 10 of them are candidates for eventual entry into the European Union: Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. The Commission's "Agenda 2000" provides a careful assessment of the readiness for membership of all these applicants and has recommended that accession negotiations start initially with Hungary, Poland,

Estonia, the Czech Republic and Slovenia. By late 1998, Hungary and Poland came closest to meeting fully the criteria established by the European Council at its summit in Copenhagen in June 1993, followed by Slovenia and Estonia. The Czech Republic has lost some ground and needs to make further progress. Latvia has made significant progress in the past year and is catching up with the group of countries with which negotiations started in March 1998. Slovakia, by completing ongoing reforms, should be able to meet the first criterion in the course of next year, thereby enabling it to fulfil the second criterion in the medium term. Lithuania cannot yet be regarded as fully satisfying either criteria, as progress in the previous year was not as strong as it should have been, partly as a consequence of the government's initial response to the Russian crisis. Bulgaria and Romania do not meet either criterion. From a low starting point Bulgaria continues to make encouraging progress and shows sustained efforts in the economic reform process. The situation in Romania, on the other hand, has at best stabilised compared with last year.

Central and Eastern Europe: Major trends (1980-1998)

- Driven by Poland, GDP rebounded after 1994 with contrasting evolution by country
- Since 1988 both gross inland energy consumption (-25%) and energy production (-33%) declined sharply
- Since 1992 final energy demand remained stable while GDP increased by about 20%
- The share of transport has doubled since 1985 but that of industry has fallen
- Increased share of electricity in final energy consumption, focused on tertiary-domestic sector
- Contribution of solid fuels in gross inland energy declined sharply but still dominated
- Energy production declined substantially, marked by ongoing substantial restructuring
- Eastern countries represented only 3% of world fossil fuel reserves, mainly coal
- Large predominance of solid fuels in electricity production marked by improving efficiency
- International concerns about nuclear safety
- Reform and privatisation of the power industry are continuing
- Refinery industry still requires further restructuring and upgrading
- Energy intensity has improved by about 2.9% per year on average since 1988 and the trend has accelerated
- Improvement in energy intensity driven by industry and the tertiary-domestic sector
- CO₂ emissions reduced by 23% since 1990
- Energy import dependency is increasing with some attempts to diversify suppliers

This region includes the following countries: Albania, Bulgaria, the Czech Republic, Hungary, Poland, Romania, the Slovak Republic and the Republics of the former Yugoslavia which together represent a stable population of around 121 million inhabitants. Given the improvement of available statistical data, the Czech and Slovak Republics will be shown individually, while the "former Yugoslavia" still includes, for statistical reasons related to the political situation prevailing in this region since 1992, all the republics emerging from the partition of that country. For the most recent years (covering 1992-1997), when available, data for the newly for-

med independent states, especially for Slovenia, have been presented to complement the existing aggregate data. This reflects, as realistically as possible, the new geopolitical configuration of the region.

Driven by Poland GDP rebounded after 1994 with contrasting evolution by country

Eastern European countries have undergone major reforms of their political and economic structures since the early 1990s:

¹ Analysis excludes the former Yugoslavia for obvious statistical reasons.

industrial restructuring and privatisation, establishment of viable legal structures, regulatory systems, reform of capital markets and trade policies... As a consequence of this transition period, structural reforms induced a deep recession between 1990 and 1993 in all countries except Poland. Thereafter these eastern countries have begun to rebound from the region's economic setback. Since 1994 they have experienced positive levels of **economic growth**, respectively 2.8%, 5.2%, 3.5%, 2.3% and 2.1% over the last five years even though different countries experienced contrasting patterns. Poland, the dominant economy in the region, accounting for about 38% of its total GDP, experienced an average growth of 3.6% per year since 1990 and an even more impressive average growth of 6.2% per year since 1994. But Poland remained the exception of the region. Amongst the other countries, Slovakia, Czech Republic and Hungary were close to their 1990 level; although Bulgaria and Romania remained well below.

Average real GDP growth in 1998 for the Central and Eastern European countries was 2.1%, after becoming negative in the second half of 1998 for most countries. Hungary and Poland, at 5.1% and 4.8% respectively, maintained the highest growth rates. The Czech Republic and Romania remained in recession with

CEEC : GDP (1985=100)

	1985	1990	1993	1994	1995	1996	1997	1998
CEEC	100.00	99.44	87.09	90.57	95.64	98.63	100.54	102.33
Poland	100.00	98.45	97.57	102.64	109.87	116.52	124.51	130.48
Hungary	100.00	104.12	88.41	91.02	92.37	93.60	97.89	102.88
Czech Republic	100.00	108.18	93.13	96.13	102.23	106.23	107.27	104.80
Slovakia	100.00	107.18	82.24	86.29	92.26	98.30	104.69	109.30
Bulgaria	100.00	107.77	90.14	91.78	94.40	84.83	78.95	81.71
Romania	100.00	85.96	69.33	72.06	77.19	80.21	74.92	69.45

Main Indicators (1985 = 100)
Rem : excluding former Yugoslavia



Main items

Since 1990 the Central and East European countries have experienced profound, but still incomplete, economic and political transitions. Prior to this they were all firmly within the Soviet sphere of influence and members of the Council for Mutual Economic Assistance (CMEA). Adoption of western-style reforms is central to this progressive transformation, leading to market liberalisation and privatisation of numerous state-owned enterprises. Both the enthusiasm for such reforms and the transition paths adopted have varied across countries. Most economies have at last stabilised and, despite the impacts of the most recent Russian financial crisis, some are now enjoying more consistent economic growth. Since 1995, the Czech Republic, Hungary and Poland have joined the OECD. These and some other countries are negotiating membership of the European Union. Successful accession requires further convergence of financial, legal, market and regulatory frameworks. Indigenous energy production in this region is still heavily based on solid fuels, chiefly produced by high-cost and subsidised, deep mines. Mining capacity has fallen since 1985, the result of both lower coal demand and reduced subsidies. Having been starved of adequate investment, the CEEC's small oil and gas production sectors need joint ventures and inward investment to modernise. The region's dependence upon the FSU for gas imports remains very high, though efforts to diversify oil imports have been more successful. Both energy intensities and environmental emissions have fallen sharply since 1990. These reductions were caused by structural changes (especially away from energy-intensive industries); the adoption of more cost-reflective energy pricing policies; and use of less coal. Continued economic adjustment will permit further falls in energy and carbon intensities, but rising real incomes will boost car ownership and hence oil demand in future.

negative growth of -2.3% and -7.3%, respectively. Bulgaria has returned to positive real GDP growth of 3.4%. The economic impact of the Kosovo crisis on the candidate countries has been limited, with Bulgaria and Romania suffering most, mainly from the disruption of the transport route along the Danube. Nevertheless, their current account balances deteriorated while the international investors' environment for the Balkan region became more critical. With the early resolution of the conflict, the main problem of a potential slowdown in investment faced by both countries has disappeared and investor confidence continues to focus on progress in reforms linked to accession to the EU.

In this light, economic prospects for Bulgaria remain broadly favourable because of the improved economic fundamentals while they remain unchanged for Romania.

ENERGY OUTLOOK

Since 1988 both gross inland energy consumption (-25%) and energy production (-33%) declined sharply

Eastern countries, like the CIS, have demonstrated large variations in energy consumption since the beginning of the economic and structural reforms. In addition, these countries were characterised, before 1990, by the world's highest energy intensity after the Former Soviet Union. This situation resulted from an industrial structure based on energy-intensive industries (steel, cement, chemicals...) using energy inefficiently; and very low energy prices as demand was largely supplied from the Former Soviet Union at prices that were usually well below world market prices. Given the economic crisis faced by the Central and Eastern European countries since 1988, a common downward trend has been observed in both energy production (-33% between 1988 and 1998), and gross inland consumption (-25%). This evolution is of importance in the context of the Kyoto Protocol because the energy circumstances of both Central and Eastern countries and the CIS have slowed down the growth of global energy consumption and hence the growth of greenhouse gas emissions. Given the very large potential for energy saving, which will stabilise energy consumption despite further economic growth - as already experienced since 1995, Eastern countries are projected to generate net carbon credits in relation to Kyoto Protocol goals.

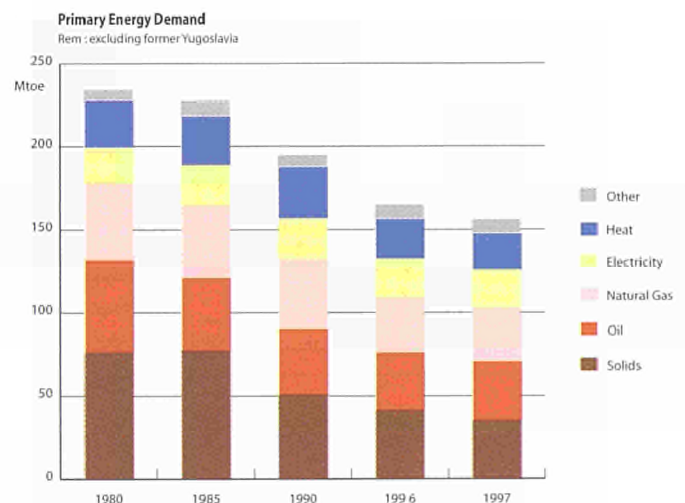
Since 1992 final energy demand remained stable while GDP increased by about 20%...

Final energy demand peaked in 1987 (236.1 Mtoe) and has declined since then by 34%, or 4% per year on average, to reach a minimum of 152.2 Mtoe in 1994. In 1995 and 1996 final energy

demand rebounded by 2.0% and 6.1% respectively at the regional level but 1997 marked a new decline by 5.1% despite the positive economic growth. Since 1992, final energy demand remained stable considering climatic variations when economic growth increase by about 20%, demonstrating the large energy saving potential. Since 1987 the reduction of energy demand affected energy forms in different ways: solid fuel (-56% between 1987 and 1997), gas (-29%), distributed heat (-27%), oil products (-22%) and electricity (-13%). The reduction of solid fuel consumption resulted from the drastic reduction of direct uses for steam and heat production in all sectors (-42% in industry and -69% in tertiary-domestic) and from the marked slowdown of steel production. Since 1992, solid fuel consumption increased slowly in industry (+10%) but continued to decline in tertiary-domestic (-39%). The evolution of gas consumption has been influenced by new supply arrangements imposed by Russia which started to invoice its supplies at world market prices instead of the special conditions prevailing before 1989. Consequently, between 1989 and 1992, gas consumption fell by 45%. Since the regularisation of supplies gas use has increased on average at 5.0% per year and its level of consumption is now close to those of oil and solids, the two main fuels. Although gas consumption decreased markedly in industry, in line with the global reduction registered in this sector, it increased regularly in the tertiary-domestic sector where major substitution occurred away from oil products and solids. Oil, sustained by increasing demand from the transport sector given a growing number of private cars, limited its overall decline to 22% but experienced a 55% reduction in the tertiary-domestic sector and a 50% reduction in industry. Distributed heat consumption, equally split between industry and space heating in 1987, remained stable between 1987 and 1997, but declined by 28% since then as a result of industrial restructuring; while tertiary-domestic consumption

TOTAL FINAL ENERGY DEMAND

Mtoe	1987	1992	1997
Solids	80.3	42.0	35.6
Oil	45.7	33.6	35.5
Gas	45.7	25.3	32.3
Electricity	26.1	21.4	22.7
Heat	30.3	30.5	22.0
Other	8.1	6.6	8.0
Total	236.1	159.4	156.2



remained unchanged despite tariff increases and the continued absence of systematic metering of consumption. Electricity demand suffered between 1987 and 1992 from the restructuring of industry that reduced industrial use by 18%. Since then the modernisation of industry and improvements in standards of living have raised electricity demand by only 1.2% per year on average.

The share of transport doubled since 1985 but that of industry has fallen...

The share of the **transport** sector in final energy consumption increased from 8% in 1985 to 15% in 1997, to the detriment of industry (41% in 1997 vs. 51% in 1985) while the share of tertiary-domestic increased slowly. Growth in transport fuel demand resulted from increased motorization, demand for new cars reaching about 1.7 million vehicles in 1998. On the other hand, energy statistics must be treated with great caution as, until recently, energy consumption for transportation in industry was partly aggregated with industrial energy consumption. Recent statistical improvements, especially better accounting of transport consumption, explain the unexpected growth in transport fuel use in Poland, the Czech Republic and Romania in 1996. The high contribution of **industry**, compared to other industrialised countries, reflects the predominance of heavy industries based on old technologies inherited from the socialist regime. Recent shifts resulted from the modernisation of industrial processes and diversification to industries with higher added values. This evolution was sustained by privatisation of state companies and impressive foreign investment. The limited increase of the share of the **tertiary-domestic** sector resulted mainly from two main factors. At the domestic level, consumption per capita decreased significantly over the last ten years by more than 30%, the major part of this reduction being observed before 1992. This improvement in energy efficiency was largely caused by increasing tariffs to reflect the real price of energy even though effective metering of energy consumption, mainly for heating uses, is still not yet widespread. On the other hand, services and commercial activities, the energy consumption of which declined sharply before 1992 following the restructuring of public services, are still at an early stage of development and will continue to increase their energy demand in the future even if efficient technologies are utilised.

Increasing share of electricity in final energy demand, focused in the tertiary-domestic sector...

The **share of electricity** in final consumption reached 14.6% in 1997 from 10.7% in 1985. It must be stressed that electricity's share of the transport sector is higher than in the OECD region for

two reasons: a larger role for railways in long distance transport and the electrification of public transport (trams and trolley buses) in a number of large and medium sized cities. A major evolution was observed in the tertiary-domestic sector where electricity's share increased from 9.1% in 1985 to 16.2% in 1997. This indicator varied widely through the region with lower shares of 9.6% in Romania and 11.1% in Poland but above 25% in three countries: the Czech Republic with 28.2%, Bulgaria with 36.2% and Albania with 55.5%. In industry the share of electricity increased more slowly as consumption declined by some 5% per year during the transition period as a result of restructuring and closure of obsolescent factories. But electricity consumption increased by just under 4.5% each year in the last three years with the rebound of industrial production and the diversification to higher added value industries where electricity use is favoured.

Contribution of solid fuels in gross inland energy declined sharply but still dominated...

Gross inland energy consumption which declined regularly by about 2.2% per year on average since 1990 was dominated by solid fuels (47% in 1998 from 52% in 1980), followed by oil (22% in 1998 from 25% in 1980) and gas (21% in 1998 from 18% in 1980). Decline of energy consumption accelerated in the last two years: -3.9% in 1997 and -4.7% in 1998 but this regional trend masked very large national variations. On the one hand, Polish energy consumption contracted by 9% in only two years as a result of energy saving policies as GDP grew by 12% during the same time. In contrast gross inland energy consumption declined by 15% in Bulgaria and 21% in Romania consecutively due to poor economic performance associated with the Kosovo War. Since the peak of 1987, the total reduction of consumption of about 101 Mtoe has been split between solid fuels (69 Mtoe), natural gas (18 Mtoe) and oil (16 Mtoe) respectively, while the contribution of nuclear increased by 3 Mtoe. Over the last two years, the major fall in consumption was concentrated on solids (-14.7 Mtoe or -12%) with the bulk of the reduction located in Poland; and on natural gas (-9.3 Mtoe or -16.3%) consumption of which declined significantly in Bulgaria and Romania while consumption remained unchanged in other countries.

Poland, the key **coal** consumer in Eastern countries with a consumption of about 64 Mtoe in 1998, accounted for about 58% of the region's total use. Coal consumption fell by 12 Mtoe in the last two years, associated with coal industry restructuring. In other countries, coal consumption is dominated by use of low-BTU sub-bituminous coal and lignite, produced from local reserves. In Poland, the contribution of solid fuels in 1998 reached 64% of

gross inland consumption. The second largest consumer was the Czech Republic where solid fuels based on indigenous production met about 53% of gross inland consumption. In comparison, in Hungary, historically oriented towards gas consumption (37% of gross inland consumption in 1998 with indigenous gas production supplemented by imports) solid fuels accounted for only 19%; and in Romania, a producer of both oil and gas, solid fuels represented only 18% of gross inland consumption.

Candidate countries must increase their environmental standards in order to achieve membership of the European Union. Increased consumption of **natural gas**, as an alternative to coal, is considered to be a key component of countries' energy policies to meet these stricter regulations. However gas consumption has not increased as quickly as expected. In four countries, the Czech Republic, Hungary, Poland and Slovakia, consumption mainly located by final consumers has remained stable since 1996. The spectacular decline in Romania, where natural gas constituted by far the largest energy source, is explained by the large overall reduction in energy consumption stemming from the very bad economic performance - a 14% decline of GDP in two years. Because regional gas reserves are limited, the expected increase in consumption will be met by imports, consequently increasing import dependency. Russia is currently the only major source of imported gas. However, efforts to diversify supply sources are underway. Poland and Norway have signed an agreement whereby Poland will import annually from Norway 500 million cubic meters from 2001 to 2006. Existing infrastructure cannot support significant imports from non-Russian sources, so pipeline development is under consideration to permit diversification of suppliers.

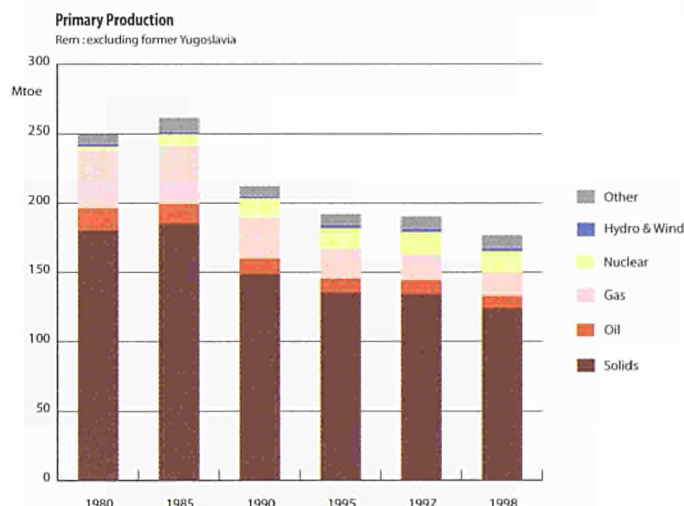
Consumption of **oil products** followed the rising trend begun in 1995, but with marked differences between countries. Poland, which accounted for 35% of total oil consumption in the region, demonstrated a continuous increase since 1991 at about 6% per year on average. All final demand sectors in Poland contributed to this increase. Oil consumption fluctuated in a small range in Hungary, the Czech Republic, Slovakia and Romania over the last five years, with increases in the transport sector being compensated by reduction of consumption in others sectors. Finally oil consumption declined sharply in Bulgaria with major reductions in all final sectors since 1990: -47% in industry, -57% in transport and -48% in tertiary-domestic.

The contribution of non-fossil fuels increased regularly. Nuclear grew by 1.3% per year on average since 1990, mainly the result of new commissioning at the Cernadova power plant in Romania

and at Kozloduy in Bulgaria, whilst the contribution of other countries remained flat. Hydro production increased by 50% since 1990, Romania accounting for about 50% of the additional production. Use of other renewables, mainly biomass, grew 3.0% per year on average - led by Poland which absorbed about 65% of regional consumption.

Energy production declined substantially, marked by ongoing substantial restructuring

Indigenous **energy production** has reflected these shifts in gross inland energy consumption. The energy sector has also been seriously affected by restructuring, investment to improve obsolete equipment and closure of unprofitable facilities. Since 1985 the reduction of fossil fuel production (60 Mtoe for solid fuels, 25 Mtoe for gas and 6 Mtoe for oil) has only been partly compensated by a small increase in nuclear output (7 Mtoe). The main reductions in indigenous production occurred in Poland and the Czech Republic (for solid fuels) and in Romania (for oil and gas).



Poland is the key coal producer in Eastern Europe. Poland's hard coal industry produced 66 Mtoe in 1998 versus a peak of 81 Mtoe in 1996, and lignite producers contributed an additional 13 Mtoe. At present, Poland's hard coal industry is operating at a loss. Over the past few years, a number of coal industry restructuring plans have been proposed to transform Poland's hard coal industry into a position of positive earnings, thus eliminating the need for government subsidies. The most recent plan was announced by Poland's Ministry of the Economy in April 1998. It calls for the closure of 24 of the country's 50 unprofitable mines over the next four years, reducing the total number of mines in Poland from 65 in 1998 to 41 by 2002. Three mines have been closed already in 1998 and three other closures are scheduled in 1999. In addition,

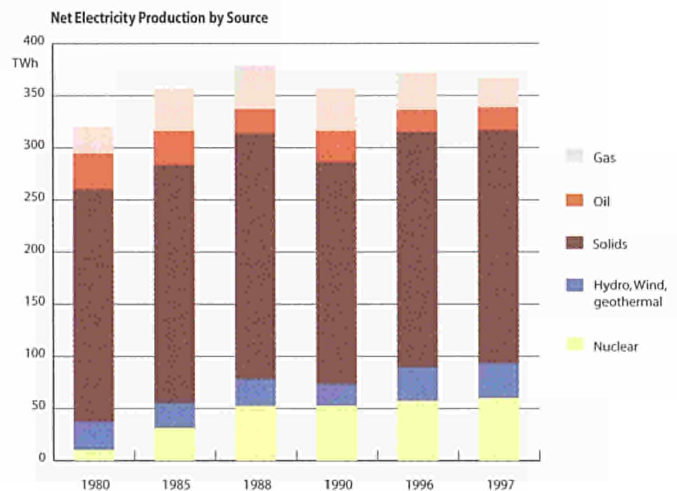
the restructuring plan aims to reduce the number of miners by nearly one-half, from 245,000 in 1998 to 128,000 by 2002. The World Bank has indicated its willingness to lend the Polish government up to \$1 billion over a 3-year period to cover the costs of this radical restructuring programme, including economic assistance for miners leaving the industry. The programme assumes full liberalisation of coal pricing and complete liberalisation of trade in coal by the year 2000. The changes brought about by this coal restructuring programme would have positive economic and environmental implications, which are important for Poland's accession to the European Union. The Czech coal industry is also currently being restructured and privatised, in part to meet requirements for European Union membership in 2003. The Czech government has reduced the number of inefficient mines in operation, cut the labour force associated with coal mining, and increased awareness of environmental issues related to the industry. To bring the Czech Republic closer in line with European Union standards, distribution networks have been connected and an energy charter agreement harmonising Czech and European Union legislation has been ratified.

Foreign investment will be critical for the development of the natural gas industry in the main producers: Romania, Poland and Hungary. In addition to developing new production infrastructure, most countries also need to refurbish or replace ageing pipes and to upgrade existing storage and production facilities. Shell is exploring a possible joint venture with Romgas, the Romanian state gas company, to rejuvenate gas fields where production has declined, to expand the gas distribution network and to increase gas storage facilities. As a result, Romania should be able to increase its revenues from the transport of Russian gas to markets in the Balkans and Eastern Europe, and to reduce dependence on Gazprom for its own internal consumption.

Regional production of crude oil plays a relatively minor role in overall consumption. The main producer, Romania, accounted for more than 70% of regional production but its output was limited to 6.5 Mtoe in 1998. With the opening of 15 oil blocks for exploration in 1996 and the influx of western technology, Romanian reserves and production are expected to rise slightly in the coming years. Petrom, the Romanian oil company involved in exploration and production, refining, distribution, transport and services, is undergoing a gradual programme to revitalise the industry, beginning with price liberalisation and the establishment of an independent regulatory agency. Oil from Russia, delivered by pipeline and tanker, satisfies much of the overall demand in these Eastern countries.

Eastern countries represented only 3% of world fossil fuel reserves, mainly coal...

Eastern countries' oil reserves at end 1998 amounted to only 0.2% of world reserves, with the major part concentrated in Romania. The situation was comparable for gas reserves which represented only 0.5% of world gas reserves, of which 50% were also located in Romania. Finally, coal reserves, mainly located in Poland, accounted for 4.4% of world reserves. As a result, Eastern countries represented only 3% of total world fossil fuel reserves.



Large predominance of solid fuels in electricity production marked by improving efficiency...

Electricity is mainly produced by thermal power stations (75% in 1997 declining from 85% in 1985); followed by nuclear (16% in 1997 increasing from 9% in 1985) and hydro (9% in 1997 thanks to a major jump of 23% in 1995 following quite stable production since 1985). Thermal power stations are mainly fired by solid fuels (about 81% in 1997 against 75% in 1985); oil and gas, with 8% and 10%, respectively, supplied the rest.

Electricity generation peaked at 385 TWh in 1989, yet only reached 369 TWh in 1997. Thus it has not been necessary to expand capacity since 1987. But as the power industry's generating capacity is old, inefficient and highly polluting, huge investment has been required to refurbish existing plants with the aim of improving their performance, cutting production costs and reducing their environmental impacts. The use of low-quality coal, combined with an absence of adequate environmental control equipment, has led to acute environmental pollution problems in

Central and Eastern European countries, particularly acid rain. Some efforts have been undertaken by countries in the region to improve the environmental performance of coal-fired plants. Low NOx burners are being installed in Poland and there are also plans to use them in Bulgaria and Romania. Circulating fluidised bed combustion boilers are being installed or planned in Poland and Romania. Electrostatic precipitators are widely used, although they are often inefficient; and several flue gas desulphurisation systems have been installed or are planned in Poland. Refurbishment programmes are under way in some countries, the Czech Republic, Hungary and Poland mainly, to improve plant thermal efficiency. Consequently average thermal efficiency of the region as a whole increased from 26.2% in 1990 to 29.4% in 1997 but still remained well below the performance of EU plants. Nevertheless the efficiency gain already achieved has caused a reduction of fuel consumption of about 10 Mtoe per year and the potential for further improvement is estimated at 15 Mtoe.

International concerns about nuclear safety...

As a result of negotiations to join the European Union, two countries, Bulgaria and Slovakia have agreed to closure schedules for specific units to maintain nuclear safety. The Bulgarian Kozloduy plant, the largest plant in the Balkan Peninsula, consists of six units using Russian-designed VVER reactors. Units 1 to 4 were commissioned in the 1970s and early 1980s. Units 5 and 6 were commissioned as recently as 1987 and 1991. Until the end of 1990, the oldest four units had some of the best load factors in the world. International concerns about the station's safety record, however, have led to calls for its complete closure. Although two of the six units were shut down for safety and maintenance reasons, it was accepted that the complete closure of Kozloduy now is impractical, given the country's dependence on nuclear power. For its part, Slovakia agreed to shut down the two units of the Bohunice plant when the new units of the Mochovce plant are fully operational. The first unit was completed in 1998 and the second one is scheduled to be online in 2000. However, Bohunice's manager believes units 1 and 2 will have to operate past the 2003 and 2005 shutdown dates originally planned, to recoup the costs of upgrading these units undertaken in the mid 1990s.

The development of renewable energy sources has been limited to improvements of existing hydroelectric facilities and small pilot projects for other renewables, such as geothermal and wind. Hydroelectricity represents a substantial source of power in only a few countries, such as Romania (23% of all electricity generated) and Slovakia (13%). Most of the potential for hydro expansion lies in Albania, Bulgaria and Romania, as well as in the former Yugoslav republics. However, as yet, these countries have found it difficult to secure financing for such expansion projects.

Reform and privatisation of the power industry are continuing...

The traditional electricity industries in this region were vertically integrated monopolies controlled by central governments. But reforms of the structure, ownership, and regulation have started. Several countries have attempted to reform their electricity industries, motivated in part by the desire to ensure availability of the foreign funds needed for upgrades and expansion and in part by the necessity to satisfy environmental, efficiency and open market criteria for accession to the European Union. The Czech Republic has been actively pursuing the upgrading and modernisation of its electric power sector to meet rising internal demand and EU environmental standards, mainly by encouraging foreign investment. In Poland privatisation is seen as the key to modernisation and efficiency of the electricity sector. In September 1996, a law was passed that laid the foundation for de-monopolisation and privatisation of the industry. Plans called for reducing the number of generating companies from 35 to 7 and for privatising power generation by the end of 2001. To date, 3 companies have been privatised. Croatia plans to improve efficiency and capacity in its electricity power sector by attracting foreign investors and spinning-off non-core businesses. Hungary has also sought foreign investment to modernise its electricity sector. In December 1997, the state privatisation agency sold 61% ownership stakes in two power companies to two consortia, one foreign and one domestic. In Bulgaria, the national electric utility, NEK, will privatise 22 large hydro plants and 41 small hydro plants over the period to 2001. Some major thermal power plants will also be sold and joint ventures with foreign investors will be established to refurbish and operate the other units.

Refinery industry still requires further restructuring and upgrading...

As regards the **refining industry**, the Communist regimes left Eastern European countries with bloated and inefficient hydrocarbon industries that suffered from decades of neglect, outdated technology, heavy debt and which imposed severe environmental impacts. In 1998, refinery capacity, including that of the former Yugoslav Republic, reached 2075 million barrels a day, or about 2.6% of world installed capacity. In 1998, rationalisation efforts led to the closure of about 10% of the existing capacity of crude oil distillation, the bulk of it being located in Bulgaria. At the same time the conversion capacity remained unchanged so that this sector still needs modernisation in order to meet the shift in demand towards lighter products such as gasoline and diesel. The output of refined petroleum products reached only 1373 million barrels a day in 1998, corresponding to a refinery capacity utilisation rate of only 66%. Most oil companies in the region remain state-owned and government-run. However, reflecting the progressive economic reforms under way in the region, private ownership is now beginning to emerge in the oil sector.

COMPETITIVENESS

Energy intensity has improved by about 2.9% per year on average since 1988 and the trend has accelerated...

Energy intensity declined slowly between 1980 and 1988 resulting from underlying technological improvement. But it must be recalled that, at this time, Eastern countries had one of the highest energy intensities in the world. The industrial structure, the dominant basis of the economy when the contribution of services was limited, comprised mainly the energy-intensive industries (steel, cement, chemicals...) to supply the former Soviet Union. These industries used energy inefficiently as domestic energy prices were kept well below world market prices. From then, the reforms undertaken to restructure the economy, and in particular the industrial sector, stimulated a dramatic improvement. The political changes which occurred in most countries between 1988 and 1993 led to decreases in both GDP (-19% between 1988 and 1992, excluding former Yugoslavia), and gross inland energy consumption (-25%). This led to an average energy intensity improvement of 1.6% per year. After 1993, with the help of foreign investment, industrial restructuring accelerated, leading to a more rapid decrease in energy intensity (-3.6% on average between 1992 and 1998), while GDP exhibited clear signs of recovering (+2.9% per year on average). This impressive decline was obtained despite a rebound of 1.2% in intensity in 1996, partly due to the cold weather conditions which boosted energy demand for space heating. Since 1997, some countries reinforced their efforts to satisfy criteria for European Union accession. These concern notably: energy pricing, energy savings, liberalisation of energy markets, and the environment. Consequently, gross inland energy consumption declined for the region as a whole by 3.9% in 1997 and 4.7% in

1998 when GDP increased by 1.9% and 1.8% respectively. This caused a faster decline in energy intensity that improved by 5.7% in 1997 and 6.4% in 1998. A large potential for further improvements still exists...

Over the period 1988-1998 there were major improvements in energy intensity in Poland (-36%), Romania (-26%) and Slovakia (-25%) and a little less in the Czech Republic (-15%). Poland, Slovakia and the Czech Republic benefited from a sustained economic rebound after 1994, accompanied by diversification of the economy towards high added value activities. This was not the case of Romania, still waiting for its economic rebound, or Bulgaria, where energy intensity has declined over the past ten years by only 8%, resulting from the improvement registered in 1998. The case of Hungary is distinctive: it has improved its energy intensity by only 12% since 1988 but its energy intensity was already 40% lower than the regional average.

CEEC : ENERGY INTENSITY (TOE/1990 MEUR)

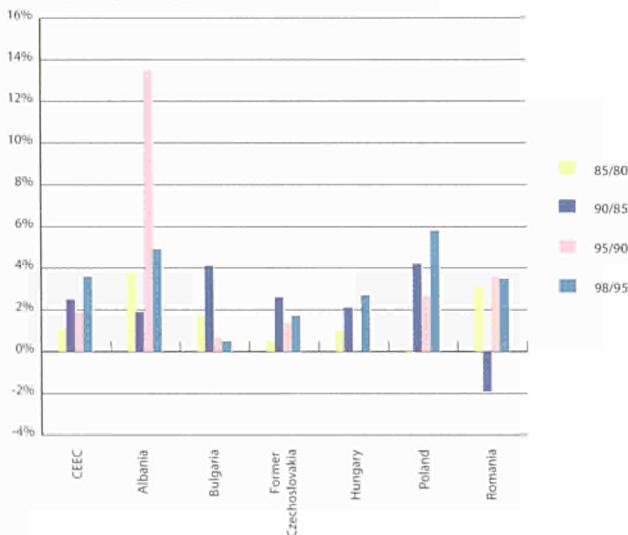
	1980	1985	1990	1995	1996	1997	1998
CEEC	2213.1	2090.4	1846.3	1673.4	1696.6	1599.8	1569.4
Poland	2711.0	2728.6	2202.1	1921.0	1977.4	1794.8	1604.3
Hungary	1186.5	1126.2	1012.8	1014.4	1021.0	958.0	935.6
Czech Republic	2512.5	2478.1	2115.5	1951.7	1948.0	1901.3	1996.6
Slovakia	1981.3	1908.0	1756.6	1656.9	1582.0	1448.9	1359.7
Romania	2159.4	1849.4	2034.3	1689.5	1634.7	1624.9	1520.2
Bulgaria	2237.2	2049.5	1666.2	1606.1	1763.1	1728.5	1581.7

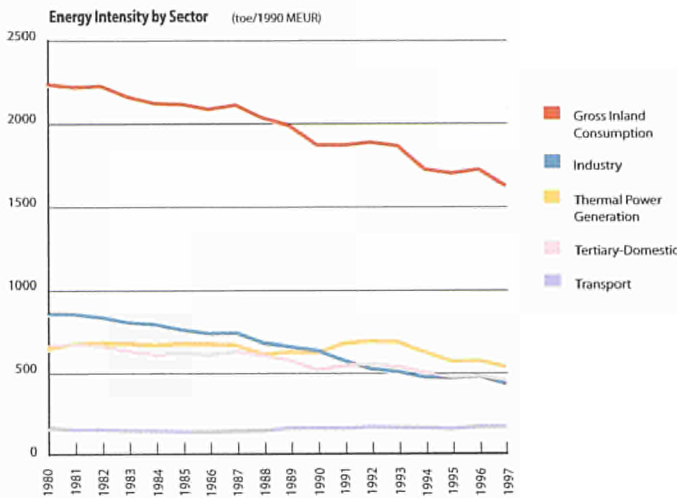
Improvement in energy intensity driven by industry and the tertiary-domestic sector...

The continuing improvement of energy intensity has been sustained mainly by the industrial sector's widespread reconstruction and modernisation (-38% since 1988) and by the tertiary-domestic sector (-26%), despite the improvement of living standards. The energy intensity of transport, which declined in the early 1980s, increased with the outset of the economic reforms to peak in 1992 about 4% above the 1980 value. Between 1992 and 1995 it declined slowly and rebounded in 1996. This was partly caused by some statistical adjustments, leading to the inclusion of some consumption for goods transportation previously recorded in the industrial sector. 1997 confirmed the 1996 value. Finally, the weight of power generation was also declining as the electricity intensity of GDP has diminished by 13% since 1988.

In terms of gross inland **energy consumption per capita**, a marked reduction has been observed since the peak of 1987 (from 3.46 toe per capita in 1987 to 2.44 toe in 1998). Despite higher energy intensity, average consumption per capita in 1997 remai-

Annual Average Rates of Improvement in Energy Intensity
Rem : excluding former Yugoslavia



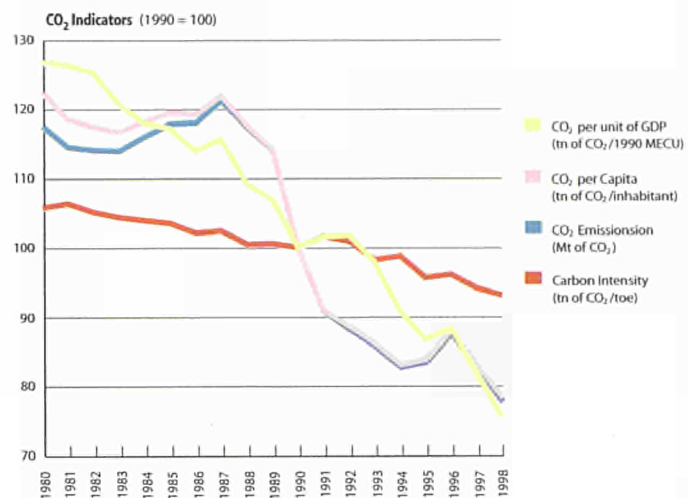


ned some 35% below the European Union average - reflecting the current lower standards of living in this region.

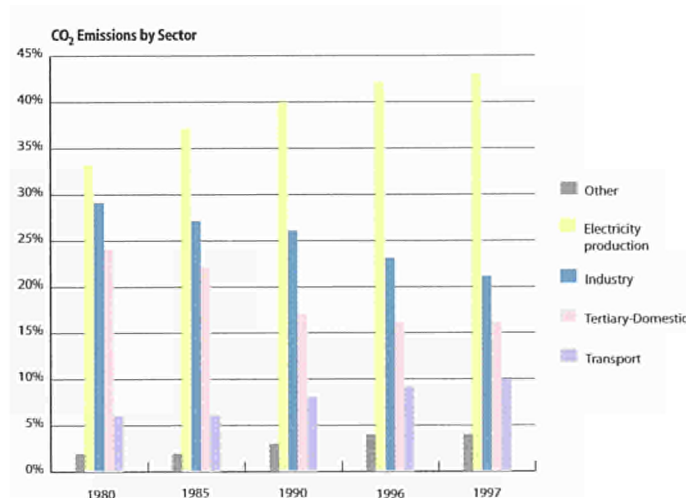
ENVIRONMENT

CO₂ emissions reduced by 23% since 1990...

The evolution of CO₂ emissions was profoundly influenced by the profile of energy consumption: increasing continuously between 1980 and 1987 to peak at 1026 million tonnes; but declining since then to reach 847 million tonnes in 1990. Since 1990, if we exclude a limited rebound in 1995-1996, CO₂ emissions were declining continuously to reach only 658 million tonnes in 1998, 23% below the 1990 level. In particular the last two years have been marked by a decline approaching 6% each year. This trend has resulted from restructuring of the economy, improving efficiency in energy use, reduction of demand caused by higher real energy prices and the switch away from coal. Despite these improvements, and the efforts accomplished by many countries in the context of European Union accession, a large potential for additional improvement still exists. Per capita CO₂ emissions, which were 20% above the average EU level in 1985, fell to only 87% of the EU level in 1997 but it must be recalled that the living standards between the two regions are not comparable. CO₂ emissions per unit of GDP have declined regularly since the beginning of the 1980s by about 2.6% per year on average, and this trend was accelerating very rapidly in 1997 and 1998. Finally, the increasing share of natural gas and the expansion of nuclear output during the second half of the 1980s caused the carbon intensity to fall steadily.



In the period 1990-97, emissions from the tertiary-domestic sector were reduced by 23%, those from industry by 32%, while those from the transport sector increased by 7.5%. The sector with the largest emissions remained power generation (about 43% of total emissions in 1997, from 40% in 1990 and 33% in 1980). This included emissions related to heat produced in cogeneration units and explains the relatively low contribution of the tertiary-domestic sector (16% of total emissions in 1997 from 24% in 1980). Industrial emissions declined in volume until 1993 to represent only 19% of total emissions but were rebounding with the recent progress of industrial production (+23% between 1993 and 1996), even though 1997 marked a new decline (-12%).



GLOBAL MARKETS

Energy import dependency is increasing with some attempts to diversify suppliers...

The overall energy dependence of this region on **external supplies** was 27% in 1998, just above the 1990 level. The present level of dependence represents a new peak since 1980. The slow increase since 1995 is explained by the substantial reduction of regional primary energy production, essentially coal and natural gas. The Eastern countries together have been historically net importers of crude oil and natural gas, mainly from the former USSR. Oil imports represented 86% of total oil requirements in 1998, increasing slightly since 1990 (84%) as oil consumption fell less rapidly than crude oil production. On the other hand, gas import dependency increased from 53% in 1990 to 65% in 1998 following a significant reduction in indigenous gas production. As regional resources of hydrocarbons are quite limited, any increase of oil or gas consumption in future will need to be met by additional imports.

Imports of Russian natural gas dominate Eastern countries' total supply, comprising 60% of consumption and 95% of imports, though some countries have made attempts to diversify their supplies. Hungary receives a small amount of gas from Western suppliers (Ruhrgas). Poland and the Czech Republic have also actively explored alternative suppliers but have yet to diversify away from Russian gas. The Czech Republic has already imported some Norwegian gas. Finally Slovenia imported limited volumes of Algerian gas through Italy. On the other hand, Gazprom has been negotiating to increase its participation in Eastern European gas companies. This is already the case in Bulgaria, where a joint venture Topenergy (50% Gazprom) is responsible for importing Russian gas; and the Slovak Gas Company (SPP) has formed a joint venture with Gazprom to increase co-operation between the two countries on gas deliveries and transit. The CIS was also the biggest supplier of crude oil and oil products to the region in 1998. They satisfied 54% of all imports, other suppliers being the Middle East (24%), Western Europe (16%) and North Africa (6%).

CENTRAL AND EASTERN COUNTRIES (FORMER YUGOSLAVIA EXCLUDED) : SUMMARY ENERGY BALANCE

Mtoe	1980	1985	1990	1995	1996	1997	1998(2)	85/80	90/85	96/90	97/96	98/97
	Annual % Change											
Primary Production	249.6	261.3	212.3	192.0	196.4	190.2	176.5	0.9%	-4.1%	-1.3%	-3.2%	-7.2%
Solids	179.9	184.8	148.6	135.3	139.6	134.6	124.1	0.5%	-4.3%	-1.0%	-3.6%	-7.8%
Oil	16.6	14.9	11.6	10.3	10.0	9.8	9.2	-2.2%	-4.9%	-2.4%	-1.8%	-6.8%
Natural gas	41.8	42.2	29.8	21.9	21.0	18.9	16.9	0.2%	-6.7%	-5.7%	-9.9%	-10.5%
Nuclear	2.8	8.2	13.8	14.3	15.1	15.8	15.3	24.0%	11.1%	1.4%	4.6%	-3.1%
Hydro & Wind	2.3	2.0	1.8	2.7	2.7	2.8	2.7	-2.2%	-2.7%	7.5%	3.9%	-4.3%
Geothermal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-
Other	6.2	9.3	6.7	7.4	8.0	8.3	8.4	8.4%	-6.2%	3.0%	3.9%	0.7%
Net Imports	71.6	65.6	77.1	58.4	69.0	68.9	65.0	-1.7%	3.3%	-1.8%	-0.1%	-5.7%
Solids	-12.6	-13.2	-11.7	-18.1	-14.0	-12.7	-14.8	1.0%	-2.4%	3.1%	-9.3%	16.1%
Oil	65.3	55.6	53.3	44.7	46.1	47.8	48.9	-3.2%	-0.9%	-2.4%	3.7%	2.3%
Crude oil	71.7	63.6	56.7	47.5	46.9	45.4	na	-2.4%	-2.3%	-3.1%	-3.1%	na
Oil products	-6.4	-8.1	-3.4	-2.8	-0.7	2.4	na	4.8%	-15.8%	-22.6%	-	na
Natural gas	17.7	21.6	33.1	31.7	36.6	33.8	30.7	4.1%	8.9%	1.7%	-7.6%	-9.3%
Electricity	1.1	1.6	2.4	0.1	0.3	0.0	0.1	8.5%	8.0%	-30.3%	-	-
Gross Inland Consumption	320.2	328.1	288.2	251.2	262.7	252.5	240.5	0.5%	-2.6%	-1.5%	-3.9%	-4.7%
Solids	167.4	173.4	137.5	118.7	124.0	118.1	109.3	0.7%	-4.5%	-1.7%	-4.7%	-7.5%
Oil	81.4	70.5	63.6	54.2	55.7	55.4	57.1	-2.8%	-2.0%	-2.2%	-0.6%	3.1%
Natural gas	59.0	63.1	62.3	53.6	56.9	52.1	47.6	1.3%	-0.2%	-1.5%	-8.5%	-8.6%
Other (1)	12.3	21.2	24.7	24.6	26.1	26.9	26.5	11.4%	3.2%	0.9%	3.1%	-1.4%
Electricity Generation in TWh	321.9	358.1	358.1	362.1	373.9	368.6	na	2.2%	0.0%	0.7%	-1.4%	na
Nuclear	10.7	31.4	53.0	55.0	57.8	60.4	na	24.0%	11.1%	1.4%	4.6%	na
Hydro & wind	26.4	23.7	20.6	31.2	31.5	32.6	na	-2.2%	-2.7%	7.3%	3.4%	na
Thermal	284.8	303.1	284.5	276.0	284.6	275.6	na	1.2%	-1.3%	0.0%	-3.2%	na
Generation Capacity in GWe	56.0	68.3	94.6	93.7	95.9	96.8	na	4.1%	6.7%	0.2%	0.9%	na
Nuclear	1.8	4.3	7.9	8.8	9.5	9.5	na	19.8%	12.8%	3.1%	0.0%	na
Hydro & wind	7.7	10.1	14.3	14.5	15.4	15.3	na	5.5%	7.2%	1.3%	-0.7%	na
Thermal	46.5	53.9	72.4	70.4	71.0	72.0	na	3.0%	6.1%	-0.3%	1.3%	na
Average Load Factor in %	65.7	59.9	43.2	44.1	44.5	43.5	na	-1.8%	-6.3%	0.5%	-2.3%	na
Fuel Inputs for Thermal Power Generation	89.6	102.2	93.3	81.8	85.0	80.7	na	2.7%	-1.8%	-1.5%	-5.1%	na
Solids	70.3	77.3	70.0	65.2	67.5	65.6	na	1.9%	-2.0%	-0.6%	-2.9%	na
Oil	10.9	10.9	9.8	6.0	6.3	6.5	na	-0.1%	-2.1%	-7.0%	2.7%	na
Gas	8.2	13.4	13.1	10.2	10.8	8.3	na	10.5%	-0.5%	-3.2%	-23.3%	na
Geothermal	0.0	0.0	0.0	0.0	0.0	0.0	na	-	-	-	-	na
Other	0.3	0.6	0.5	0.3	0.3	0.3	na	13.0%	-4.5%	-4.6%	-1.2%	na
Average Thermal Efficiency in %	27.3	25.5	26.2	29.0	28.8	29.4	na	-1.4%	0.6%	1.6%	2.0%	na
Non-Energy Uses	11.0	10.8	11.7	11.7	12.8	13.0	na	-0.3%	1.6%	1.5%	1.5%	na
Total Final Energy Demand	234.1	227.4	194.6	155.2	164.6	156.2	na	-0.6%	-3.1%	-2.7%	-5.1%	na
Solids	76.6	77.6	51.3	39.7	41.8	35.6	na	0.2%	-7.9%	-3.4%	-14.8%	na
Oil	55.7	44.2	39.6	32.5	34.7	35.5	na	-4.5%	-2.2%	-2.2%	2.5%	na
Gas	46.0	43.4	41.5	31.8	33.2	32.3	na	-1.2%	-0.9%	-3.7%	-2.6%	na
Electricity	21.7	24.3	25.1	21.9	23.1	22.7	na	2.2%	0.6%	-1.4%	-1.7%	na
Heat	28.2	29.2	30.8	22.2	24.2	22.0	na	0.7%	1.0%	-3.9%	-9.1%	na
Other	5.9	8.7	6.3	7.1	7.7	8.0	na	8.2%	-6.4%	3.5%	4.4%	na
CO₂ Emissions in Mt of CO₂	995.1	997.6	847.1	705.9	741.5	698.0	657.7	0.1%	-3.2%	-2.2%	-5.9%	-5.8%
Indicators												
Population (Million)	95.33	97.94	99.34	98.81	98.72	98.68	98.62	0.5%	0.3%	-0.1%	0.0%	-0.1%
GDP (index 1985=100)	92.2	100.0	99.4	95.6	98.6	100.5	102.3	1.6%	-0.1%	-0.1%	1.9%	1.8%
Gross Inl Cons./GDP (toe/1990 MEUR)	2213.1	2090.4	1846.3	1673.4	1696.6	1599.8	1497.2	-1.1%	-2.5%	-1.4%	-5.7%	-6.4%
Gross Inl Cons./Capita (toe/inhabitant)	3.36	3.35	2.90	2.54	2.66	2.56	2.44	0.0%	-2.8%	-1.4%	-3.8%	-4.7%
Electricity Generated/Capita (kWh/inhabitant)	3377	3657	3605	3664	3788	3735	na	1.6%	-0.3%	0.8%	-1.4%	na
CO ₂ Emissions/Capita (t of CO ₂ /inhabitant)	10.4	10.2	8.5	7.1	7.5	7.1	6.7	-0.5%	-3.5%	-2.1%	-5.8%	na
Import Dependency %	22.3	20.0	26.7	23.2	26.2	27.2	27.0	-2.2%	5.9%	-0.3%	3.9%	-1.0%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Estimates.



CENTRAL AND EASTERN COUNTRIES (FORMER YUGOSLAVIA EXCLUDED) : MAIN INDICATORS

	1980	1985	1990	1995	1996	1997	85/80	90/85	96/90	97/96
	Annual % Change									
Gross Inland Consumption (Mtoe)	320.2	328.1	288.2	251.2	262.7	252.5	0.5%	-2.6%	-1.5%	-3.9%
Public Thermal Power Generation	76.4	87.4	80.9	74.4	77.1	73.6	2.7%	-1.5%	-0.8%	-4.5%
Autoprod. Thermal Power Generation	13.3	14.8	12.4	7.3	7.9	7.1	2.2%	-3.5%	-7.2%	-10.4%
Energy Branch	14.1	14.6	15.1	18.4	18.5	18.1	0.7%	0.7%	3.4%	-1.8%
Final Energy Consumption	234.2	227.4	194.6	154.8	164.3	155.7	-0.6%	-3.1%	-2.8%	-5.2%
Industry	120.2	114.9	95.2	66.6	70.2	64.0	-0.9%	-3.7%	-4.9%	-8.9%
Transport	21.0	19.2	22.3	20.8	23.5	23.8	-1.8%	3.0%	0.9%	1.2%
Tertiary-Domestic	92.9	93.3	77.1	67.5	70.6	68.0	0.1%	-3.7%	-1.5%	-3.7%
Energy Intensity (toe/1990 MEUR)	2213.1	2090.4	1846.3	1673.4	1696.6	1599.8	-1.1%	-2.5%	-1.4%	-5.7%
Public Thermal Power Generation	527.9	557.0	518.5	495.9	498.2	466.6	1.1%	-1.4%	-0.7%	-6.3%
Autoprod. Thermal Power Generation	91.7	94.1	79.3	48.9	50.9	44.8	0.5%	1.4%	0.0%	5.5%
Industry	830.9	732.2	610.0	443.8	453.6	405.2	-2.5%	-3.6%	-4.8%	-10.7%
Transport	145.3	122.3	142.9	138.3	151.7	150.5	-3.4%	3.2%	1.0%	-0.8%
Tertiary-Domestic	642.5	594.5	494.0	449.4	456.1	431.1	-1.5%	-3.6%	-1.3%	-5.5%
Energy per Capita (Kgoe/inhabitant)	3358	3350	2901	2542	2661	2558	0.0%	-2.8%	-1.4%	-3.8%
Industry	1261	1173	959	674	711	648	-1.4%	-4.0%	-4.8%	-8.9%
Transport	220	196	224	210	238	241	-2.3%	2.7%	1.0%	1.2%
Tertiary-Domestic	975	953	776	683	715	689	-0.5%	-4.0%	-1.4%	-3.6%
Electricity Share (%)										
Final Energy Consumption	9.3%	10.7%	12.9%	14.1%	14.1%	14.6%	2.8%	3.8%	1.5%	3.7%
Industry	11.5%	12.6%	14.2%	14.8%	14.8%	16.7%	1.9%	2.3%	0.7%	12.9%
Transport	5.2%	6.5%	5.9%	5.2%	4.6%	4.3%	4.8%	-2.1%	-4.1%	-6.1%
Tertiary-Domestic	7.3%	9.1%	13.3%	16.3%	16.4%	16.2%	4.5%	7.8%	3.6%	-1.8%
Total Renewable Consumption (Mtoe)	8.5	11.3	8.5	10.2	10.7	11.2	6.0%	-5.6%	4.0%	3.9%
Hydro	2.3	2.0	1.8	2.7	2.7	2.8	-2.2%	-2.7%	7.3%	3.5%
Biomass	6.2	9.3	6.7	7.5	8.0	8.3	8.5%	-6.2%	2.9%	3.9%
Other	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	46.2%
Renewable intensity (toe/1990MEUR)	58.5	72.1	54.5	67.7	69.3	70.7	4.3%	-5.5%	4.1%	1.9%
Renewable per capita (Kgoe/inhabitant)	88.7	115.6	85.6	102.9	108.8	113.0	5.4%	-5.8%	4.1%	3.9%
CO₂ Emissions (Mt of CO₂)	995.1	997.6	847.1	705.9	741.5	698.0	0.1%	-3.2%	-2.2%	-5.9%
Public Thermal Power Generation	281.2	317.1	293.4	275.9	285.6	274.6	2.4%	-1.5%	-0.4%	-3.8%
Autoprod. Thermal Power Generation	49.3	54.3	44.9	24.8	26.7	24.1	2.0%	-3.7%	-8.3%	-9.8%
Energy Branch	23.1	22.5	23.9	30.5	30.7	30.7	-0.6%	1.3%	4.3%	-0.2%
Industry	287.4	274.1	217.5	158.3	169.1	148.6	-0.9%	-4.5%	-4.1%	-12.1%
Transport	61.9	55.6	64.8	60.3	68.7	69.7	-2.1%	3.1%	1.0%	1.5%
Tertiary-Domestic	238.8	220.3	145.6	117.2	116.4	112.0	-1.6%	-7.9%	-3.7%	-3.8%
Carbon Intensity (tn of CO₂/toe)	3.1	3.0	2.9	2.8	2.8	2.8	-0.4%	-0.7%	-0.7%	-2.1%
Public Power Generation	3.5	3.2	3.0	3.0	3.0	3.0	-1.2%	-1.3%	-0.2%	-1.0%
Public Thermal Power Generation	3.7	3.6	3.6	3.7	3.7	3.7	-0.3%	0.0%	0.4%	0.7%
Autoprod. Power Generation	3.7	3.7	3.6	3.4	3.4	3.4	-0.2%	-0.3%	-1.1%	0.5%
Autoprod. Thermal Power Generation	3.7	3.7	3.6	3.4	3.4	3.4	-0.2%	-0.3%	-1.1%	0.6%
Energy Branch	3.7	3.6	3.5	3.3	3.3	3.3	-0.2%	-0.4%	-1.0%	-1.0%
Industry	1.6	1.5	1.6	1.7	1.7	1.7	-1.3%	0.6%	0.9%	1.7%
Transport	2.4	2.4	2.3	2.4	2.4	2.3	-0.1%	-0.9%	0.9%	-3.5%
Tertiary-Domestic	2.9	2.9	2.9	2.9	2.9	2.9	-0.3%	0.1%	0.1%	0.4%
CO₂ per Capita (kg of CO₂/inhabitant)	10438	10186	8527	7144	7511	7074	-0.5%	-3.5%	-2.1%	-5.8%
Industry	3014	2798	2189	1602	1713	1506	-1.5%	-4.8%	-4.0%	-12.1%
Transport	649	568	652	610	696	707	-2.6%	2.8%	1.1%	1.6%
Tertiary-Domestic	2505	2249	1465	1186	1179	1134	-2.1%	-8.2%	-3.6%	-3.8%
CO₂ per unit of GDP (tn of CO₂/1990 MEUR)	6878	6355	5427	4702	4790	4423	-1.6%	-3.1%	-2.1%	-7.6%
Public Thermal Power Generation	1944	2020	1879	1838	1845	1740	0.8%	-1.4%	-0.3%	-5.7%
Autoprod. Thermal Power Generation	341	346	288	165	173	153	0.3%	-3.6%	-8.2%	-11.6%
Energy Branch	369	342	366	259	286	243	-1.5%	1.3%	-4.0%	-15.1%
Industry	160	143	153	203	199	194	-2.2%	1.4%	4.4%	-2.1%
Transport	1986	1746	1393	1054	1092	942	-2.5%	-4.4%	-4.0%	-13.8%
Tertiary-Domestic	428	354	415	402	444	442	-3.7%	3.2%	1.1%	-0.4%

BULGARIA : SUMMARY ENERGY BALANCE

Mtoe	1980	1985	1990	1996	1997	1998(2)	85/80	90/85	96/90	97/96	98/97
	Annual % Change										
Primary Production	7.7	9.5	9.8	10.3	10.0	9.8	4.3%	0.6%	0.9%	-3.5%	-1.6%
Solids	5.2	5.3	5.4	5.2	4.9	5.0	0.4%	0.4%	-0.7%	-5.3%	1.7%
Oil	0.3	0.2	0.1	0.0	0.0	0.0	-6.1%	-21.5%	-10.2%	-12.5%	0.0%
Natural gas	0.1	0.0	0.0	0.0	0.0	0.0	-35.0%	-10.1%	22.0%	-15.2%	0.0%
Nuclear	1.6	3.4	3.8	4.7	4.6	4.4	16.3%	2.2%	3.6%	-1.8%	-5.5%
Hydro & Wind	0.3	0.2	0.2	0.1	0.1	0.1	-9.7%	-3.3%	-1.9%	1.4%	-3.4%
Geothermal	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-
Other	0.2	0.4	0.4	0.2	0.3	0.3	16.0%	-2.8%	-5.8%	0.4%	8.2%
Net Imports	21.0	21.6	17.1	13.0	11.0	10.0	0.6%	-4.5%	-4.6%	-15.5%	-8.6%
Solids	4.3	5.2	3.4	2.4	2.4	2.2	4.0%	-8.3%	-5.6%	0.3%	-6.9%
Oil	13.4	11.5	8.6	5.9	5.0	5.1	-3.0%	-5.7%	-6.1%	-14.7%	1.4%
Crude oil	13.2	12.6	8.3	7.1	6.0	na	-0.9%	-8.0%	-2.6%	-15.8%	na
Oil products	0.1	-1.1	0.3	-1.2	-1.0	na	-	-	-	-21.3%	na
Natural gas	3.0	4.6	4.9	4.7	3.9	2.7	8.6%	1.3%	-0.5%	-18.6%	-29.5%
Electricity	0.3	0.4	0.3	0.0	-0.3	0.0	2.3%	-2.5%	-	682.1%	-95.7%
Gross Inland Consumption	28.7	31.0	27.1	22.6	20.6	19.5	1.5%	-2.6%	-3.0%	-8.8%	-5.3%
Solids	9.4	10.5	8.8	7.3	7.5	7.2	2.2%	-3.4%	-3.1%	2.9%	-3.8%
Oil	13.7	11.5	8.8	5.6	4.7	4.8	-3.4%	-5.1%	-7.4%	-15.5%	1.9%
Natural gas	3.2	4.6	4.9	4.7	3.7	2.7	7.7%	1.0%	-0.6%	-20.9%	-25.8%
Other (1)	2.5	4.4	4.7	5.1	4.7	4.8	12.4%	1.2%	1.4%	-6.9%	1.4%
Electricity Generation in TWh	34.8	41.6	42.1	41.5	41.6	na	3.6%	0.2%	-0.3%	0.2%	na
Nuclear	6.2	13.1	14.7	18.1	17.8	na	16.3%	2.2%	3.6%	-1.8%	na
Hydro & wind	3.7	2.2	1.9	1.7	1.7	na	-9.6%	-3.4%	-1.9%	1.1%	na
Thermal	25.0	26.3	25.6	21.7	22.1	na	1.0%	-0.5%	-2.7%	1.8%	na
Generation Capacity in GWe	8.2	10.2	11.1	12.1	12.1	na	4.6%	1.7%	1.4%	0.0%	na
Nuclear	0.9	1.8	2.8	3.5	3.5	na	14.9%	9.4%	4.2%	0.0%	na
Hydro & wind	1.9	2.0	2.0	1.4	1.4	na	1.1%	0.0%	-5.5%	0.0%	na
Thermal	5.4	6.5	6.4	7.1	7.1	na	3.6%	-0.3%	1.9%	0.0%	na
Average Load Factor in %	48.5	46.4	43.2	39.2	39.3	na	-0.9%	-1.4%	-1.6%	0.2%	na
Fuel Inputs for Thermal Power Generation	9.5	9.8	7.8	8.2	8.0	na	0.7%	-4.4%	0.8%	-2.5%	na
Solids	5.4	5.5	5.4	5.9	6.1	na	0.5%	-0.2%	1.3%	4.8%	na
Oil	4.2	3.4	0.7	0.7	0.7	na	-3.7%	-27.7%	1.7%	-5.3%	na
Gas	0.0	0.9	1.7	1.6	1.2	na	-	13.5%	-1.2%	-27.6%	na
Geothermal	0.0	0.0	0.0	0.0	0.0	na	-	-	-	-	na
Other	0.0	0.0	0.0	0.0	0.0	na	-	-	-	-	na
Average Thermal Efficiency in %	22.6	22.9	28.1	22.7	23.7	na	0.3%	4.1%	-3.5%	4.4%	na
Non-Energy Uses	0.7	0.7	0.5	1.4	1.3	na	0.9%	-6.5%	18.2%	-7.3%	na
Total Final Energy Demand	19.7	18.8	17.5	11.4	10.1	na	-0.9%	-1.4%	-6.8%	-12.2%	na
Solids	3.8	4.8	1.5	1.4	1.3	na	4.6%	-21.1%	-1.3%	-6.2%	na
Oil	8.0	5.4	5.8	2.9	2.4	na	-7.6%	1.4%	-11.1%	-16.6%	na
Gas	3.2	3.7	2.3	1.5	1.2	na	3.0%	-9.1%	-7.0%	-18.1%	na
Electricity	2.6	3.0	3.0	2.6	2.3	na	3.4%	0.1%	-2.7%	-10.9%	na
Heat	1.9	1.4	4.5	2.9	2.6	na	-5.5%	26.0%	-7.1%	-9.8%	na
Other	0.2	0.4	0.4	0.2	0.2	na	16.0%	-2.9%	-6.4%	0.1%	na
CO₂ Emissions in Mt of CO₂	83.5	81.2	64.8	53.1	49.6	na	-0.6%	-4.4%	-3.3%	-6.6%	na
Indicators											
Population (Million)	8.86	8.94	8.72	8.36	8.31	8.27	0.2%	-0.5%	-0.7%	-0.5%	-0.5%
GDP (index 1985=100)	84.8	100.0	107.8	84.8	78.9	81.7	3.3%	1.5%	-3.9%	-6.9%	3.5%
Gross Inl Cons./GDP (toe/1990 MEUR)	2237.2	2049.5	1666.2	1763.1	1728.5	1581.7	-1.7%	-4.1%	0.9%	-2.0%	-8.5%
Gross Inl Cons./Capita (toe/inhabitant)	3.24	3.46	3.11	2.70	2.48	2.36	1.4%	-2.1%	-2.3%	-8.3%	-4.8%
Electricity Generated/Capita (kWh/inhabitant)	3931	4656	4834	4963	5000	na	3.4%	0.8%	0.4%	0.7%	na
CO ₂ Emissions/Capita (t of CO ₂ /inhabitant)	9.4	9.1	7.4	6.4	6.0	na	-0.7%	-3.9%	-2.6%	-6.1%	na
Import Dependency %	73.3	69.3	62.5	56.7	52.2	50.6	-1.1%	-2.1%	-1.6%	-7.9%	-3.2%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Estimates.



CZECH REPUBLIC : SUMMARY ENERGY BALANCE

Mtoe	1980	1985	1990	1996	1997	1998(2)	85/80	90/85	96/90	97/96	98/97
Annual % Change											
Primary Production	43.5	44.8	39.5	32.5	31.5	31.3	0.6%	-2.5%	-3.2%	-3.0%	-0.8%
Solids	42.2	43.0	35.2	28.1	27.0	26.6	0.4%	-4.0%	-3.7%	-4.1%	-1.1%
Oil	0.2	0.3	0.2	0.2	0.4	0.6	2.6%	-5.1%	0.4%	108.1%	33.3%
Natural gas	0.3	0.2	0.2	0.2	0.2	0.2	-5.3%	-3.6%	-1.6%	-10.4%	0.0%
Nuclear	0.0	0.6	3.3	3.3	3.3	3.3	-	39.3%	0.3%	-2.8%	0.0%
Hydro & Wind	0.2	0.1	0.1	0.2	0.2	0.2	-6.9%	-2.9%	7.8%	-5.6%	-5.9%
Geothermal	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-
Other	0.6	0.5	0.5	0.4	0.5	0.4	-3.9%	1.9%	-2.2%	21.6%	-16.8%
Net Imports	4.5	4.1	5.4	9.3	9.8	10.5	-1.7%	5.5%	9.4%	5.3%	7.8%
Solids	-8.7	-9.4	-7.9	-6.3	-5.7	-4.4	1.6%	-3.4%	-3.6%	-9.7%	-22.6%
Oil	10.9	10.1	8.6	8.1	8.0	7.4	-1.6%	-3.1%	-1.1%	-1.0%	-7.0%
Crude oil	9.2	8.7	7.4	7.4	6.9	na	-1.0%	-3.3%	0.0%	-6.8%	na
Oil products	1.7	1.3	1.2	0.7	1.1	na	-4.9%	-1.8%	-9.8%	63.4%	na
Natural gas	2.4	3.5	4.8	7.5	7.6	7.5	7.9%	6.3%	7.9%	0.8%	-1.4%
Electricity	-0.1	-0.1	-0.1	0.0	-0.1	0.0	-14.9%	0.7%	-100.0%	-	-
Gross Inland Consumption	47.6	49.3	45.5	41.2	40.6	41.6	0.7%	-1.6%	-1.7%	-1.4%	2.6%
Solids	33.2	33.5	27.5	21.4	21.1	22.2	0.2%	-3.9%	-4.1%	-1.3%	5.2%
Oil	11.1	10.4	9.0	8.3	7.9	7.8	-1.4%	-2.9%	-1.4%	-4.0%	-1.1%
Natural gas	2.6	4.2	5.3	7.5	7.7	7.7	10.2%	4.4%	6.2%	1.7%	0.0%
Other (1)	0.6	1.2	3.9	4.0	3.9	3.9	12.9%	26.8%	0.6%	-2.8%	0.9%
Electricity Generation in TWh	52.7	58.1	62.6	63.8	63.7	na	2.0%	1.5%	0.3%	-0.2%	na
Nuclear	0.0	2.4	12.6	12.9	12.5	na	-	39.3%	0.3%	-2.8%	na
Hydro & wind	2.4	1.7	1.4	2.0	1.7	na	-7.0%	-2.9%	5.3%	-13.7%	na
Thermal	50.3	54.1	48.5	49.0	49.5	na	1.5%	-2.1%	0.2%	1.0%	na
Generation Capacity in GWe	0.0	0.0	15.3	14.7	14.9	na	-	-	-0.6%	0.9%	na
Nuclear	0.0	0.0	1.8	1.8	1.8	na	-	-	0.0%	0.0%	na
Hydro & wind	0.0	0.0	1.4	1.8	1.8	na	-	-	4.0%	2.1%	na
Thermal	0.0	0.0	12.1	11.2	11.3	na	-	-	-1.3%	0.8%	na
Average Load Factor in %	0.0	0.0	46.7	49.5	48.9	na	-	-	1.0%	-1.1%	na
Fuel Inputs for Thermal Power Generation	11.4	11.7	10.1	13.4	13.3	na	0.5%	-2.9%	4.9%	-0.8%	na
Solids	10.0	10.6	9.2	12.5	12.3	na	1.2%	-2.8%	5.3%	-1.7%	na
Oil	1.2	0.9	0.7	0.4	0.4	na	-5.6%	-4.4%	-11.0%	0.0%	na
Gas	0.2	0.2	0.2	0.5	0.5	na	0.0%	0.0%	18.8%	7.1%	na
Geothermal	0.0	0.0	0.0	0.0	0.0	na	-	-	-	-	na
Other	0.0	0.0	0.0	0.1	0.2	na	-	-	-	67.0%	na
Average Thermal Efficiency in %	37.9	39.7	41.3	31.3	31.8	na	0.9%	0.8%	-4.5%	1.8%	na
Non-Energy Uses	1.2	1.5	1.7	2.2	2.0	na	3.9%	2.4%	4.3%	-8.0%	na
Total Final Energy Demand	39.2	41.0	35.3	26.5	25.7	na	0.9%	-2.9%	-4.7%	-2.7%	na
Solids	23.2	24.0	18.6	7.0	6.5	na	0.7%	-4.9%	-15.1%	-6.8%	na
Oil	8.4	7.7	6.4	5.2	5.0	na	-1.8%	-3.7%	-3.5%	-2.9%	na
Gas	2.4	3.4	4.2	5.9	6.0	na	7.7%	4.0%	5.7%	2.9%	na
Electricity	3.3	3.7	4.1	4.3	4.3	na	2.7%	2.2%	0.7%	-1.3%	na
Heat	1.4	1.7	1.5	3.7	3.5	na	3.9%	-2.6%	17.1%	-7.5%	na
Other	0.6	0.5	0.5	0.4	0.5	na	-3.9%	1.9%	-3.7%	14.6%	na
CO₂ Emissions in Mt of CO₂	176.0	182.3	151.4	115.7	113.0	na	0.7%	-3.6%	-4.4%	-2.4%	na
Indicators											
Population (Million)	10.33	10.34	10.36	10.32	10.30	10.29	0.0%	0.1%	-0.1%	-0.1%	-0.1%
GDP (index 1985=100)	95.2	100.0	108.2	106.2	107.3	104.8	1.0%	1.6%	-0.3%	1.0%	-2.3%
Gross Inl Cons./GDP (toe/1990 MEUR)	2512.5	2478.1	2115.5	1948.0	1901.3	1996.6	-0.3%	-3.1%	-1.4%	-2.4%	5.0%
Gross Inl Cons./Capita (toe/inhabitant)	4.61	4.77	4.39	3.99	3.94	4.05	0.7%	-1.6%	-1.6%	-1.3%	2.7%
Electricity Generated/Capita (kWh/inhabitant)	5099	5623	6037	6187	6181	na	2.0%	1.4%	0.4%	-0.1%	na
CO ₂ Emissions/Capita (t of CO ₂ /inhabitant)	17.0	17.6	14.6	11.2	11.0	na	0.7%	-3.7%	-4.3%	-2.2%	na
Import Dependency %	9.5	8.4	11.9	22.5	24.0	25.3	-2.4%	7.2%	11.2%	6.9%	5.1%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Estimates

HUNGARY : SUMMARY ENERGY BALANCE

Mtoe	1980	1985	1990	1996	1997	1998(2)	85/80	90/85	96/90	97/96	98/97
	Annual % Change										
Primary Production	14.9	16.9	14.2	12.9	12.7	12.4	2.6%	-3.4%	-1.6%	-1.0%	-3.0%
Solids	6.3	5.7	4.1	3.2	3.3	3.9	-2.0%	-6.3%	-4.2%	2.8%	17.0%
Oil	2.5	2.5	2.3	2.1	2.0	1.5	0.0%	-2.1%	-1.1%	-6.9%	-25.7%
Natural gas	5.1	5.8	3.8	3.6	3.4	3.1	2.8%	-8.2%	-0.9%	-6.7%	-6.7%
Nuclear	0.0	1.7	3.6	3.7	3.6	3.6	-	16.2%	0.5%	-1.5%	0.0%
Hydro & Wind	0.0	0.0	0.0	0.0	0.0	0.0	5.4%	2.9%	3.1%	5.6%	0.0%
Geothermal	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-
Other	0.9	1.1	0.4	0.2	0.4	0.2	3.9%	-19.1%	-8.0%	97.8%	-46.0%
Net Imports	14.4	13.8	14.2	13.6	13.1	13.8	-0.7%	0.5%	-0.7%	-3.4%	5.1%
Solids	2.2	2.6	1.6	1.4	1.1	1.1	3.6%	-9.0%	-2.6%	-21.5%	-0.3%
Oil	8.3	7.1	6.4	4.7	5.3	5.9	-3.3%	-1.8%	-5.0%	11.7%	11.5%
Crude oil	7.4	6.4	6.3	5.1	5.6	na	-2.9%	-0.3%	-3.4%	8.5%	na
Oil products	0.9	0.7	0.2	-0.4	-0.3	na	-6.5%	-25.7%	-	-32.8%	na
Natural gas	3.2	3.3	5.2	7.3	6.5	6.6	0.4%	9.7%	5.8%	-9.9%	0.7%
Electricity	0.6	0.9	1.0	0.2	0.2	0.2	7.9%	0.6%	-23.7%	-2.1%	11.9%
Gross Inland Consumption	28.9	30.4	28.5	25.8	25.3	26.0	1.0%	-1.3%	-1.6%	-1.9%	2.6%
Solids	8.4	8.0	6.1	4.6	4.4	4.9	-0.9%	-5.3%	-4.7%	-5.3%	13.7%
Oil	11.0	9.8	8.5	6.8	7.0	7.2	-2.1%	-2.8%	-3.6%	1.9%	3.3%
Natural gas	8.0	8.8	8.9	10.2	9.7	9.7	2.1%	0.2%	2.3%	-5.2%	0.2%
Other (1)	1.5	3.7	4.9	4.1	4.3	4.1	19.4%	5.9%	-2.9%	3.9%	-4.2%
Electricity Generation in TWh	23.9	26.8	28.4	35.1	35.4	na	2.3%	1.2%	3.6%	0.9%	na
Nuclear	0.0	6.5	13.7	14.2	14.0	na	-	16.2%	0.5%	-1.5%	na
Hydro & wind	0.1	0.2	0.2	0.2	0.2	na	6.7%	2.8%	2.5%	4.3%	na
Thermal	23.8	20.2	14.5	20.7	21.2	na	-3.2%	-6.3%	6.1%	2.5%	na
Generation Capacity in GWe	4.8	5.8	6.6	7.5	7.9	na	3.7%	2.6%	2.2%	4.9%	na
Nuclear	0.0	0.8	1.7	1.8	1.8	na	-	15.1%	1.8%	0.0%	na
Hydro & wind	0.0	0.0	0.0	0.0	0.0	na	0.0%	0.9%	0.0%	0.0%	na
Thermal	4.8	4.9	4.9	5.6	6.0	na	0.6%	-0.2%	2.4%	6.5%	na
Average Load Factor in %	56.3	52.7	49.2	53.2	51.1	na	-1.3%	-1.4%	1.3%	-3.8%	na
Fuel Inputs for Thermal Power Generation	7.8	7.0	5.4	6.0	5.9	na	-2.2%	-4.9%	1.6%	-1.5%	na
Solids	4.3	3.7	3.4	3.0	2.9	na	-2.8%	-1.9%	-2.2%	-3.7%	na
Oil	1.0	1.4	0.4	1.2	1.4	na	5.6%	-20.2%	18.5%	17.4%	na
Gas	2.5	1.9	1.6	1.8	1.6	na	-5.4%	-3.3%	1.9%	-10.9%	na
Geothermal	0.0	0.0	0.0	0.0	0.0	na	-	-	-	-	na
Other	0.0	0.0	0.0	0.0	0.0	na	-	-	-	-	na
Average Thermal Efficiency in %	26.2	24.9	23.1	29.9	31.1	na	-1.0%	-1.5%	4.4%	4.0%	na
Non-Energy Uses	2.6	2.3	1.8	1.5	1.6	na	-2.3%	-5.3%	-2.3%	4.7%	na
Total Final Energy Demand	20.8	21.5	19.7	16.5	15.9	na	0.7%	-1.7%	-3.0%	-3.4%	na
Solids	4.0	4.2	2.8	1.1	0.8	na	1.2%	-7.9%	-14.0%	-27.0%	na
Oil	7.7	6.4	6.2	4.1	4.0	na	-3.8%	-0.5%	-6.7%	-3.2%	na
Gas	3.9	4.9	5.4	6.8	6.7	na	4.6%	1.9%	4.1%	-1.9%	na
Electricity	2.2	2.6	2.7	2.5	2.5	na	3.4%	0.9%	-1.6%	0.5%	na
Heat	2.1	2.4	2.3	1.8	1.5	na	2.7%	-0.9%	-4.2%	-12.5%	na
Other	0.9	1.1	0.4	0.2	0.4	na	3.9%	-19.3%	-7.8%	97.8%	na
CO₂ Emissions in Mt of CO₂	82.3	79.7	69.2	58.8	56.2	na	-0.7%	-2.8%	-2.7%	-4.4%	na
Indicators											
Population (Million)	10.71	10.58	10.37	10.19	10.16	10.12	-0.2%	-0.4%	-0.3%	-0.4%	-0.4%
GDP (index 1985=100)	90.1	100.0	104.1	93.6	97.9	102.9	2.1%	0.8%	-1.8%	4.6%	5.1%
Gross Inl Cons./GDP (toe/1990 MEUR)	1186.5	1126.2	1012.8	1021.0	958.0	935.6	-1.0%	-2.1%	0.1%	-6.2%	-2.3%
Gross Inl Cons./Capita (toe/inhabitant)	2.70	2.87	2.75	2.53	2.49	2.57	1.3%	-0.9%	-1.4%	-1.5%	3.0%
Electricity Generated/Capita (kWh/inhabitant)	2230	2533	2743	3443	3486	na	2.6%	1.6%	3.9%	1.2%	na
CO ₂ Emissions/Capita (t of CO ₂ /inhabitant)	7.7	7.5	6.7	5.8	5.5	na	-0.4%	-2.4%	-2.4%	-4.1%	na
Import Dependency %	49.7	45.5	49.8	52.7	51.8	53.1	-1.7%	1.8%	0.9%	-1.6%	2.4%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Estimates.



POLAND : SUMMARY ENERGY BALANCE

Mtoe	1980	1985	1990	1996	1997	1998(2)	85/80	90/85	96/90	97/96	98/97
Annual % Change											
Primary Production	124.1	128.1	101.5	103.5	100.9	91.8	0.6%	-4.6%	0.3%	-2.5%	-9.0%
Solids	115.9	118.0	94.5	94.5	92.0	82.6	0.4%	-4.4%	0.0%	-2.6%	-10.2%
Oil	0.3	0.2	0.2	0.4	0.4	0.4	-10.5%	-2.2%	14.3%	-6.2%	16.7%
Natural gas	4.5	4.1	2.4	3.1	3.2	3.2	-1.9%	-10.5%	4.7%	2.0%	0.0%
Nuclear	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-
Hydro & Wind	0.2	0.2	0.1	0.2	0.2	0.2	-4.7%	-5.2%	5.3%	1.8%	13.2%
Geothermal	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-
Other	3.1	5.7	4.4	5.3	5.2	5.4	13.0%	-5.0%	3.4%	-3.3%	4.6%
Net Imports	2.6	-1.8	2.1	5.6	8.2	6.8	-	-	17.8%	45.3%	-17.3%
Solids	-20.5	-23.2	-18.9	-18.1	-17.4	-19.1	2.5%	-4.0%	-0.7%	-3.8%	9.6%
Oil	18.8	16.7	14.3	17.7	19.2	19.8	-2.3%	-3.0%	3.6%	8.4%	3.3%
Crude oil	16.6	13.8	12.9	15.0	15.7	na	-3.7%	-1.2%	2.5%	4.5%	na
Oil products	2.1	2.9	1.4	2.7	3.5	na	6.6%	-14.0%	11.8%	30.3%	na
Natural gas	4.3	4.9	6.8	6.3	6.6	6.3	2.4%	6.9%	-1.2%	4.5%	-5.0%
Electricity	0.0	-0.2	-0.1	-0.3	-0.2	-0.2	55.5%	-13.3%	20.2%	-30.1%	28.2%
Gross Inland Consumption	126.5	128.4	102.0	108.4	105.2	98.5	0.3%	-4.5%	1.0%	-3.0%	-6.3%
Solids	96.0	96.9	75.4	75.7	71.3	63.5	0.2%	-4.9%	0.1%	-5.9%	-10.8%
Oil	18.5	16.9	13.3	18.0	19.3	20.1	-1.8%	-4.7%	5.2%	7.3%	4.3%
Natural gas	8.8	8.9	8.9	9.4	9.4	9.5	0.3%	0.0%	0.9%	-0.3%	0.4%
Other (1)	3.2	5.6	4.4	5.2	5.1	5.4	11.6%	-4.8%	2.9%	-1.8%	4.2%
Electricity Generation in TWh	120.8	135.6	134.5	141.2	140.9	na	2.3%	-0.2%	0.8%	-0.2%	na
Nuclear	0.0	0.0	0.0	0.0	0.0	na	-	-	-	-	na
Hydro & wind	2.3	1.9	1.4	1.9	2.0	na	-4.6%	-5.2%	5.3%	1.6%	na
Thermal	118.4	133.7	133.1	139.2	139.0	na	2.5%	-0.1%	0.8%	-0.2%	na
Generation Capacity in GWe	24.7	29.0	30.9	29.5	29.9	na	3.3%	1.3%	-0.8%	1.6%	na
Nuclear	0.0	0.0	0.0	0.0	0.0	na	-	-	-	-	na
Hydro & wind	1.3	2.0	1.9	2.0	2.0	na	8.8%	-1.3%	1.7%	0.0%	na
Thermal	23.4	27.1	29.1	27.4	27.9	na	2.9%	1.4%	-1.0%	1.7%	na
Average Load Factor in %	55.8	53.3	49.7	54.7	53.7	na	-0.9%	-1.4%	1.6%	-1.7%	na
Fuel Inputs for Thermal Power Generation	46.5	50.6	44.5	38.3	37.4	na	1.7%	-2.5%	-2.5%	-2.2%	na
Solids	43.9	48.2	42.7	37.6	36.8	na	1.9%	-2.4%	-2.1%	-2.3%	na
Oil	2.3	1.8	1.2	0.4	0.4	na	-4.7%	-7.0%	-17.4%	12.0%	na
Gas	0.1	0.1	0.1	0.1	0.1	na	-7.9%	0.0%	2.8%	-22.6%	na
Geothermal	0.0	0.0	0.0	0.0	0.0	na	-	-	-	-	na
Other	0.3	0.6	0.4	0.1	0.1	na	13.0%	-5.0%	-17.5%	0.1%	na
Average Thermal Efficiency in %	21.9	22.7	25.7	31.3	31.9	na	0.8%	2.5%	3.3%	2.0%	na
Non-Energy Uses	4.2	4.2	4.2	4.1	4.2	na	0.2%	-0.1%	-0.5%	2.7%	na
Total Final Energy Demand	80.2	80.8	62.3	69.9	66.1	na	0.2%	-5.1%	1.9%	-5.5%	na
Solids	34.4	32.4	19.3	27.8	22.9	na	-1.2%	-9.9%	6.3%	-17.8%	na
Oil	12.1	11.4	9.3	13.5	14.6	na	-1.2%	-4.0%	6.3%	8.2%	na
Gas	6.1	6.0	6.0	6.1	6.7	na	-0.2%	-0.1%	0.3%	10.1%	na
Electricity	7.2	7.8	8.3	8.0	8.1	na	1.7%	1.2%	-0.5%	1.4%	na
Heat	17.7	18.1	15.6	9.3	8.7	na	0.5%	-3.0%	-8.2%	-6.3%	na
Other	2.8	5.1	3.9	5.2	5.0	na	13.0%	-5.0%	4.8%	-3.4%	na
CO₂ Emissions in Mt of CO₂	419.6	423.2	339.8	358.2	333.7	na	0.2%	-4.3%	0.9%	-6.9%	na
Indicators											
Population (Million)	35.58	37.20	38.12	38.62	38.65	38.68	0.9%	0.5%	0.2%	0.1%	0.1%
GDP (index 1985=100)	99.1	100.0	98.5	116.5	124.5	130.5	0.2%	-0.3%	2.8%	6.9%	4.8%
Gross Inl Cons./GDP (toe/1990 MEUR)	2711.0	2728.6	2202.1	1977.4	1794.8	1604.3	0.1%	-4.2%	-1.8%	-9.2%	-10.6%
Gross Inl Cons./Capita (toe/inhabitant)	3.55	3.45	2.68	2.81	2.72	2.55	-0.6%	-5.0%	0.8%	-3.1%	-6.4%
Electricity Generated/Capita (kWh/inhabitant)	3394	3644	3528	3656	3646	na	1.4%	-0.6%	0.6%	-0.3%	na
CO ₂ Emissions/Capita (t of CO ₂ /inhabitant)	11.8	11.4	8.9	9.3	8.6	na	-0.7%	-4.8%	0.7%	-6.9%	na
Import Dependency %	2.0	-1.4	2.0	5.2	7.8	6.8	-	-	16.7%	49.9%	-11.7%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Estimates.

ROMANIA : SUMMARY ENERGY BALANCE

Mtoe	1980	1985	1990	1996	1997	1998(2)	85/80	90/85	96/90	97/96	98/97
	Annual % Change										
Primary Production	52.6	54.3	39.7	31.3	29.4	26.1	0.6%	-6.1%	-3.9%	-6.0%	-11.2%
Solids	8.1	10.3	7.6	7.5	6.2	4.8	4.9%	-6.0%	-0.1%	-17.3%	-23.3%
Oil	11.2	10.4	7.7	6.7	6.6	6.5	-1.4%	-5.9%	-2.3%	-1.5%	-1.5%
Natural gas	31.3	31.3	22.9	13.8	11.9	10.1	0.0%	-6.1%	-8.1%	-13.5%	-14.8%
Nuclear	0.0	0.0	0.0	0.4	1.4	1.4	-	-	-	289.8%	-3.9%
Hydro & Wind	1.1	1.1	0.9	1.4	1.5	1.4	0.1%	-2.9%	6.2%	11.1%	-4.0%
Geothermal	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-
Other	1.0	1.2	0.6	1.6	1.8	1.9	4.5%	-12.8%	18.1%	10.0%	6.6%
Net Imports	12.1	11.3	21.6	14.4	14.2	10.9	-1.4%	13.9%	-6.5%	-1.3%	-23.5%
Solids	4.0	4.9	4.3	2.5	3.2	1.9	4.1%	-2.7%	-8.8%	29.1%	-39.1%
Oil	6.9	4.6	10.6	6.2	7.0	6.6	-8.1%	18.4%	-8.5%	12.3%	-5.8%
Crude oil	15.5	14.2	15.6	6.9	6.1	na	-1.7%	1.9%	-12.6%	-12.7%	na
Oil products	-8.6	-9.6	-5.0	-0.7	0.9	na	2.4%	-12.3%	-27.4%	-	na
Natural gas	1.1	1.5	5.9	5.7	4.0	2.3	6.6%	31.2%	-0.8%	-28.7%	-42.2%
Electricity	0.0	0.3	0.8	0.1	0.0	0.0	49.9%	23.8%	-33.6%	-72.9%	36.8%
Gross Inland Consumption	64.7	64.6	61.1	45.8	42.5	36.9	0.0%	-1.1%	-4.7%	-7.2%	-13.3%
Solids	12.1	15.2	11.7	9.9	9.2	6.7	4.6%	-5.1%	-2.7%	-7.6%	-26.7%
Oil	18.1	14.9	18.2	13.1	12.7	13.0	-3.8%	4.1%	-5.4%	-2.7%	1.9%
Natural gas	32.4	31.9	28.8	19.4	15.9	12.5	-0.3%	-2.0%	-6.4%	-17.9%	-21.7%
Other (1)	2.1	2.6	2.4	3.4	4.7	4.7	4.4%	-1.7%	6.3%	38.4%	0.5%
Electricity Generation in TWh	66.1	70.9	63.9	61.4	57.1	na	1.4%	-2.1%	-0.7%	-6.9%	na
Nuclear	0.0	0.0	0.0	1.4	5.4	na	-	-	-	289.6%	na
Hydro & wind	12.6	12.7	11.0	15.8	17.5	na	0.1%	-2.9%	6.2%	11.1%	na
Thermal	53.5	58.2	52.9	44.2	34.2	na	1.7%	-1.9%	-2.9%	-22.6%	na
Generation Capacity in GWe	16.1	19.6	22.5	22.8	22.7	na	4.0%	2.8%	0.2%	-0.6%	na
Nuclear	0.0	0.0	0.0	0.7	0.7	na	-	-	-	0.0%	na
Hydro & wind	3.5	4.4	5.7	6.0	5.9	na	5.1%	5.1%	1.1%	-2.3%	na
Thermal	12.7	15.2	16.8	16.1	16.1	na	3.7%	2.1%	-0.7%	0.0%	na
Average Load Factor in %	46.9	41.4	32.4	30.7	28.8	na	-2.5%	-4.7%	-0.9%	-6.3%	na
Fuel Inputs for Thermal Power Generation	11.3	19.9	22.3	16.2	13.2	na	12.0%	2.3%	-5.2%	-18.3%	na
Solids	4.7	7.0	7.1	6.7	5.6	na	8.4%	0.2%	-1.0%	-16.2%	na
Oil	1.5	2.8	6.2	3.3	3.4	na	13.1%	17.6%	-10.0%	1.4%	na
Gas	5.1	10.1	9.0	6.2	4.2	na	14.5%	-2.3%	-6.1%	-31.5%	na
Geothermal	0.0	0.0	0.0	0.0	0.0	na	-	-	-	-	na
Other	0.0	0.0	0.0	0.0	0.0	na	-	-	21.8%	10.0%	na
Average Thermal Efficiency in %	40.7	25.2	20.4	23.4	22.2	na	-9.2%	-4.1%	2.4%	-5.2%	na
Non-Energy Uses	1.4	1.2	1.1	1.7	1.9	na	-3.5%	-1.8%	7.7%	15.4%	na
Total Final Energy Demand	57.6	49.0	43.0	28.0	26.5	na	-3.2%	-2.6%	-6.9%	-5.3%	na
Solids	6.6	6.8	3.7	1.6	1.5	na	0.7%	-11.6%	-13.0%	-3.7%	na
Oil	13.4	8.9	8.0	6.8	7.4	na	-7.9%	-2.1%	-2.7%	8.2%	na
Gas	27.3	21.8	19.8	9.0	7.7	na	-4.3%	-1.9%	-12.3%	-14.4%	na
Electricity	4.6	5.1	4.7	3.4	3.3	na	1.9%	-1.8%	-5.1%	-3.2%	na
Heat	4.7	5.1	6.2	5.6	4.9	na	1.6%	3.8%	-1.5%	-13.0%	na
Other	0.9	1.2	0.6	1.6	1.7	na	4.8%	-13.2%	18.0%	10.0%	na
CO₂ Emissions in Mt of CO₂	176.9	175.3	165.7	116.3	107.4	na	-0.2%	-1.1%	-5.7%	-7.6%	na
Indicators											
Population (Million)	22.20	22.73	23.21	22.61	22.55	22.49	0.5%	0.4%	-0.4%	-0.2%	-0.3%
GDP (index 1985=100)	85.7	100.0	86.0	80.2	74.9	69.4	3.1%	-3.0%	-1.1%	-6.6%	-7.3%
Gross Inl Cons./GDP (toe/1990 MEUR)	2159.4	1849.4	2034.3	1634.7	1624.9	1520.2	-3.1%	1.9%	-3.6%	-0.6%	-6.4%
Gross Inl Cons./Capita (toe/inhabitant)	2.91	2.84	2.63	2.03	1.89	1.64	-0.5%	-1.5%	-4.3%	-6.9%	-13.0%
Electricity Generated/Capita (kWh/inhabitant)	2978	3121	2753	2714	2533	na	0.9%	-2.5%	-0.2%	-6.6%	na
CO ₂ Emissions/Capita (t of CO ₂ /inhabitant)	8.0	7.7	7.1	5.1	4.8	na	-0.7%	-1.5%	-5.3%	-7.4%	na
Import Dependency %	18.7	17.5	35.4	31.4	33.4	29.5	-1.4%	15.2%	-2.0%	6.3%	-11.8%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Estimates.



SLOVAKIA : SUMMARY ENERGY BALANCE

Mtoe	1980	1985	1990	1996	1997	1998(2)	85/80	90/85	96/90	97/96	98/97
Annual % Change											
Primary Production	3.4	4.8	5.3	4.8	4.7	4.4	7.1%	1.9%	-1.5%	-2.7%	-5.6%
Solids	1.7	1.7	1.4	1.1	1.1	1.2	-0.2%	-3.7%	-3.6%	2.2%	2.1%
Oil	0.0	0.1	0.1	0.1	0.1	0.0	9.5%	2.6%	-0.7%	-9.7%	-50.0%
Natural gas	0.1	0.3	0.3	0.2	0.2	0.2	17.8%	2.1%	-5.6%	-7.8%	-6.7%
Nuclear	1.2	2.4	3.1	2.9	2.8	2.6	15.7%	5.1%	-1.1%	-4.1%	-6.7%
Hydro & Wind	0.2	0.2	0.2	0.4	0.4	0.3	-1.3%	-2.3%	14.8%	-3.8%	-11.6%
Geothermal	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-
Other	0.2	0.1	0.2	0.1	0.1	0.1	-4.7%	5.2%	-12.2%	7.9%	-13.8%
Net Imports	17.4	16.7	16.5	13.0	12.5	12.6	-0.8%	-0.2%	-3.8%	-3.6%	0.4%
Solids	6.0	6.5	5.7	4.1	3.7	3.4	1.7%	-2.6%	-5.1%	-10.4%	-9.1%
Oil	7.4	5.9	4.7	3.5	3.3	3.8	-4.6%	-4.3%	-5.1%	-5.4%	15.8%
Crude oil	9.8	7.9	6.2	5.3	5.3	na	-4.1%	-4.9%	-2.4%	-1.3%	na
Oil products	-2.3	-2.0	-1.4	-1.9	-2.0	na	-2.5%	-6.9%	4.6%	6.1%	na
Natural gas	3.7	3.9	5.6	5.1	5.2	5.3	1.3%	7.4%	-1.5%	2.0%	1.9%
Electricity	0.3	0.4	0.4	0.3	0.4	0.1	4.8%	4.4%	-6.0%	13.6%	-66.1%
Gross Inland Consumption	20.8	21.7	21.4	17.7	17.2	16.9	0.8%	-0.3%	-3.1%	-2.5%	-2.0%
Solids	7.7	8.3	7.4	5.0	4.7	4.5	1.5%	-2.3%	-6.2%	-6.6%	-3.2%
Oil	7.5	6.0	4.7	3.4	3.3	3.7	-4.3%	-4.7%	-5.4%	-2.9%	11.8%
Natural gas	3.8	4.2	5.3	5.6	5.6	5.5	2.1%	4.8%	0.6%	1.5%	-2.0%
Other (1)	1.8	3.1	3.9	3.7	3.6	3.1	11.3%	4.7%	-1.0%	-2.3%	-13.1%
Electricity Generation in TWh	20.0	21.9	23.4	25.1	24.3	na	1.9%	1.3%	1.1%	-2.9%	na
Nuclear	4.5	9.4	12.0	11.3	10.8	na	15.7%	5.1%	-1.1%	-4.1%	na
Hydro & wind	2.3	2.1	1.9	4.3	4.1	na	-1.3%	-2.3%	14.8%	-3.9%	na
Thermal	13.2	10.4	9.5	9.5	9.4	na	-4.6%	-1.8%	0.0%	-1.1%	na
Generation Capacity in GWe	0.9	1.8	6.3	7.4	7.4	na	14.9%	29.2%	2.7%	0.0%	na
Nuclear	0.9	1.8	1.8	1.8	1.8	na	14.9%	0.0%	0.0%	0.0%	na
Hydro & wind	0.0	0.0	1.7	2.4	2.4	na	-	-	6.3%	0.0%	na
Thermal	0.0	0.0	2.9	3.3	3.3	na	-	-	2.0%	0.0%	na
Average Load Factor in %	259.0	142.3	42.2	38.5	37.3	na	-11.3%	-21.6%	-1.6%	-2.9%	na
Fuel Inputs for Thermal Power Generation	2.8	2.9	2.8	2.8	2.7	na	0.2%	-0.3%	0.0%	-3.9%	na
Solids	2.0	2.2	2.0	1.9	1.9	na	1.5%	-1.5%	-1.2%	-0.4%	na
Oil	0.6	0.4	0.2	0.2	0.1	na	-6.3%	-9.3%	-1.0%	-37.3%	na
Gas	0.3	0.3	0.6	0.7	0.7	na	2.1%	12.9%	2.2%	7.9%	na
Geothermal	0.0	0.0	0.0	0.0	0.0	na	-	-	-	-	na
Other	0.0	0.0	0.0	0.1	0.0	na	-	-	-	-100.0%	na
Average Thermal Efficiency in %	39.9	31.2	28.8	28.8	29.7	na	-4.8%	-1.6%	0.0%	3.0%	na
Non-Energy Uses	0.6	0.8	2.3	1.9	2.0	na	5.4%	24.1%	-2.7%	2.8%	na
Total Final Energy Demand	14.3	14.0	14.6	11.5	11.1	na	-0.3%	0.7%	-3.9%	-3.0%	na
Solids	4.1	4.4	4.8	2.9	2.6	na	1.6%	1.8%	-8.4%	-10.6%	na
Oil	5.0	3.8	3.2	1.9	1.9	na	-5.1%	-3.6%	-8.7%	-0.1%	na
Gas	2.9	3.2	3.7	3.9	4.0	na	2.0%	2.7%	1.1%	1.0%	na
Electricity	1.6	1.8	2.0	2.0	2.0	na	2.4%	1.8%	0.0%	-2.7%	na
Heat	0.5	0.5	0.6	0.8	0.7	na	3.8%	3.6%	3.6%	-12.5%	na
Other	0.2	0.1	0.2	0.0	0.1	na	-4.7%	5.2%	-43.2%	1392.8%	na
CO₂ Emissions in Mt of CO₂	50.0	48.8	49.9	37.7	36.7	na	-0.5%	0.5%	-4.6%	-2.8%	na
Indicators											
Population (Million)	4.98	5.19	5.28	5.34	5.38	5.41	0.8%	0.3%	0.2%	0.7%	0.5%
GDP (index 1985=100)	92.5	100.0	107.2	98.3	104.7	109.3	1.6%	1.4%	-1.4%	6.5%	4.4%
Gross Inl Cons./GDP (toe/1990 MEUR)	1981.3	1908.0	1756.6	1582.0	1448.9	1359.7	-0.8%	-1.6%	-1.7%	-8.4%	-6.2%
Gross Inl Cons./Capita (toe/inhabitant)	4.18	4.17	4.04	3.30	3.20	3.12	0.0%	-0.6%	-3.3%	-3.2%	-2.5%
Electricity Generated/Capita (kWh/inhabitant)	4006	4226	4435	4690	4519	na	1.1%	1.0%	0.9%	-3.7%	na
CO ₂ Emissions/Capita (t of CO ₂ /inhabitant)	10.0	9.4	9.4	7.1	6.8	na	-1.3%	0.1%	-4.7%	-3.5%	na
Import Dependency %	83.5	76.9	77.0	73.8	72.9	74.6	-1.6%	0.0%	-0.7%	-1.2%	2.4%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Estimates.

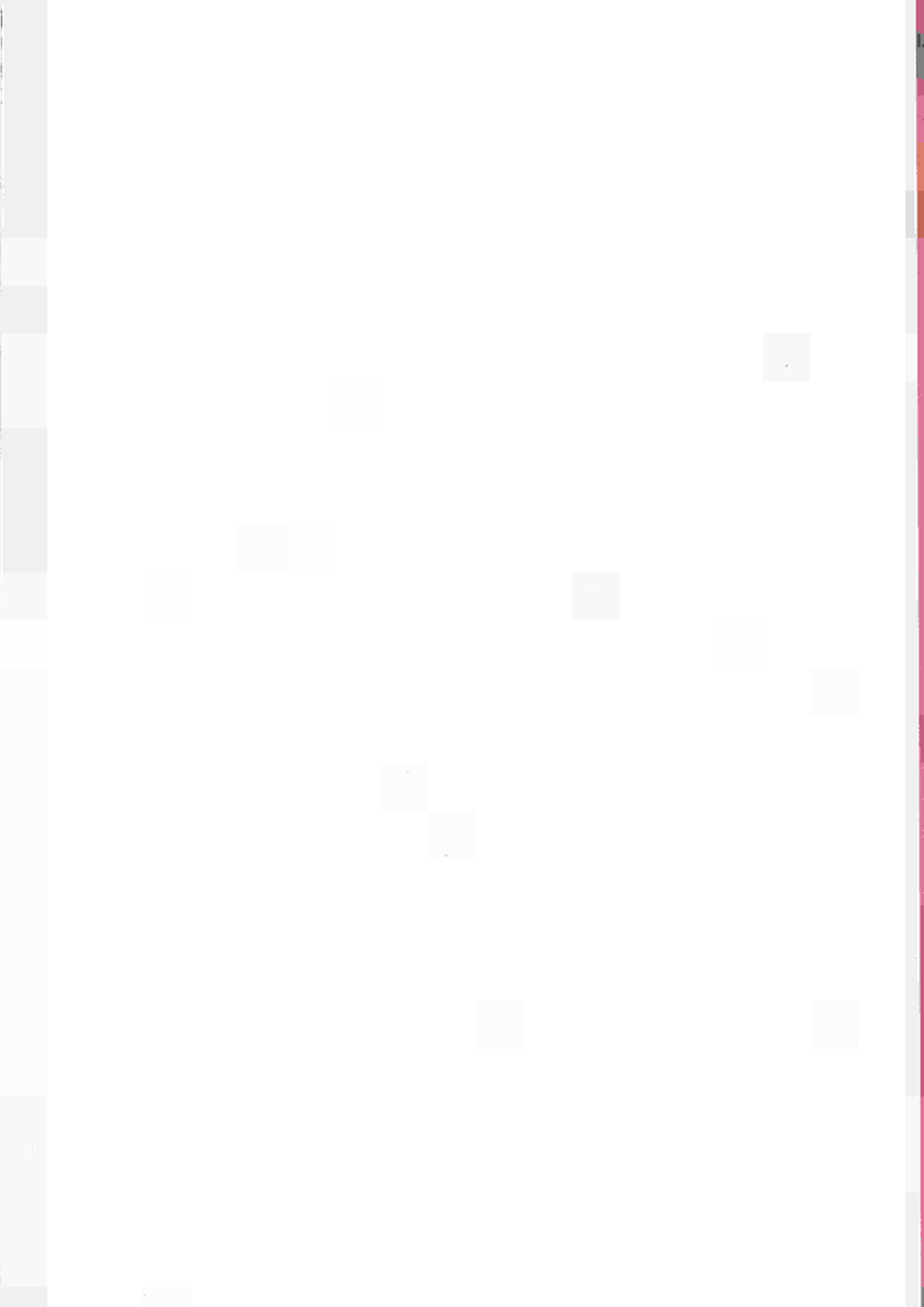
SLOVENIA : SUMMARY ENERGY BALANCE

Mtoe	1990	1992	1995	1996	1997	1998(2)	95/90	96/95	97/96	98/97
Primary Production	2.7	2.8	2.8	2.8	2.9	2.9	1.1%	-1.7%	3.9%	1.5%
Solids	1.2	1.2	1.0	1.0	1.1	1.0	-2.6%	-2.3%	3.8%	-2.7%
Oil	0.0	0.0	0.0	0.0	0.0	0.0	-7.8%	-50.0%	0.0%	0.0%
Natural gas	0.0	0.0	0.0	0.0	0.0	0.0	-4.9%	-28.6%	-10.0%	0.0%
Nuclear	1.2	1.0	1.2	1.2	1.3	1.4	0.7%	-4.5%	10.0%	4.2%
Hydro & Wind	0.3	0.3	0.3	0.3	0.3	0.3	1.9%	13.3%	-15.8%	6.5%
Geothermal	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-
Other	0.0	0.2	0.2	0.2	0.2	0.2	-	0.0%	0.0%	-0.2%
Net Imports	2.5	2.1	3.0	3.4	3.5	3.7	3.6%	14.1%	2.8%	4.4%
Solids	0.1	0.1	0.2	0.2	0.2	0.2	8.2%	16.5%	-16.4%	15.4%
Oil	1.8	1.6	2.3	2.7	2.8	2.9	4.6%	18.4%	2.8%	2.8%
Crude oil	0.6	0.6	0.6	0.5	0.6	na	0.3%	-11.9%	18.7%	na
Oil products	1.2	1.0	1.7	2.2	2.2	na	6.5%	29.4%	-1.1%	na
Natural gas	0.7	0.5	0.7	0.6	0.7	0.8	0.7%	-4.3%	9.3%	6.3%
Electricity	-0.1	-0.2	-0.1	-0.1	-0.1	-0.1	10.8%	0.0%	2.8%	-2.7%
Gross Inland Consumption	5.3	4.9	5.9	6.2	6.4	6.6	2.3%	4.9%	3.4%	3.2%
Solids	1.4	1.3	1.2	1.2	1.3	1.2	-2.9%	-5.1%	9.1%	-2.7%
Oil	1.8	1.6	2.3	2.7	2.7	2.9	5.7%	16.5%	-0.7%	5.5%
Natural gas	0.7	0.6	0.7	0.7	0.7	0.8	-0.4%	-2.2%	9.0%	6.3%
Other (1)	1.4	1.4	1.6	1.6	1.7	1.7	3.7%	-1.2%	4.0%	2.7%
Electricity Generation in TWh	12.4	12.1	12.6	12.8	13.2	na	0.3%	1.0%	3.1%	na
Nuclear	4.6	4.0	4.8	4.6	5.0	na	0.7%	-4.5%	10.0%	na
Hydro & wind	3.0	3.4	3.2	3.7	3.1	na	1.9%	13.3%	-15.8%	na
Thermal	4.9	4.7	4.6	4.5	5.1	na	-1.0%	-2.0%	11.5%	na
Generation Capacity in GWe	2.5	2.5	2.5	2.5	2.5	na	-0.4%	0.0%	0.0%	na
Nuclear	0.6	0.6	0.6	0.6	0.6	na	0.0%	0.0%	0.0%	na
Hydro & wind	0.8	0.8	0.8	0.8	0.8	na	0.1%	0.0%	0.0%	na
Thermal	1.1	1.1	1.1	1.1	1.1	na	-0.8%	0.0%	0.0%	na
Average Load Factor in %	56.1	54.5	58.1	58.6	60.5	na	0.7%	1.0%	3.1%	na
Fuel Inputs for Thermal Power Generation	1.3	1.2	1.2	1.1	1.1	na	-1.6%	-5.0%	-2.3%	na
Solids	1.1	1.0	1.0	0.9	1.0	na	-1.3%	-5.2%	10.4%	na
Oil	0.2	0.1	0.1	0.1	0.1	na	-5.0%	5.8%	-58.3%	na
Gas	0.1	0.1	0.1	0.1	0.0	na	-0.7%	-18.8%	-76.9%	na
Geothermal	0.0	0.0	0.0	0.0	0.0	na	-	-	-	na
Other	0.0	0.0	0.0	0.0	0.0	na	-	-	-	na
Average Thermal Efficiency in %	32.4	32.4	33.5	34.5	39.4	na	0.6%	3.1%	14.1%	na
Non-Energy Uses	0.0	0.0	0.1	0.2	0.1	na	79.2%	36.0%	-26.5%	na
Total Final Energy Demand	3.4	3.3	4.0	4.4	4.5	na	3.2%	10.7%	2.7%	na
Solids	0.3	0.2	0.1	0.1	0.1	na	-16.3%	-1.5%	-17.8%	na
Oil	1.5	1.5	2.1	2.5	2.5	na	6.8%	15.7%	2.5%	na
Gas	0.5	0.4	0.4	0.5	0.5	na	-3.5%	15.4%	11.9%	na
Electricity	0.8	0.8	0.8	0.8	0.8	na	-0.8%	1.2%	3.7%	na
Heat	0.2	0.2	0.2	0.2	0.2	na	1.6%	6.8%	-4.9%	na
Other	0.0	0.3	0.3	0.3	0.3	na	-	-0.1%	0.0%	na
CO₂ Emissions in Mt of CO₂	12.3	11.4	12.8	13.9	14.1	na	0.9%	7.9%	1.9%	na
Indicators										
Population (Million)	2.00	2.00	1.99	1.99	1.99	1.98	-0.1%	0.1%	-0.3%	-0.1%
GDP (index 1990=100)	100.0	119.0	134.1	138.2	143.3	148.9	6.0%	3.1%	3.7%	3.9%
Gross Inl Cons./GDP (toe/1990 MEUR)	386.0	305.3	322.3	328.1	327.1	325.0	-3.5%	1.8%	-0.3%	-0.7%
Gross Inl Cons./Capita (toe/inhabitant)	2.63	2.47	2.95	3.10	3.21	3.32	2.4%	4.9%	3.7%	3.3%
Electricity Generated/Capita (kWh/inhabitant)	6227	6052	6356	6414	6629	na	0.4%	0.9%	3.4%	na
CO ₂ Emissions/Capita (t of CO ₂ /inhabitant)	6.1	5.7	6.5	7.0	7.1	na	1.0%	7.8%	2.2%	na
Import Dependency %	48.0	42.6	51.7	56.1	55.8	56.4	1.5%	8.6%	-0.6%	1.2%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Estimates.

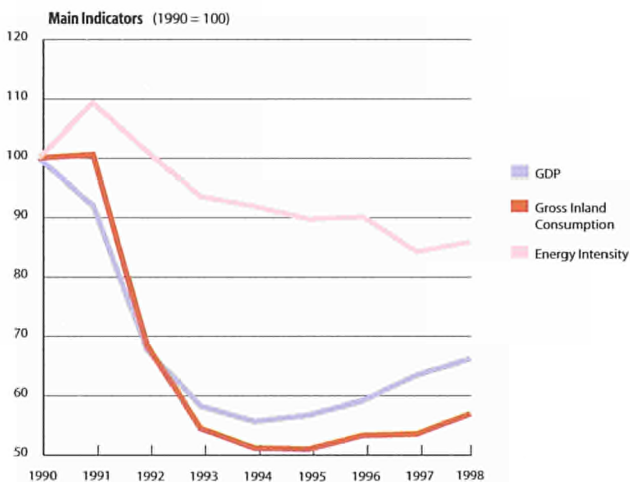




The Baltic States: Major trends (1990-1998)

- . Economies began to recover over the last three years, pushed by Estonia
- ...but the economic dependence upon Russia remains of importance
- . Both energy production and demand decreased strongly until 1994 but only production has recovered since then
- . Final demand has halved since 1990, but the transport sector has increased its share
- . Primary energy production, concentrated on oil shale and nuclear, decreased substantially
- . The future of nuclear power plants remains in question
- . Energy intensity improved globally by 14% since 1990 but country variations were very important
- . CO₂ emissions dropped by 53% between 1990 and 1995, remaining stable since then
- . Energy import dependency declined slowly to 49% in 1997

The Baltic countries comprise Estonia, Latvia and Lithuania, previously part of the former USSR. Reliable economic and energy indicators for these countries seem almost impossible to gather over a long-term period. This situation prevailed before independence, as generally observed elsewhere in the former USSR, due to aggregation of figures for several Republics and to nonstandardised methods of recording economic and energy data. As a consequence, the energy data and indicators described below must be interpreted very carefully, in particular data related to the year 1990 and to biomass.



Economies began to recover over the last three years, pushed by Estonia...

The separation from the former USSR provoked a severe economic crisis in the Baltic countries, as their main economic relations had been restricted to the former Soviet Republics. GDP dropped by about 44% between 1990 and 1994 but stabilised in 1995 and has begun to recover vigorously over the last three years, +5.3% per year on average. This evolution is due to several factors, including the disruption of trading links with other former Soviet

Republics, the transformation of these centrally-planned economies to market-based ones and the reorientation of trade towards the West. All three Republic are candidates for accession to the European Union but Estonia is presently the best positioned.

... but the economic dependence upon Russia remains of importance

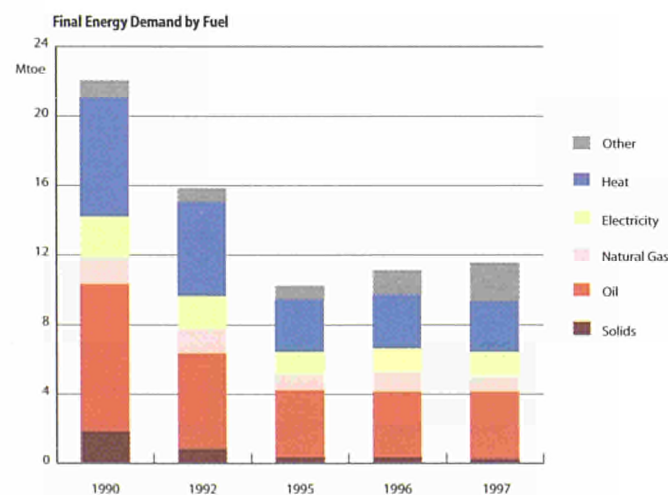
Estonia's economy has grown steadily since 1994, spurred by economic liberalisation and privatisation. The privatisation programme has been run by the Estonian privatisation agency, which was established in 1992. Privatisation of small and medium-sized companies has been completed in Estonia, whilst that of large-scale enterprises, such as energy, is in progress. The 1998 Estonian GDP corresponded to 82% of its 1990 level. The Estonian Government is giving high priority to the energy sector in its ongoing economic reform programme. Lithuania has moved to open up its economy by privatising industry. An agreement has already been reached to privatise much of its oil sector, and Lithuania has also established a commission to restructure and privatise its electric power company. However, the economy slowed down at the end of 1998 as a result of the financial crisis in neighbouring Russia, and Lithuania entered a recession in 1999. The 1998 Lithuanian GDP was only 66% of its 1990 level. Latvia has complete privatisation of many small and medium sized enterprises, with privatisation of most large firms planned for 2000. Many of the largest foreign investments have taken place in the energy sector. The 1998 Latvian GDP represented 57% of its 1990 level. However, although the Baltic countries have reoriented somewhat towards the West, their relations with Russia, the major power in the region, remain of great importance. Russia remains a major trading partner with all three countries. In addition, they depend upon Russia for almost all of their oil and gas supplies. A major illustration of this economic dependence was the great impact of the Russian financial crisis upon the Baltic States, whilst its implications for other Eastern countries were far more limited.

ENERGY OUTLOOK

Both energy production and demand decreased strongly until 1994 but only production has recovered since then...

As a direct consequence of economic restructuring, both **energy production and gross inland energy consumption** have decreased significantly since 1990. The production of energy declined from 11.6 Mtoe in 1990 to 6.9 Mtoe in 1994 and rebounded to 10.2 Mtoe in 1998, whereas the gross inland energy consumption decreased from 35.1 Mtoe in 1990 to 18.0 Mtoe in 1994 and then increased again to reach 20.0 Mtoe in 1998. Demand for all fossil fuels was severely reduced: between 1990 and 1998, consumption of solid fuel dropped by 56%, and of oil products and natural gas by 54%. Only the consumption of non-fossil fuels (nuclear, biomass and hydro) increased substantially over this period, driven by biomass. This last observation should be interpreted with care because non-commercial energy was not explicitly recorded in former Soviet Union statistics.

These developments resulted directly from the trends in **total final energy demand**, mainly constituted by oil and distributed heat which accounted for one third each. Total final demand halved between 1990 and 1997; the reduction reached 55% in 1995 and has recovered slowly since then. The demand for oil, gas and distributed heat fell in absolute terms by 55%, 40% and 57% respectively in the region as a whole. At the same time, demand for electricity decreased by 42% and solid fuels by 84%. This evolution resulted both from the economic climate and effective increases of energy prices with energy markets adjusting abruptly to the reality of world or regional market prices. The contraction of the total demand was similar in Estonia and Lithuania, -53% since 1990, and a little less in Latvia, -37%.



Main items

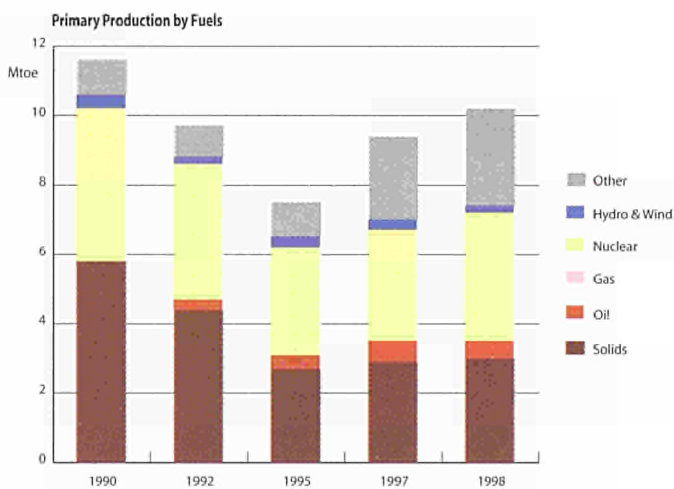
The three small Baltic States - Estonia, Latvia and Lithuania - achieved legal independence from the former Soviet Union in September 1991. Since then they have wanted economic and political realignment with Europe; and all three have applied for membership of the European Union. Not surprisingly, following decades of close economic integration within the FSU, it is proving difficult to adjust their economies. In the early 1990s, they all experienced steep falls in living standards and industrial production. Progressive economic reform - including prudent budgetary policies, liberalisation and privatisation, supported by international loans - have since 1995 led to much greater macroeconomic stability and GDP growth. Even so, in 1998 these countries' GDP was still below the 1990 level. Despite efforts to diversify their economic and trade relations, Russia remains by far the largest trading partner. The most recent Russian financial crisis impacted upon trade and created some uncertainty about their medium-term economic prospects. Energy resources are limited, comprising small reserves of coal, shale oil and off-shore oil in the Baltic Sea; modest hydro-electric capacity; the Ignalina nuclear plant in Lithuania (though this is scheduled for closure on safety grounds); and peat and timber. As a result, the Baltic States remain heavily dependent upon oil and gas imports from Russia. In future they could well become important for the transit of Russian oil and gas exports into eastern and western Europe.

Final demand has halved since 1990, but the transport sector increased its share... The evolution of the sectoral composition of final energy demand demonstrated the effects of the severe economic crisis which resulted in a steep reduction in industrial production and a subsequent lowering of living standards. Between 1990 and 1995 total energy consumption by industry decreased by 60% while tertiary-domestic consumption declined by 57%. At the same time, energy demand for transport fell by only 24% as a result of the increasing importance of transport in the new market economies especially the growth in car ownership. The first signs of real economic recovery occurred only in 1996 and were confirmed over the next two years. Subsequently energy consumption by industry and by transport increased slowly but that of the tertiary-domestic sector continued to decline. Consequently the transport sector's share of final demand increased from 15% in 1990 to 24% in 1997 at the expense of the tertiary-domestic sector (from 55% to 51%) and industry (from 30% to 25%).

Electricity's overall share in final energy demand has remained relatively unchanged since 1990, reaching 20% in industry but only 14% in the tertiary-domestic sector. These levels remained well below European Union averages and demonstrate the large potential for increases in electricity demand in future as living standards improve.

Primary energy production concentrated on oil shale and nuclear, decreased substantially...

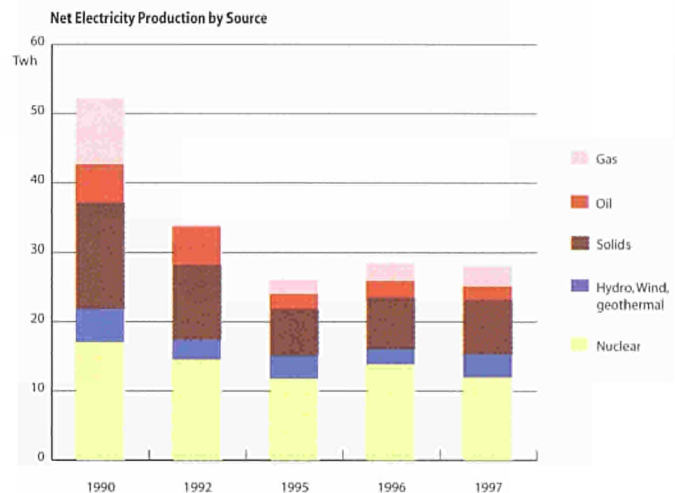
The Baltic countries are energy producers of solid fuel, mainly shale oil in Estonia, and nuclear electricity in Lithuania. Production has declined significantly between 1990 and 1994, by 48% for oil shale and by 52% for nuclear electricity as export markets to other Republics disappeared. Since 1994, oil shale production has stabilised at about 3 Mtoe. Nuclear output, however, showed an increasing trend but still remained in 1998 15% below its 1990 peak. A limited production of oil started in Lithuania. On the other hand, biomass production seems to have increased substantially since 1990. However, the accuracy of this data awaits confirmation. The statistical series on biomass experienced a discontinuity in 1996, with complete stability before 1996 but a rapid increase after this date.



The future of nuclear power plants remains in question...

Electricity generation capacity has remained almost constant since 1990 at about 11 GWe, the only major modification being the commissioning of 600 MWe of pump storage units in 1994. Thermal power stations represented 58% of the capacity in 1997, the balance being covered by nuclear energy (22%) and hydro (20%). The load factor dropped dramatically from 55% to 29% over the period as, at the same time, electricity production fell by about 46%. Solid fuels (62% in 1997), natural gas (23%) and oil (15%) met demand from thermal power stations, production from

which was almost equivalent to that from nuclear units in 1997. Between 1990 and 1994, the contribution of natural gas fell drastically (-75%) due to supply reductions imposed by Gazprom as a means of securing payment for deliveries. Since 1994, gas deliveries have increased a little but still remained two-thirds lower than in 1990.



The Ignalina nuclear power station in Lithuania is a major concern because it is a RBMK type reactor, the same design used at Ukraine's Chernobyl nuclear plant. The EU has made closure of the Ignalina plants a pre-condition for Lithuanian membership of the European Union, and the Lithuanian parliament has agreed to the closure of Ignalina's Unit 1. To facilitate the closure and develop alternative sources of power, the European Union announced at the end of 1999 that it would provide an initial 10 million Euros in aid to Lithuania through its Phare programme, as well as an additional 20 million Euros per year from 2000-2006. Although the European Union would like both units of Ignalina to be closed, the Lithuanian parliament may not approve closure of the second unit until completion of the next version of the national energy strategy in 2004.

COMPETITIVENESS

Energy intensity improved globally by 14% since 1990 but country variations were very important...

In terms of **energy intensity**, as energy consumption declined more rapidly than economic activity between 1990 and 1995, a decrease of 10% was observed during this transition period. But, as this region is relatively small, rapid shifts in energy intensity could result merely from closing or opening a single large industrial plant. Since 1995, despite the rebound of economic activity,

energy intensity has continued to improve on average by 1.4% per year with marked annual fluctuations: +0.4% in 1996, -6.5% in 1997 and +2.0% in 1998. Major advances were observed in Estonia (-35% since 1990) and Lithuania (-19%); although energy intensity in Latvia increased regularly to be finally 17% higher in 1997 than in 1990.

The evolution of sectoral energy intensity was marked by the continued improvement of power stations, apart from a 4.7% increase in 1996. Industry, confronted with restructuring and modernisation, improved its energy intensity between 1990 and 1995 by about one third, but intensity has increased slowly since then with the resurgence of industrial activity. The tertiary-domestic sector, now faced with energy prices more in line with market prices, demonstrated a significant improvement (-26% since 1990) even if lifestyle modifications - such as higher penetration of electrical appliances - created additional consumption. Finally the energy intensity of transport increased by 25%.

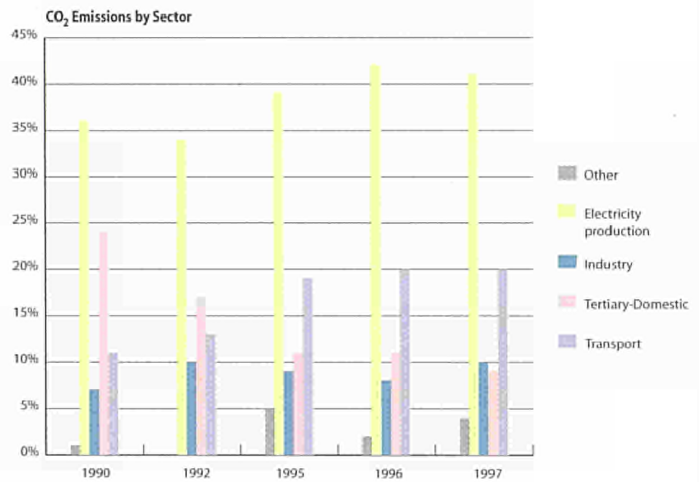
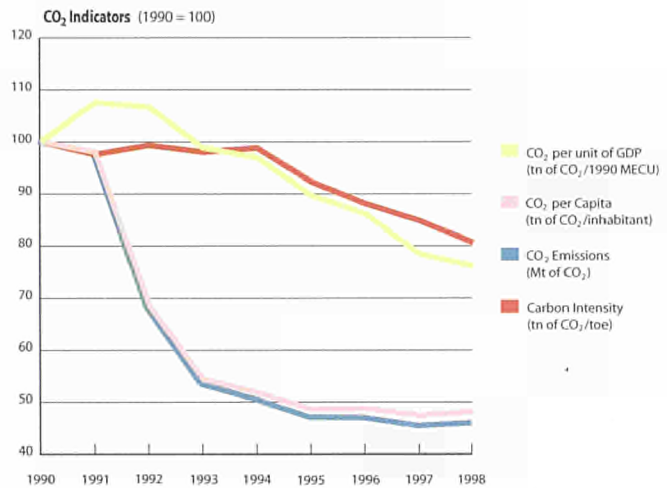
The **gross inland energy consumption per capita** dropped from 4.41 to 2.31 toe/inhabitant over the period 1990-1995, but rebounded to 2.47 toe/inhabitant in 1997.

ENVIRONMENT

CO₂ emissions dropped by 53% between 1990 and 1995, remaining stable since then...

As final energy consumption has fallen significantly since 1990, **CO₂ emissions** followed the same trend: from 87 Mt. CO₂ in 1990 to 40 Mt. CO₂ in 1998 (a 54% drop over eight years). Since 1995, growing contributions from nuclear and biomass have led to a stabilised consumption of fossil fuels within overall gross inland energy consumption. Consequently CO₂ emissions were stable over the last four years. As the population of the Baltic countries remained essentially steady over the period, the **per capita CO₂ emissions** followed the same trend, and dropped from 11.0 to 5.2 tonnes of CO₂/inhabitant over the period, compared to an average value for the EU of 8.4 over the same period.

Turning to CO₂ emissions by sector at the regional level, the largest sector in terms of emissions is power generation with about 41% of total emissions in 1997 (36% in 1990). Transport, rapidly emerging as the second contributor, accounted for 20% in 1997 as against 11% in 1990. The tertiary-domestic sector declined to 9% in 1997 from 24% in 1990 whereas industry increased from 7% in 1990 to 10% in 1997.



GLOBAL MARKETS

Energy import dependency declined slowly to 49% in 1997...

The Baltic countries are **energy importers** of coal, but especially of oil and gas, from the CIS. These imports dropped by 52% between 1990 and 1993 but have been quite stable since then, the structure by product also remaining unchanged. Historically, with a large capacity based upon nuclear power, the Baltic countries have been net exporters of electricity to neighbouring republics of the Former Soviet Union. But electricity exports disappeared as early as 1993. As gross energy consumption dropped by 44% over the period, the **energy import dependency** fell from 65% in 1990 to 50% in 1997.



BALTIC COUNTRIES : SUMMARY ENERGY BALANCE

Mtoe	1990	1995	1996	1997	1998(3)	95/90	96/95	97/96	98/97
Primary Production	11.6	7.5	9.0	9.4	10.2	-8.3%	19.6%	4.1%	8.5%
Solids (1)	5.8	2.7	3.0	2.9	3.0	-14.2%	12.2%	-3.8%	3.9%
Oil	0.0	0.4	0.5	0.6	0.5	-	13.2%	14.9%	-12.9%
Natural gas	0.0	0.0	0.0	0.0	0.0	-	-	-	-
Nuclear	4.4	3.1	3.7	3.2	3.7	-6.7%	17.7%	-13.6%	15.7%
Hydro & Wind	0.4	0.3	0.2	0.3	0.2	-7.6%	-34.0%	48.4%	-32.6%
Geothermal	0.0	0.0	0.0	0.0	0.0	-	-	-	-
Other	1.0	1.0	1.6	2.4	2.8	-0.4%	64.3%	50.8%	14.3%
Net Imports	22.9	10.8	10.3	9.6	10.0	-13.9%	-5.2%	-6.3%	4.3%
Solids	1.9	0.6	0.5	0.5	0.2	-21.1%	-17.0%	14.3%	-59.9%
Oil	14.1	6.8	6.4	5.6	6.3	-13.7%	-5.8%	-11.4%	12.6%
Crude oil	9.6	3.6	4.0	5.6	na	-17.8%	12.4%	38.6%	na
Oil products	4.6	3.2	2.3	0.0	na	-7.2%	-26.6%	-98.6%	na
Natural gas	8.2	3.6	3.7	3.7	3.6	-15.2%	1.7%	0.1%	-2.7%
Electricity	-1.3	-0.1	-0.2	-0.2	-0.1	-40.1%	134.3%	-3.8%	-55.7%
Gross Inland Consumption	35.1	17.9	18.7	18.8	20.0	-12.6%	4.6%	0.5%	6.4%
Solids	8.0	3.5	3.6	3.5	3.2	-15.2%	2.0%	-2.6%	-7.1%
Oil	14.6	6.6	6.4	6.2	6.7	-14.5%	-3.5%	-2.7%	6.7%
Natural gas	8.1	3.6	3.7	3.7	3.6	-14.8%	1.6%	0.2%	-2.9%
Other (2)	4.5	4.2	5.1	5.4	6.6	-1.7%	22.1%	6.8%	21.1%
Electricity Generation in TWh	52.2	26.2	28.5	28.1	na	-12.9%	8.7%	-1.3%	na
Nuclear	17.0	11.8	13.9	12.0	na	-7.0%	17.9%	-13.8%	na
Hydro & wind	4.9	3.3	2.2	3.3	na	-7.6%	-33.9%	48.5%	na
Thermal	30.3	11.1	12.3	12.8	na	-18.3%	11.6%	4.0%	na
Generation Capacity in GWe	10.8	11.1	11.1	11.1	na	0.5%	0.0%	0.0%	na
Nuclear	2.5	2.4	2.4	2.4	na	-1.1%	0.0%	0.0%	na
Hydro & wind	1.6	2.2	2.2	2.2	na	6.8%	0.0%	0.0%	na
Thermal	6.7	6.5	6.5	6.5	na	-0.7%	0.0%	0.0%	na
Average Load Factor in %	55.2	27.0	29.4	29.0	na	-13.3%	8.7%	-1.3%	na
Fuel Inputs for Thermal Power Generation	9.5	4.6	4.9	4.7	na	-13.5%	7.6%	-4.1%	na
Solids	4.8	2.8	2.9	2.9	na	-9.9%	3.6%	-0.3%	na
Oil	1.7	0.9	1.0	0.7	na	-12.6%	10.3%	-28.5%	na
Gas	3.0	0.9	1.0	1.1	na	-21.9%	18.1%	8.2%	na
Geothermal	0.0	0.0	0.0	0.0	na	-	-	-	na
Other	0.0	0.0	0.0	0.0	na	-	-	-	na
Average Thermal Efficiency in %	27.5	20.7	21.5	23.3	na	-5.5%	3.7%	8.4%	na
Non-Energy Uses	2.0	0.8	0.8	0.9	na	-17.9%	10.6%	3.2%	na
Total Final Energy Demand	22.0	10.3	11.1	11.5	na	-14.1%	8.0%	3.1%	na
Solids	1.9	0.4	0.4	0.3	na	-25.4%	-2.7%	-18.9%	na
Oil	8.4	3.8	3.7	3.8	na	-14.6%	-2.5%	1.3%	na
Gas	1.5	0.9	1.1	0.9	na	-10.1%	22.1%	-15.3%	na
Electricity	2.4	1.3	1.4	1.4	na	-11.1%	3.0%	2.1%	na
Heat	6.8	3.0	3.1	2.9	na	-15.1%	3.3%	-7.7%	na
Other	1.0	0.8	1.4	2.2	na	-3.5%	71.5%	51.7%	na
CO₂ Emissions in Mt of CO₂	87.4	41.1	41.0	39.7	40.1	-14.0%	-0.2%	-3.3%	1.1%
Indicators									
Population (Million)	7.96	7.72	7.67	7.63	7.59	-0.6%	-0.6%	-0.5%	-0.5%
GDP (index 1990=100)	100.0	56.8	59.2	63.5	66.3	-10.7%	4.1%	7.4%	4.4%
Gross Inl Cons./GDP (toe/1990 MEUR)	1376.1	1234.6	1240.1	1160.1	1182.8	-2.1%	0.4%	-6.5%	2.0%
Gross Inl Cons./Capita (toe/inhabitant)	4.41	2.32	2.44	2.47	2.64	-12.0%	5.2%	1.0%	6.9%
Electricity Generated/Capita (kWh/inhabitant)	6559	3394	3713	3683	na	-12.3%	9.4%	-0.8%	na
CO ₂ Emissions/Capita (t of CO ₂ /inhabitant)	11.0	5.3	5.4	5.2	5.3	-13.4%	0.4%	-2.8%	1.6%
Import Dependency %	65.2	59.5	53.7	49.2	49.1	-1.8%	-9.7%	-8.3%	-0.4%

(1) Includes oil shale.

(2) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

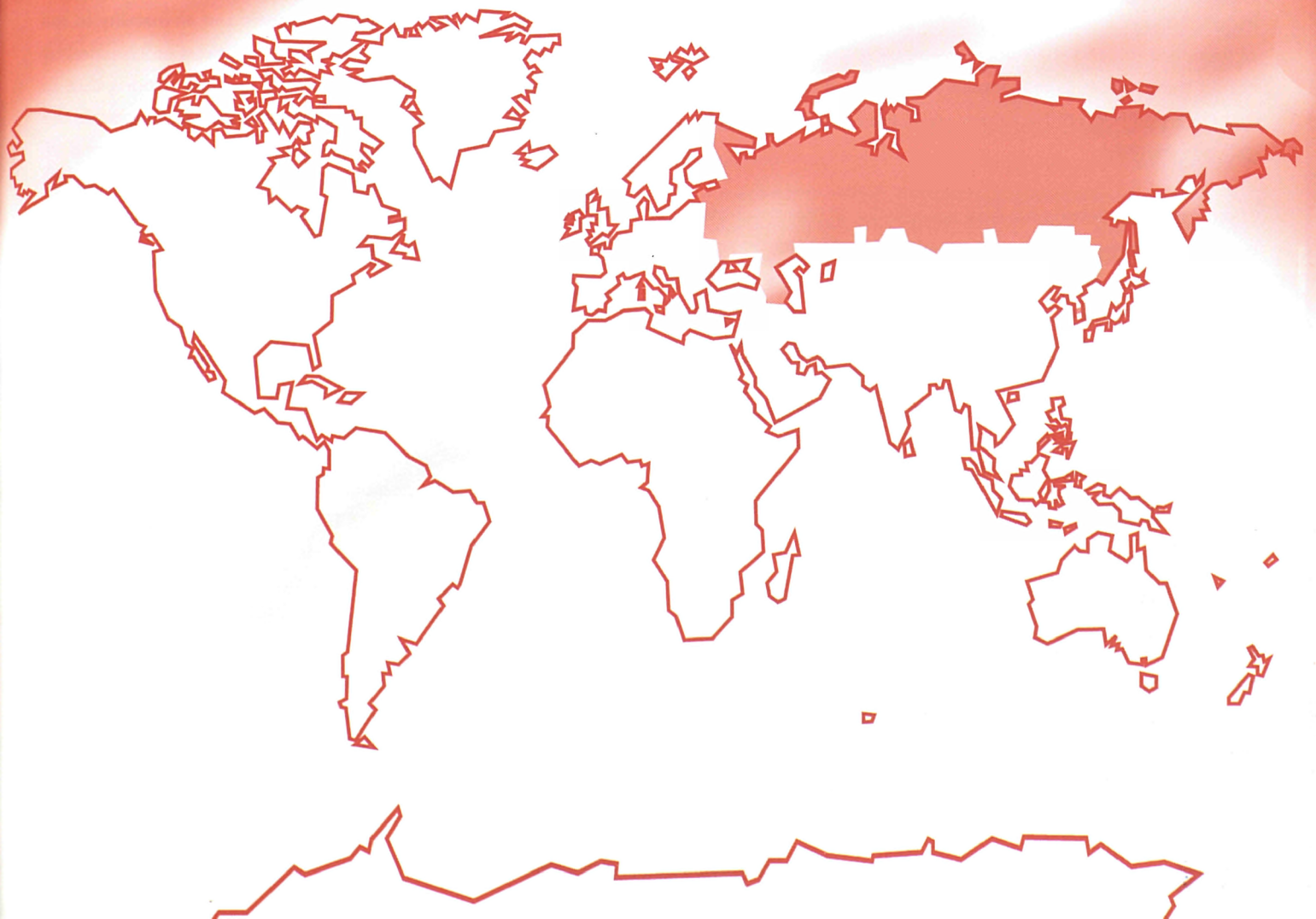
(3) Estimates.

BALTIC COUNTRIES : MAIN INDICATORS

	1990	1995	1996	1997	95/90	95/94	96/95	97/96
Gross Inland Consumption (Mtoe)	35.1	17.9	18.7	18.8	-12.6%	-0.3%	4.6%	0.5%
Public Thermal Power Generation	9.3	4.3	4.7	4.6	-14.0%	-6.6%	7.8%	-1.9%
Autoprod. Thermal Power Generation	0.2	0.2	0.3	0.1	0.3%	-11.8%	4.2%	-45.6%
Energy Branch	1.0	1.2	0.8	1.0	2.4%	19.4%	-27.3%	23.1%
Final Energy Consumption	21.9	10.1	10.9	11.1	-14.3%	-7.6%	7.0%	2.6%
Industry	6.5	2.4	2.7	2.8	-17.8%	-4.8%	9.9%	2.8%
Transport	3.3	2.5	2.6	2.6	-5.3%	6.7%	4.7%	-0.1%
Tertiary-Domestic	12.1	5.2	5.5	5.7	-15.7%	-14.4%	6.9%	3.7%
Energy Intensity (toe/1990 MEUR)	1376.1	1234.6	1240.1	1160.1	-2.1%	-2.4%	0.4%	-6.5%
Public Thermal Power Generation	362.3	299.4	310.0	283.2	-3.7%	-8.5%	3.6%	-8.6%
Autoprod. Thermal Power Generation	9.3	16.5	16.6	8.4	12.2%	-13.6%	0.1%	-49.4%
Industry	254.6	168.3	177.7	170.0	-7.9%	-6.8%	5.5%	-4.3%
Transport	130.3	174.4	175.4	163.1	6.0%	4.5%	0.5%	-7.0%
Tertiary-Domestic	474.6	356.0	365.5	353.0	-5.6%	-16.2%	2.7%	-3.4%
Energy per Capita (Kgoe/inhabitant)	4411.7	2321.9	2443.5	2467.0	-12.0%	0.4%	5.2%	1.0%
Industry	816.1	316.6	350.0	361.5	-17.3%	-4.2%	10.6%	3.3%
Transport	417.6	328.1	345.6	346.8	-4.7%	7.4%	5.3%	0.4%
Tertiary-Domestic	1521.4	669.6	720.2	750.7	-15.1%	-13.8%	7.5%	4.2%
Electricity Share (%)								
Final Energy Consumption	11%	13%	13%	12%	3.8%	4.9%	-3.8%	-0.4%
Industry	15%	21%	20%	20%	6.5%	5.1%	-6.9%	1.4%
Transport	2%	1%	1%	1%	-7.2%	-15.9%	-9.9%	0.1%
Tertiary-Domestic	11%	15%	14%	14%	6.7%	11.4%	-2.9%	-2.8%
Total Renewable Consumption (Mtoe)	1.4	1.1	1.6	2.5	-4.7%	-18.4%	44.8%	51.3%
Hydro	0.4	0.3	0.2	0.3	-7.6%	-11.8%	-34.0%	48.4%
Biomass	1.0	0.8	1.4	2.2	-3.5%	-20.4%	71.5%	51.7%
Other	0.0	0.0	0.0	0.0	-	-	-	-
Renewable intensity (toe/1990MEUR)	56.0	77.7	108.0	152.2	6.8%	-20.1%	39.1%	40.9%
Renewable per capita (Kgoe/inhabitant)	179.6	146.0	212.9	323.6	-4.0%	-17.8%	45.7%	52.0%
CO₂ Emissions (Mt of CO₂)	87.4	41.1	41.0	39.7	-14.0%	-6.9%	-0.2%	-3.3%
Public Thermal Power Generation	30.8	15.3	16.4	16.0	-13.0%	-7.5%	6.8%	-2.0%
Autoprod. Thermal Power Generation	0.8	0.7	0.7	0.4	-1.1%	-12.6%	4.7%	-47.4%
Energy Branch	1.0	2.0	0.8	1.4	13.8%	79.6%	-61.7%	83.2%
Industry	6.0	3.6	3.4	3.8	-9.6%	21.1%	-5.4%	9.4%
Transport	10.0	7.7	8.0	8.0	-5.2%	7.0%	4.8%	-0.1%
Tertiary-Domestic	21.1	4.4	4.3	3.4	-27.1%	-25.0%	-0.7%	-20.5%
Carbon Intensity (tn of CO₂/toe)	2.5	2.3	2.2	2.1	-1.6%	-6.6%	-4.6%	-3.7%
Public Power Generation	2.2	2.0	1.9	2.0	-2.0%	-16.1%	-3.2%	4.1%
Public Thermal Power Generation	3.3	3.5	3.5	3.5	1.1%	-0.9%	-1.0%	-0.1%
Autoprod. Power Generation	3.2	3.0	3.0	2.9	-1.3%	-1.0%	0.5%	-4.0%
Autoprod. Thermal Power Generation	3.2	3.0	3.0	2.9	-1.3%	-1.0%	0.5%	-3.3%
Energy Branch	1.0	1.7	0.9	1.3	11.1%	50.4%	-47.3%	48.8%
Industry	0.9	1.5	1.3	1.4	10.0%	27.3%	-13.9%	6.4%
Transport	3.0	3.0	3.0	3.0	0.1%	0.3%	0.1%	0.0%
Tertiary-Domestic	1.7	0.8	0.8	0.6	-13.5%	-12.4%	-7.1%	-23.4%
CO₂ per Capita (kg of CO₂/inhabitant)	10970	5329	5352	5201	-13.4%	-6.2%	0.4%	-2.8%
Industry	756	472	450	494	-9.0%	21.9%	-4.8%	9.9%
Transport	1255	993	1047	1051	-4.6%	7.7%	5.5%	0.4%
Tertiary-Domestic	2648	564	564	450	-26.6%	-24.5%	0.0%	-20.2%
CO₂ per unit of GDP (tn of CO₂/1990 MEUR)	3422	2833	2716	2446	-3.7%	-8.8%	-4.1%	-10.0%
Public Thermal Power Generation	1208	1057	1084	989	-2.6%	-9.4%	2.6%	-8.7%
Autoprod. Thermal Power Generation	30	49	50	24	10.8%	-14.4%	0.6%	-51.0%
Energy Branch	41	137	50	86	27.4%	75.9%	-63.2%	70.5%
Industry	236	251	228	232	1.3%	18.6%	-9.1%	1.8%
Transport	392	528	531	494	6.2%	4.8%	0.7%	-7.0%
Tertiary-Domestic	826	300	286	212	-18.3%	-26.6%	-4.6%	-26.0%

SUMMARY ENERGY BALANCE	ESTONIA				LATVIA				LITHUANIA			
	Mtoe	1991	1995	1997	1998	1991	1995	1997	1998	1991	1995	1997
Primary Production	5.1	3.3	3.8	4.0	1.2	0.7	1.6	1.7	4.8	3.6	4.0	4.4
Solids	4.8	2.6	2.8	2.9	0.4	0.1	0.1	0.1	0.0	0.0	0.0	0.0
Oil	0.1	0.3	0.4	0.3	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2
Natural gas	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nuclear	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.4	3.1	3.2	3.7
Hydro & Wind	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.2	0.0	0.0	0.0	0.0
Geothermal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other	0.2	0.3	0.6	0.7	0.5	0.4	1.3	1.5	0.3	0.2	0.5	0.5
Net Imports	4.1	1.9	1.8	1.6	6.4	3.4	2.9	3.3	13.4	5.6	4.9	5.1
Solids	0.7	0.3	0.3	0.0	0.4	0.1	0.1	0.1	0.6	0.1	0.1	0.1
Oil	2.5	1.0	0.9	1.1	3.2	2.1	1.6	2.2	9.0	3.6	3.1	3.1
Crude oil	0.0	0.0	0.0	na	0.0	0.0	0.0	na	11.8	3.6	5.6	na
Oil products	2.5	1.0	0.9	na	3.2	2.1	1.6	na	-2.8	0.0	-2.5	na
Natural gas	1.3	0.6	0.6	0.6	2.5	1.0	1.1	0.8	4.8	2.0	2.0	2.1
Electricity	-0.4	-0.1	-0.1	-0.1	0.4	0.2	0.2	0.2	-1.1	-0.2	-0.3	-0.2
Gross Inland Consumption	9.6	5.2	5.6	5.5	7.5	4.0	4.5	5.0	18.2	8.8	8.8	9.5
Solids	5.8	3.1	3.2	2.9	0.8	0.2	0.2	0.2	0.7	0.2	0.1	0.1
Oil	2.7	1.2	1.3	1.3	3.2	2.0	1.7	2.1	9.0	3.4	3.2	3.2
Natural gas	1.3	0.6	0.6	0.6	2.5	1.0	1.1	0.8	4.8	2.0	2.0	2.1
Other (1)	-0.2	0.3	0.5	0.7	1.1	0.7	1.5	1.9	3.7	3.2	3.4	4.0
Electricity Generation in Twh	14.6	8.7	9.2	na	5.6	4.0	4.5	na	29.4	13.5	14.4	na
Nuclear	0.0	0.0	0.0	na	0.0	0.0	0.0	na	17.0	11.8	12.0	na
Hydro & wind	0.0	0.0	0.0	na	3.3	2.9	3.0	na	0.3	0.4	0.3	na
Thermal	14.6	8.7	9.2	na	2.4	1.0	1.5	na	12.0	1.3	2.1	na
Generation Capacity in GWe	3.4	3.3	3.3	3.3	2.1	2.1	2.1	na	5.3	5.7	5.7	na
Nuclear	0.0	0.0	0.0	0.0	0.0	0.0	0.0	na	2.5	2.4	2.4	na
Hydro & wind	0.0	0.0	0.0	0.0	1.5	1.5	1.5	na	0.1	0.7	0.7	na
Thermal	3.4	3.3	3.3	3.3	0.6	0.6	0.6	na	2.7	2.6	2.6	na
Average Load Factor in %	48.9	30.2	32.0	na	30.8	22.0	24.9	na	63.4	27.1	28.8	na
Fuel Inputs for Thermal Power Generation	5.1	3.0	3.1	na	1.1	0.6	0.0	na	3.2	1.0	1.0	na
Solids	4.3	2.8	2.9	na	0.0	0.1	0.0	na	0.0	0.0	0.0	na
Oil	0.5	0.1	0.1	na	0.3	0.3	0.1	na	1.2	0.6	0.5	na
Gas	0.3	0.1	0.1	na	0.7	0.3	0.5	na	2.0	0.5	0.5	na
Geothermal	0.0	0.0	0.0	na	0.0	0.0	0.0	na	0.0	0.0	0.0	na
Other	0.0	0.0	0.0	na	0.0	0.0	0.0	na	0.0	0.0	0.0	na
Average Thermal Efficiency in %	24.7	25.3	25.7	na	18.7	15.1	19.4	na	31.9	11.0	18.5	na
Non-Energy Uses	0.3	0.2	0.2	na	0.0	0.0	0.0	na	1.9	0.5	0.6	na
Total Final Energy Demand	5.0	2.5	2.9	na	6.2	3.3	4.0	na	9.9	4.5	4.5	na
Solids	0.4	0.2	0.1	na	0.6	0.1	0.1	na	0.6	0.2	0.1	na
Oil	1.5	0.9	0.9	na	2.1	1.3	1.2	na	4.1	1.7	1.7	na
Gas	0.3	0.2	0.2	na	0.6	0.3	0.3	na	0.7	0.4	0.3	na
Electricity	0.6	0.4	0.4	na	0.7	0.4	0.4	na	1.0	0.5	0.6	na
Heat	2.1	0.6	0.6	na	1.7	0.9	0.9	na	3.2	1.6	1.3	na
Other	0.2	0.3	0.6	na	0.5	0.3	1.1	na	0.3	0.2	0.5	na
CO₂ Emissions in Mt of CO₂	31.5	16.7	17.3	na	19.4	9.6	8.7	na	34.7	14.8	13.7	na
Indicators												
Population (Million)	1.6	1.5	1.5	1.5	2.7	2.5	2.5	2.5	3.7	3.7	3.7	3.7
GDP (index 1985=100)	92.0	67.9	78.7	81.8	89.6	49.6	54.6	56.7	94.3	58.0	64.2	67.5
	1967.8	1431.8	1329.7	1275.8	858.6	817.5	831.9	901.6	1851.0	1452.9	1317.3	1347.8
Gross Inl Cons./GDP (toe/1985 MEUR)	1967.8	1431.8	1329.7	1275.8	858.6	817.5	831.9	901.6	1851.0	1452.9	1317.3	1347.8
Gross Inl Cons./Capita (toe/inhabitant)	6.1	3.5	3.8	3.8	2.8	1.6	1.8	2.0	4.9	2.4	2.4	2.6
Electricity Generated/Capita (Kwh/inhabitant)	9340.4	5853.8	6316.9	na	2113.4	1581.5	1826.0	na	7846.9	3639.3	3882.1	na
CO ₂ Emissions/Capita (t of CO ₂ /inhabitant)	20.1	11.2	11.8	na	7.3	3.8	3.5	na	9.3	4.0	3.7	na
Import Dependency %	41.8	36.0	31.2	28.8	84.2	81.8	59.2	64.8	73.5	63.4	55.7	53.9

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.



CIS: Major trends (1980-1998)

- Total decline of GDP reached 43% between 1990 and 1996, reinforced by the 1998 financial crisis
- Considering statistical series disruptions, final energy consumption fell by about 33% between 1990 and 1997
- Decline of final energy consumption accelerated since 1995, especially in industry and tertiary-domestic sectors
- Share of electricity was increasing but still remained lower than in OECD countries, especially in tertiary-domestic
- Gross inland energy consumption, met about 50% by natural gas, declined by 36% over ten years
- Russia remained the second biggest energy producer in the world after the United States
- Efforts to rationalise the coal industry were hampered by the payment arrears of consumers
- Crude oil production, concentrated in a small number of large fields, experienced an upturn since 1997
- Large oil potential of Caspian Basin still limited by the development of pipeline infrastructure
- In 1998 CIS again became the world's largest gas producer, just ahead of the United States
- CIS represented about 22% of the world's fossil fuel reserves, mainly located in Russia
- Gas power stations responsible for about 50% of total electricity generation
- Power sector in urgent need of financing to assure maintenance and required development
- Refining industry demonstrated a large overcapacity compared to the internal demand
- Energy intensity increased by 17% since 1990 and the near future appears unfavourable...
- ...but a large potential exists for improvement
- CO₂ emissions have fallen by 39% since 1990
- Energy exports peaked in 1998 to generate hard currency earnings

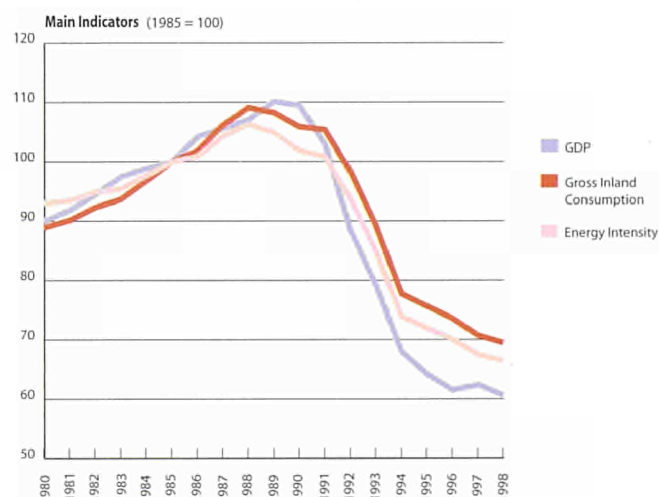
The Community of Independent States (CIS) includes the following twelve republics: Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine and Uzbekistan. In addition, as consolidated energy balances do not exist for Baltic countries before 1992, they are included in the total energy balances; if available, the contribution of these countries has been identified explicitly. As the contribution of these countries was limited to only 2% of the total gross inland consumption of the former USSR, the effect of this aggregation is limited.

Energy and macroeconomic data available for all these republics remained of dubious quality. Comparing data from key sources (OECD, PlanEcon, BP and the US Department of Energy) reveals significant differences. Furthermore, consecutive updates of annual data were marked by substantial statistical adjustments. Consequently comments are made on significant trends rather than relying on absolute values to draw analytical conclusions. In addition, some statistical series suffer from major time disruptions; and discrepancies still remain between the sum of all Republics and statistical data for the CIS as a whole, even for recent years.

Total decline of GDP reached 43% between 1990 and 1996, reinforced by the 1998 financial crisis...

The Russian Federation and other independent states, apart from the Baltics, have been in trouble since the beginning of their transition period. The implementation of reforms has been difficult politically and the short-term economic consequences painful.

The GDP contracted by 43% between 1990 and 1996. After rebounding modestly by 1.5% in 1997, GDP resumed its decline in 1998 amidst a profound financial crisis. The immediate cause of the Russian crisis was the growing loss of financial market confidence in the country's fiscal and international payments situation, leading to a loss of international reserves and an inability to roll over treasury bills as they matured. The crisis was accentuated by the rapid decline in earnings from oil and gas exports due to lower prices on international markets, and from the impact of the Asian economic and financial crisis which undermined confidence among international investors in emerging markets generally. In August 1998, pressure on the ruble led the Government to abandon efforts to maintain its stability. The Government also





imposed a 90-day moratorium on foreign-debt repayments without consulting the banking sector. The ruble immediately lost almost half of its value. Inflation, which had fallen to 11% in 1997, surged to more than 50% in September 1998 alone. The crisis undermined the fragile confidence in banks that had been achieved, disrupting transactions between businesses and exacerbating the effects of the devaluation. Consequently PlanEcon radically revised its GDP forecast for Russia for 1999 from +4.2% to -5%, with no positive GDP growth expected before 2001.

Russia, whose economy dominates the CIS, accounts for slightly more than 68% of total GDP. Politically and economically Russia dominates all the regions. Despite a wealth of natural resources, a well-educated population and a diverse industrial base, Russia continues to struggle to make the transition from the centrally planned economy of the Soviet era to a modern market economy. Ukraine, the second largest economy with just 13% of total GDP, accentuated the trends apparent in Russia. With the continuous decline of economic activities from 1990, GDP in 1998 had fallen 58% on 1990 levels by 1998. On the other hand, other republics were more contrasted with maximum declines by 68% in Moldova and 67% in Georgia but only 21% in Belarus and 9% in Uzbekistan. Moldova excepted, the economic situation has been improving in these republics since 1995.

ENERGY OUTLOOK

Considering statistical series disruptions, final energy consumption fell by about 33% between 1990 and 1997...

Final energy demand peaked in 1989 at 892 Mtoe but, since then, has experienced an accelerated decline down to 571 Mtoe in 1997, a fall of more than 36% over 8 years. But this observation needs to be placed in context. In fact, statistical series were somewhat disrupted in 1992. In particular the accounting of heat generation produced by local heating plants has improved since 1992. As a result of this, heat consumption was accounted for at the final stage instead of by the fuels used to produce it; and, as a consequence, production losses were reported in the transformation sector. The volume of heat generation produced by local heating plants averaged 130 Mtoe in 1992. That corresponds to about 25 Mtoe of losses reported in the transformation sector. Even allowing for this statistical adjustment, final energy demand still experienced a decline of about 33% between 1990 and 1997.

With all the modifications which occurred in 1992 it is difficult to evaluate precisely the evolution of consumption by fuel since 1990. Over the period 1992-1997 for which consistent data were available, total final energy demand fell continuously. Those fuels

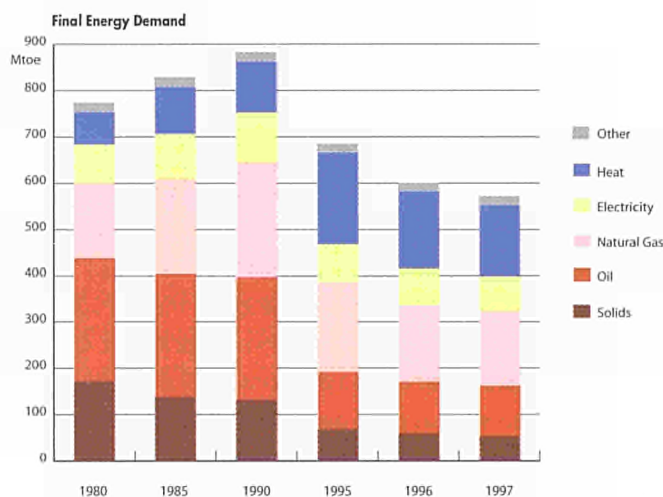
Main items

Since 1990 the progressive disintegration of the former Soviet Union has caused a severe, sustained, economic collapse and continuing political uncertainty. Economic transition in the CIS has encountered major difficulties. Poor economic data make precise measurement difficult, but the region's GDP, industrial production and living standards have all fallen steeply. In 1998 yet another Russian financial crisis undermined earlier efforts to stabilise the currency and control inflation. Debts accumulated further; and inward investment flows were heavily curtailed and even reversed. Creation of privately-owned banking, service and industrial enterprises was further disrupted, with mounting arrears (unpaid bills and salaries). Other regional economies suffered similar reversals to differing extents. The CIS has huge reserves of coal, oil and especially gas - making it a crucial player on EU and world energy markets. Despite recent reductions in oil and gas output, petroleum exports increased given the collapse in internal market demand. Lower petroleum prices seriously affected export earnings and government revenues. Yet greater foreign investment in gas production has been secured; and several major pipeline projects are under construction. In future, gas exports will expand considerably, notably to the EU and eastern and southern Europe. The inefficient Russian and Ukrainian coal industries are being restructured. Much of the CIS suffers from severe environmental degradation and pollution. Older nuclear reactors cause acute safety concerns; and back-end nuclear issues - such as plant decommissioning and radioactive waste disposal - demand urgent attention. The economic collapse, especially lower output from energy-intensive industries, has reduced regional CO₂ emissions by 39% since 1990. Further structural reforms, and energy price increases to reflect costs, will lower CIS energy and carbon intensity in future. The region is thus expected to gain substantial credits from the carbon trading schemes now emerging in response to the Kyoto Protocol.

delivered by a fixed infrastructure (gas, electricity and heat) declined less rapidly than fuels that require physical deliveries (solid fuels and oil). In total the demand fell by 206 Mtoe over these six years; mainly oil products (96 Mtoe or a 47% reduction), followed by distributed heat (90 Mtoe or 37%), solids (50 Mtoe or 48%), gas (42 Mtoe or 21%) and electricity (27 Mtoe or 26%). Even though these reductions are very impressive, the International Energy Agency estimated that a further large potential for reductions still exists.



Despite Russia's considerable progress in establishing cost-based and market-related prices in the energy sector, sizeable subsidies remained. Underpricing of energy results in major distortions in energy consumption and significant economic and environmental costs. One of the largest forms of energy subsidy in Russia is non-payment, which effectively means a zero price to the consumer. In general, non-payment and payment arrears are most prevalent among industrial and commercial customers, where non-payment of bills along the entire production and supply chain is common. The collection rate among households tends to be much higher. Barter, which is prevalent throughout the Russian economy, may also contain some price subsidies and is certainly a possible means of tax avoidance. Although some headway appears to have been made in the last year or so to recover payments, this remains a major problem especially for gas and electricity. The IEA estimates that removal of these subsidies could reduce electricity use by a quarter and gas use by more than a third!



Decline of final energy consumption accelerated since 1995, especially in industry and tertiary-domestic sectors...

In 1990, the last year of the Soviet energy data system, industry represented about 44% of total final demand, the tertiary-domestic sector 40% and transport 16%. Since then, considering the lack of coherent data, it can be estimated that the industry and transport shares have been reduced by about 25% and 19% respectively whereas the residential share increased by about 32%. Between 1990 and 1997, final energy demand was reduced by 33% with marked differences between sectors: industry declined by 50%, transport by 47% and tertiary-domestic by 13%. Over the last two years the fall was especially marked for industry (-20%) and tertiary-domestic (-18%), whilst transport consumption flattened (-4%). Demand in the residential sector, which increased by 6% between 1990 and 1995, appeared to be unresponsive to price changes partly due to both the absence of metering and control

equipment and non-payment of bills. The combined effects of initial reforms and the drastic reduction in incomes induced a rapid decline after 1995. It is particularly significant that tertiary-domestic energy consumption per capita was at the same level in the CIS and in the European Union whilst the comfort and equipment ownership levels were absolutely non-comparable between these two regions. In 1993, it was estimated that there were less than 18 million private cars in the CIS, or about 60 cars per 1000 inhabitants. Political instability and economic contraction, along with bureaucratic delays, have reduced sales of personal motor vehicles in the region and made it more difficult for auto manufacturers to penetrate the market. In addition, data on kilometres driven per vehicle in this region suggest that the average distance travelled per vehicle has fallen dramatically in recent years.

Share of electricity was increasing but still remained lower than in OECD countries, especially in tertiary-domestic...

The electricity share in final consumption increased regularly from 11.8% in 1985 to 12.1% in 1990 and 13.5% in 1997. If the electricity share in industrial energy consumption approached that of OECD countries, the situation was completely different in the tertiary-domestic sector where it remained very low: 11.8% in 1997 against 9.3% in 1990. Household appliances such as televisions and refrigerators are already in widespread use. Other devices such as video recorders and freezers are rarer, while appliances such as fully automated washing machines, clothes dryers and dish washers are virtually unknown. There is great scope for the introduction of these products with any improvement of living standards, but their use is also subject to space constraints in household accommodation. The low level of maximum power demand currently available in some apartments also strictly limits the use of larger electricity using appliances. About 85% of electricity connections require modernisation to accommodate larger electricity consuming items such as washing machines. Much of the housing stock is limited to a maximum demand of 1.3 kW per apartment. Overcoming this constraint will take considerable investment and time.

Gross inland energy consumption, met about 50% by natural gas, declined by 36% over ten years...

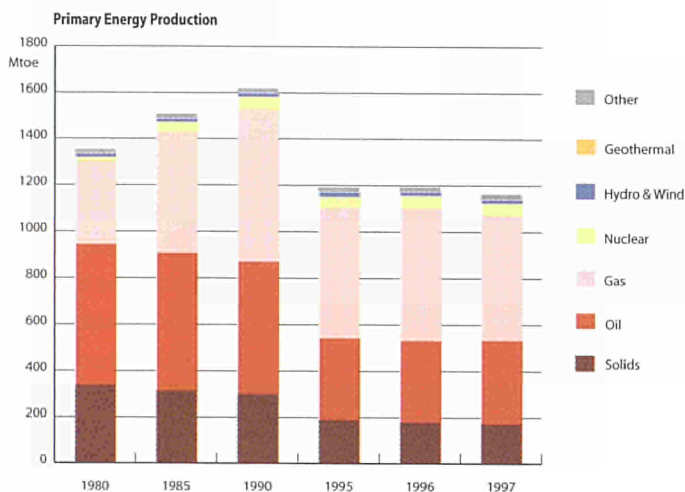
Gross inland energy consumption, after a peak of 1389 Mtoe in 1988, fell to only 885 Mtoe in 1998 or a 36% fall over ten years. The decline was very rapid between 1991 and 1994, with a reduction by about 10% each year on average; but it has slowed down since then to about 3% per year on average. The reduction, however, was not the same for all primary fuels as already illustrated by the evolution of final consumption. Solids and oil demand decreased systematically since 1980, and very rapidly after the reforms of





1990 (-7.5% on average per year for solid fuels and -9.4% for oil). On the other hand, natural gas consumption steadily increased during the 1980s to become the largest source of energy since 1985. Since 1990 gas consumption dropped on average by 2.5% per year, slower than gross inland energy consumption. Consequently, gas consumption accounted for more than half of

gross inland consumption in 1998. Other forms of energy consumption were met mainly by nuclear energy, with limited contributions from both hydro and renewable energy. Nuclear energy saw a significant increase between 1980 and 1988, stagnated until 1993, fell by 15.5% in 1994, recovered gradually to its 1993 level in 1996 and declined again over the last two years. The contribution of hydro has been stable since 1985 at about 20 Mtoe although there is a large potential for expansion.



Russia remained the second biggest energy producer in the world after the United States...

The CIS as a whole remains the second biggest energy producer in the world after the United States and just ahead of China, and is the world's leading producer and exporter of natural gas. CIS republics produce all types of primary fossil fuels, although they are not equally distributed. In 1998, Russia accounted for 80% of total energy production, but 56% of solid fuels production, 84% of oil production, 86% of gas production, 53% of nuclear electricity and 72% of hydro. Other major producers are Ukraine (solids, oil, natural gas and nuclear), Kazakhstan (solids, oil and gas), Uzbekistan (oil and gas) and Turkmenistan (gas).

CIS(1) : TOTAL ENERGY

Mtoe	1980	1985	1990	1995	1996	1997	1998	85/80	90/85	96/90	97/96	98/97
	Annual % Change											
Total Production	1357.9	1513.0	1624.3	1201.9	1197.2	1167.4	1162.6	2.2%	1.4%	-5.0%	-2.5%	-0.4%
Armenia	1.3	1.5	0.1	0.2	0.7	0.5	0.5	3.5%	-38.3%	32.9%	-27.6%	0.0%
Azerbaijan	26.2	24.7	20.3	14.7	14.4	14.0	16.9	-1.2%	-3.8%	-5.6%	-2.6%	21.0%
Belarus	3.7	5.4	4.3	3.3	3.1	3.3	3.3	7.9%	-4.6%	-4.9%	3.6%	0.4%
Georgia	1.7	1.9	1.3	0.6	0.7	0.7	0.6	1.8%	-6.6%	-10.4%	-0.3%	-8.0%
Kazakhstan	79.9	82.9	86.0	61.9	62.1	64.0	62.5	0.8%	0.7%	-5.3%	3.1%	-2.3%
Kyrgyzstan	2.3	2.2	2.3	1.4	1.4	1.4	1.3	-0.3%	0.5%	-7.5%	-2.6%	-4.8%
Moldova	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-7.1%	-5.7%	8.1%	9.9%	8.7%
Russia	979.1	1132.6	1253.0	947.2	942.8	922.6	924.6	3.0%	2.0%	-4.6%	-2.1%	0.2%
Tajikistan	2.2	2.0	1.9	1.3	1.3	1.3	1.2	-1.4%	-1.8%	-5.3%	-6.7%	-4.2%
Turkmenistan	65.2	73.3	74.2	33.5	32.8	18.7	13.1	2.4%	0.3%	-12.7%	-43.0%	-30.0%
Ukraine	154.8	143.5	130.1	81.9	79.8	80.2	77.0	-1.5%	-1.9%	-7.8%	0.5%	-4.0%
Uzbekistan	32.8	32.2	38.4	47.1	47.3	48.8	48.5	-0.4%	3.6%	3.5%	3.3%	-0.8%
Baltics (2)	8.7	10.8	12.6	8.5	10.6	11.8	13.0	4.3%	3.3%	-2.8%	11.3%	9.7%
Total Net Import	-212.2	-219.2	-260.0	-244.4	-276.4	-278.0	-283.4	0.6%	3.5%	1.0%	0.6%	1.9%
Total Gross Inland Consumption	1131.9	1272.3	1347.7	963.6	937.3	899.9	885.1	2.3%	1.1%	-5.8%	-4.0%	-1.7%
Armenia	5.7	4.5	7.6	1.7	1.8	1.8	1.9	-4.4%	10.9%	-21.4%	0.8%	6.5%
Azerbaijan	20.0	20.8	22.7	13.5	12.7	12.7	10.5	0.8%	1.7%	-9.2%	-0.7%	-16.9%
Belarus	18.3	33.2	40.5	24.1	24.6	24.4	24.2	12.7%	4.0%	-8.0%	-0.6%	-1.1%
Georgia	10.4	7.5	10.3	1.5	2.1	2.3	2.2	-6.3%	6.5%	-23.0%	8.5%	-4.0%
Kazakhstan	77.0	77.1	96.1	53.8	43.9	37.7	38.1	0.0%	4.5%	-12.2%	-14.2%	1.1%
Kyrgyzstan	4.8	4.7	1.7	2.7	3.1	2.8	3.4	-0.3%	-18.6%	10.5%	-8.0%	21.9%
Moldova	23.1	26.0	26.2	21.6	21.8	21.7	21.5	2.4%	0.1%	-3.0%	-0.9%	-0.7%
Russia	709.1	755.3	804.7	603.4	590.1	571.7	568.8	1.3%	1.3%	-5.0%	-3.1%	-0.5%
Tajikistan	4.0	4.2	3.3	3.3	3.5	3.4	3.3	0.6%	-4.8%	1.3%	-3.9%	-1.3%
Turkmenistan	8.7	69.6	18.5	14.8	12.4	12.4	12.0	51.6%	-23.2%	-6.5%	0.1%	-3.2%
Ukraine	198.9	196.7	237.5	163.4	159.8	148.4	139.5	-0.2%	3.8%	-6.4%	-7.1%	-6.0%
Uzbekistan	27.2	41.2	44.5	42.0	44.0	45.0	42.3	8.6%	1.6%	-0.2%	2.3%	-5.9%
Baltics (1)	24.8	31.5	34.1	17.1	17.3	16.6	17.2	4.9%	1.6%	-10.7%	-3.8%	3.6%

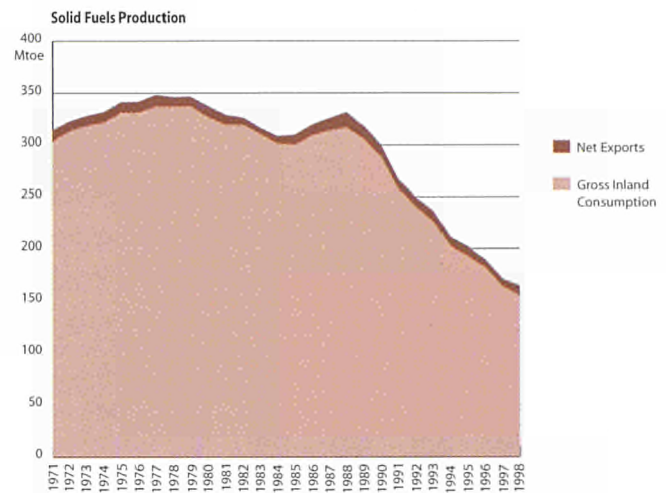
(1) Including Baltics only for statistical reasons
 (2) Including oil shale



Efforts to rationalise the coal industry were hampered by the payment arrears of consumers...

For solid fuels the CIS (165 Mtoe in 1998) is now the third largest producer in the world after China (635 Mtoe) and the United States (572 Mtoe) even though Russia, the main contributor, was individually overtaken by India, Australia and South Africa. Solid fuel production dropped by 45% from 1990 to 1997, due largely to the closure of uneconomic mines in the face of declining regional demand and investment. The three main coal-producing countries - Russia (56% of total production in 1998), Ukraine (23%) and Kazakhstan (18%) - were facing similar problems but the decline was more accentuated in Ukraine. Strikes caused by mining companies' failure to pay wages, itself the result of 80% non-payment by coal consumers, contributed to a 3.6% drop in output in 1997. Strikes also disrupted production in 1998 which declined again by 5.1%. The coal industries in Russia and Ukraine continue to be state-run operations, although efforts are underway to privatise the industries in both countries. The restructuring of the coal industry is aimed at shutting all uneconomic mines, removing all subsidies and privatising viable mining operations. Worsening

payment problems with coal consumers and alleged misappropriation and misspending of money allocated to the industry have undermined these efforts.



CIS(1): SOLID FUELS

Mtoe	1980	1985	1990	1995	1996	1997	1998	85/80	90/85	96/90	97/96	98/97
Annual % Change												
Total Production	338.8	312.5	300.5	190.4	180.1	173.6	164.7	-1.6%	-0.8%	-8.2%	-3.6%	-5.1%
Armenia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-
Azerbaijan	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-
Belarus	0.0	2.4	1.3	0.6	0.6	0.5	0.5	-	-11.3%	-13.4%	-3.0%	-0.3%
Georgia	0.9	0.7	0.4	0.0	0.0	0.0	0.0	-5.3%	-10.3%	-46.4%	-80.0%	-0.3%
Kazakhstan	56.9	55.0	54.2	35.8	33.1	31.3	29.9	-0.7%	-0.3%	-7.9%	-5.3%	-4.3%
Kyrgyzstan	1.5	1.4	1.3	0.3	0.3	0.3	0.3	-1.3%	-2.3%	-23.5%	22.0%	-15.8%
Moldova	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-
Russia	171.9	155.5	154.1	106.9	104.1	98.8	92.7	-2.0%	-0.2%	-6.3%	-5.0%	-6.2%
Tajikistan	0.5	0.2	0.1	0.0	0.0	0.0	0.0	-19.7%	-2.2%	-40.1%	-42.9%	-0.3%
Turkmenistan	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-
Ukraine	96.2	88.8	81.1	43.1	38.2	38.7	37.3	-1.6%	-1.8%	-11.8%	1.4%	-3.7%
Uzbekistan	2.8	1.8	2.1	1.1	1.0	1.0	1.0	-8.9%	3.6%	-12.0%	3.5%	-3.7%
Baltics (2)	8.0	6.8	5.8	2.7	3.0	2.9	3.0	-3.2%	-3.2%	-10.3%	-3.8%	3.9%
Total Net Import	-11.1	-8.8	-11.7	-9.2	-5.9	-19.7	-18.6	-4.5%	5.9%	-10.9%	235.4%	-5.6%
Total Gross Inland Consumption	326.8	301.1	288.8	193.6	182.3	164.1	155.3	-1.6%	-0.8%	-7.4%	-10.0%	-5.4%
Armenia	0.0	0.2	0.2	0.0	0.0	0.0	0.0	-	1.3%	-54.4%	-0.2%	-0.4%
Azerbaijan	0.0	0.1	0.1	0.0	0.0	0.0	0.0	-	1.2%	-42.3%	-0.2%	-0.4%
Belarus	0.0	3.5	2.7	1.3	1.2	1.0	0.8	-	-4.5%	-13.0%	-17.6%	-22.8%
Georgia	0.9	0.7	0.5	0.0	0.0	0.0	0.0	-5.2%	-7.2%	-36.4%	-93.8%	-20.3%
Kazakhstan	54.0	52.5	52.0	30.8	24.3	21.2	21.5	-0.6%	-0.2%	-11.9%	-12.8%	1.3%
Kyrgyzstan	1.5	1.4	1.2	0.4	0.6	0.9	1.5	-1.2%	-2.5%	-11.6%	62.0%	59.2%
Moldova	0.0	2.2	1.8	0.6	0.5	0.1	0.2	-	-3.9%	-19.1%	-70.5%	11.8%
Russia	176.6	148.3	147.4	105.3	107.0	94.2	86.5	-3.4%	-0.1%	-5.2%	-12.0%	-8.1%
Tajikistan	0.5	0.2	0.1	0.0	0.0	0.0	0.0	-19.6%	-2.5%	-15.9%	-6.0%	-46.3%
Turkmenistan	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-100.0%	-
Ukraine	81.7	82.8	72.0	50.7	43.9	42.2	40.7	0.3%	-2.8%	-7.9%	-3.9%	-3.5%
Uzbekistan	2.7	1.7	2.8	1.0	1.2	1.0	0.9	-8.8%	10.8%	-13.8%	-17.9%	-3.5%
Baltics (1)	9.0	7.7	8.0	3.5	3.6	3.5	3.2	-3.0%	0.6%	-12.5%	-2.6%	-7.1%

(1) Including Baltics only for statistical reasons

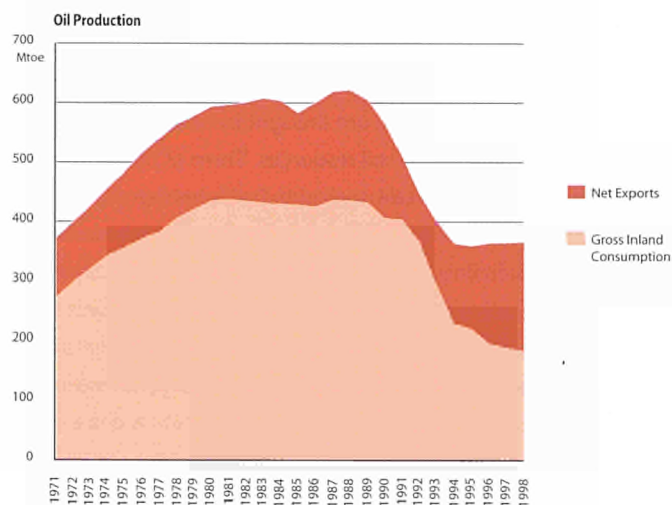
(2) Including oil shale





Crude oil production, concentrated in a small number of large fields, experienced an upturn since 1997...

Crude oil production has decreased since 1980 (606 Mtoe) to reach only 352 Mtoe in 1996, with an accelerating trend (more than -10% per year) between 1990 and 1994. Production as a whole increased by 2.2% in 1997 and 0.6% in 1998 after the stabilisation registered in 1996. Russia represented more than 84% of the total production, remaining the third largest world producer after Saudi Arabia and the United States. Russian production is concentrated in a small number of large fields located mainly in West Siberia which accounted for two thirds of total output. A drop in output from the super-giant Samotlor field in West Siberia was responsible for one third of the total decline in Russian oil production since 1988. This dramatic production decline is a result of several factors, including: natural reservoir depletion due to overproduction and poor field management; insufficient investment due to an unpredictable fiscal system as well as unclear and sometimes conflicting laws and regulations that deterred foreign investors, stalled implementation of tax reforms; and poor technical management. Activity by foreign companies is



currently restricted to a number of joint ventures which, however, will have some impact on total oil production. Negotiations are also under way for larger projects that will support the expected rebound of oil production in the near future.

CIS : OIL

Mtoe	1980	1985	1990	1995	1996	1997	1998	85/80	90/85	96/90	97/96	98/97
Annual % Change												
Total Production	606.2	598.2	573.5	354.7	351.9	359.6	361.7	-0.3%	-0.8%	-7.8%	2.2%	0.6%
Armenia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-
Azerbaijan	14.8	13.2	12.3	9.2	9.1	9.1	12.0	-2.2%	-1.5%	-4.8%	-0.9%	32.9%
Belarus	2.6	2.0	2.1	1.9	1.9	1.8	1.8	-4.6%	0.2%	-1.6%	-2.0%	0.0%
Georgia	0.0	0.6	0.2	0.0	0.1	0.1	0.1	-	-18.4%	-7.2%	4.7%	-33.4%
Kazakhstan	18.8	23.0	25.3	20.5	23.1	25.5	26.1	4.1%	1.9%	-1.5%	10.8%	2.1%
Kyrgyzstan	0.2	0.2	0.2	0.1	0.1	0.1	0.1	-2.8%	-3.4%	-7.5%	-15.8%	0.0%
Moldova	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-
Russia	552.3	546.6	519.6	306.4	300.7	305.2	303.0	-0.2%	-1.0%	-8.7%	1.5%	-0.7%
Tajikistan	0.4	0.4	0.2	0.0	0.0	0.0	0.0	-0.2%	-12.4%	-31.4%	23.8%	0.0%
Turkmenistan	8.1	6.1	5.6	4.4	4.3	4.7	5.8	-5.5%	-1.5%	-4.2%	8.5%	23.5%
Ukraine	7.6	4.1	5.3	4.1	4.5	4.6	4.5	-11.6%	5.2%	-2.7%	1.9%	-1.8%
Uzbekistan	1.3	2.0	2.8	7.5	7.5	7.8	7.7	8.2%	7.2%	17.8%	3.7%	-1.8%
Baltics	0.0	0.0	0.0	0.4	0.5	0.6	0.5	-	-	-	14.9%	-12.9%
Total Net Import	-156.93	-153.10	-158.37	-139.44	-167.66	-175.28	-181.88	-0.5%	0.7%	1.0%	4.5%	3.8%
Total Gross Inland Consumption	437.5	430.7	408.3	221.6	198.1	191.2	185.5	-0.3%	-1.1%	-11.4%	-3.5%	-3.0%
Armenia	2.2	3.1	3.6	0.3	0.2	0.2	0.2	7.1%	2.8%	-40.7%	0.0%	32.9%
Azerbaijan	7.6	8.5	7.8	7.0	6.9	6.9	6.7	2.3%	-1.6%	-2.0%	0.2%	-3.4%
Belarus	14.7	29.0	25.7	10.7	10.5	9.0	8.7	14.6%	-2.4%	-13.9%	-14.2%	-3.4%
Georgia	5.4	5.9	4.3	0.2	0.9	1.0	1.0	1.8%	-6.0%	-23.3%	7.9%	-0.3%
Kazakhstan	16.1	18.9	36.0	11.5	10.5	9.1	9.5	3.3%	-13.7%	-18.6%	-13.0%	4.4%
Kyrgyzstan	2.2	2.9	0.0	0.6	0.7	0.5	0.5	5.7%	-100.0%	-	-27.6%	9.7%
Moldova	6.2	6.2	4.5	1.0	1.0	0.9	0.9	0.0%	-6.2%	-22.6%	-7.2%	-0.3%
Russia	310.4	259.5	242.1	146.8	129.9	127.2	121.7	-3.5%	-1.4%	-9.9%	-2.1%	-4.3%
Tajikistan	1.9	2.6	0.2	1.2	1.2	1.2	1.3	6.5%	-41.1%	37.2%	0.0%	3.4%
Turkmenistan	1.3	2.1	6.4	3.5	3.3	3.7	3.6	10.1%	25.1%	-10.5%	10.3%	-1.8%
Ukraine	52.1	66.4	55.7	25.2	20.2	18.4	18.0	5.0%	-3.5%	-15.6%	-8.9%	-2.2%
Uzbekistan	7.0	10.3	7.4	6.9	6.6	6.9	6.8	8.0%	-6.5%	-1.8%	5.3%	-2.2%
Baltics (1)	10.4	15.3	14.6	6.6	6.4	6.2	6.7	8.0%	-1.0%	-12.8%	-2.7%	6.7%

(1) Including Baltics only for statistical reasons



Large oil potential of the Caspian Basin still limited by the development of the pipeline infrastructure...

The Caspian Basin is an area of potentially vast resources. Only the United States and Saudi Arabia are thought to have more ultimately recoverable conventional oil resources. Three of the independent states, Azerbaijan, Kazakhstan and Turkmenistan, have the greatest oil production potential in the Caspian Sea region. Key issues in the Caspian Basin include: legal issues concerning ownership and development rights in the Caspian Sea; regional instability; and development of transnational export routes to take oil and gas from the landlocked Caspian Sea region to world markets. The development of adequate infrastructures is the key to enabling the Caspian region to join the ranks of major suppliers in world oil trade. Currently, Caspian oil, in relatively small quantities, is able to flow through pipelines into Russia. By the end of the decade, several pipeline routes to the Black Sea are expected to become available. Significantly larger volumes are expected to flow via pipeline through Turkey to the Mediterranean Sea and across Iran to the Persian Gulf. Even China has indicated an interest in obtaining its oil supplies via such pipelines.

In 1998 CIS again became the world's largest gas producer, just ahead of the United States...

The CIS, and in particular Russia, has one of the most gas-intensive economies in the world and is the world's largest gas exporter. Production has nonetheless been declining gradually in recent years, from a peak of 671 Mtoe in 1991 to 547 Mtoe in 1998, because of falling regional demand and gas field depletion. Overall gas consumption in the CIS increased again by 1% in 1998 led by Russia, the largest gas producer (86% of total CIS production). Three fields - Urengoy, Yamburg and Orenburg - account for roughly 80% of total production. Attention is now focused on new fields in the Yamal Peninsula and the Far East Sakha region. Since 1994, Uzbekistan has become the second producer, far ahead of production in Turkmenistan and Ukraine.

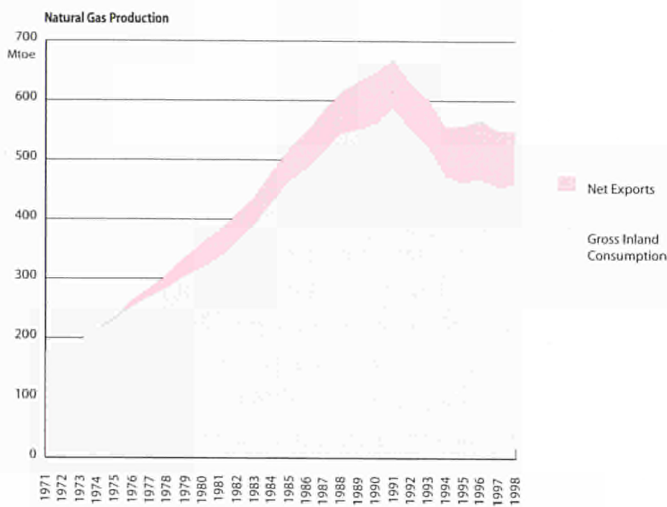
Gazprom, the Russian state gas company, controls more than 95% of Russia's natural gas production; owns and operates 140,000 km of gas pipeline grids; markets all of the gas on domestic and export markets; participates in joint ventures for marketing in several European countries; and controls one-fifth of the world's

CIS : NATURAL GAS

Mtoe	1980	1985	1990	1995	1996	1997	1998	85/80	90/85	96/90	97/96	98/97
Annual % Change												
Total Production	359,6	520,1	656,3	569,0	573,0	541,7	546,9	7,7%	4,8%	-2,2%	-5,5%	1,0%
Armenia	0,0	0,0	0,0	0,0	0,0	0,0	0,0	-	-	-	-	-
Azerbaijan	11,3	11,3	8,0	5,4	5,1	4,8	4,8	0,1%	-6,8%	-7,2%	-5,6%	-0,7%
Belarus	0,3	0,2	0,2	0,2	0,2	0,2	0,2	-4,7%	0,3%	-2,4%	-1,6%	-0,7%
Georgia	0,2	0,1	0,0	0,0	0,0	0,0	0,0	-22,2%	-6,4%	-39,5%	-0,2%	-0,7%
Kazakhstan	3,5	4,4	5,7	4,8	5,3	6,5	5,9	4,7%	5,4%	-1,4%	24,1%	-9,7%
Kyrgyzstan	0,1	0,1	0,1	0,0	0,0	0,0	0,0	-1,5%	-3,5%	-19,0%	54,3%	-0,7%
Moldova	0,0	0,0	0,0	0,0	0,0	0,0	0,0	-	-	-	-	-
Russia	212,8	372,8	517,2	475,2	478,7	459,0	471,6	11,9%	6,8%	-1,3%	-4,1%	2,8%
Tajikistan	0,2	0,2	0,1	0,0	0,0	0,0	0,0	4,1%	-18,0%	-12,8%	-15,2%	-0,7%
Turkmenistan	57,1	67,1	68,5	29,0	28,4	14,0	7,2	3,3%	0,4%	-13,6%	-50,9%	-48,1%
Ukraine	45,9	35,5	22,5	15,2	15,4	15,1	15,0	-5,0%	-8,7%	-6,1%	-1,7%	-0,7%
Uzbekistan	28,2	27,9	32,9	38,1	38,2	39,5	39,3	-0,2%	3,3%	2,5%	3,5%	-0,7%
Baltics (1)	0,0	0,4	1,0	1,0	1,6	2,4	2,8	-	20,2%	8,3%	50,8%	14,3%
Total Net Import	-42,6	-54,8	-86,9	-94,9	-100,1	-94,5	-91,2	5,2%	9,7%	2,4%	-5,5%	-3,6%
Total Gross Inland Consumption	315,9	460,9	559,4	460,8	465,4	453,7	455,8	7,8%	4,0%	-3,0%	-2,5%	0,5%
Armenia	2,4	0,0	3,6	1,1	0,9	1,1	1,2	-100,0%	-	-20,7%	24,6%	6,5%
Azerbaijan	11,3	11,4	14,2	5,8	5,1	4,8	2,9	0,2%	4,6%	-15,7%	-5,8%	-39,0%
Belarus	3,7	0,2	11,0	11,5	12,1	13,8	14,1	-44,2%	122,9%	1,6%	13,8%	2,3%
Georgia	3,6	0,1	4,4	0,7	0,6	0,8	0,7	-51,2%	113,2%	-27,6%	21,2%	-14,9%
Kazakhstan	6,4	4,4	5,7	10,1	7,8	6,2	5,9	-7,2%	5,5%	5,3%	-20,9%	-4,3%
Kyrgyzstan	0,9	0,1	0,1	0,7	0,9	0,5	0,5	-35,6%	-4,8%	49,8%	-42,0%	0,0%
Moldova	0,8	0,0	3,3	2,6	2,9	3,1	3,0	-100,0%	-	-1,8%	6,8%	-3,5%
Russia	196,0	307,8	370,6	311,5	312,9	309,7	322,3	9,4%	3,8%	-2,8%	-1,0%	4,1%
Tajikistan	0,9	0,2	1,4	0,7	0,9	0,9	0,9	-26,0%	47,3%	-6,3%	-9,3%	0,0%
Turkmenistan	7,2	67,4	12,2	11,2	9,1	8,8	8,4	56,4%	-28,9%	-4,9%	-3,4%	-4,3%
Ukraine	61,7	34,7	91,8	68,5	74,5	66,3	61,0	-10,9%	21,5%	-3,4%	-11,0%	-8,0%
Uzbekistan	16,5	28,0	33,0	32,7	33,9	34,0	31,3	11,2%	3,3%	0,5%	0,3%	-8,0%
Baltics (1)	4,5	6,6	8,1	3,6	3,7	3,7	3,6	8,0%	4,1%	-12,3%	0,2%	-2,9%

(1) Including Baltics only for statistical reasons





natural gas reserves. Gazprom's 1997 revenues of US\$23 billion made it Russia's largest earner of hard currency, while its tax payments accounted for 25% of total federal government tax revenues. Gazprom has been unable to make all of its tax payments because only 15% of its domestic customers pay promptly and in cash, and Gazprom has been prevented by the government from shutting off supplies for non-payment to power generation and other industries. In order to meet World Bank conditions for additional funding it was decided in June 1998 to break up Gazprom into separate production, transmission and distribution units; to allow greater access by independent producers to the pipeline system at the same transportation rates as Gazprom's own marketing units; and to revise pipeline tariffs.

Gazprom's pipeline network is in need of extensive maintenance, as over 16,500 km require repair and re-insulation, with 21,500 km being operated at reduced pressure because of extensive corrosion. Other near-term needs include finding new fields in more accessible regions in order to reduce transportation costs. Gazprom's 3-year plan through 2000 focuses on proving reserves currently assessed as prospective or possible.

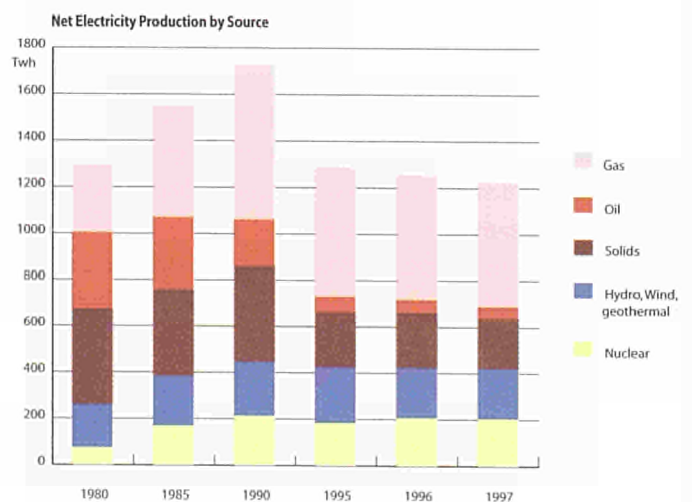
CIS represented about 22% of the world's fossil fuel reserves, mainly located in Russia...

The CIS's oil reserves at end 1997 amounted to about 6.3% of the world's oil reserves, the bulk of which were concentrated in Russia (4.6%). The situation is somewhat more favourable for natural gas with the CIS accounting for 38.8% of world reserves, mainly concentrated in Russia (32.9%). In addition, as described above, a very large potential of new oil and gas reserves exists in the Caspian Basin. CIS coal reserves totalled 21.8% of world reserves.

Consequently the CIS represented 22% of the world's fossil fuel reserves, mainly located in Russia.

Gas power stations responsible for about 50% of total electricity generation...

Electricity generation peaked in 1990, and has declined continuously since then to be in 1997 5% lower than the 1996 level, reflecting the weak economy. Although it has experienced a continuous decrease since 1990 (-35%), thermal generation dominated electricity production, with about two-thirds of total generation in 1997 (three-quarters in 1990). Hydropower output has remained stable since 1985 representing only 18% of electricity production in 1997, but with very large potential in future. Nuclear production, which tripled its contribution from 1980 to 1990, has declined slowly since then with the progressive decommissioning of obsolete and unsafe nuclear power plants, compensated by the commissioning of new units (Ukraine) or reopening of mothballed units (Armenia). The fuel mix varied by region depending on primary resources and import facilities. The use of solid fuels in thermal power stations remained rather stable over the 1980s but has declined significantly since then (-48%); its share in thermal power stations dropping progressively from 40% in 1980 to 32% in 1990 and only 27% in 1997. Gas became the most important fuel for power generation in 1983 (35% of the total) and since then has continued to increase its share (66% of the total in 1997). Gas is projected to remain the dominant fuel for electricity generation mainly due to the more favourable economics of gas-fired generation. The consumption of oil for electricity production decreased by about 85% between 1980 and 1997 as a result of this substitution by gas. Its contribution has now become marginal.



Power sector in urgent need for financing to assure maintenance and required development...

Total generation capacity was 328 GWe in 1997, down from 344 GWe in 1990. Without significant investment and equipment upgrades, as well as rationalisation of inefficient and obsolete capacity, regional power shortages will become more widespread. In Russia while 6 GWe of new plant capacity were being built annually from 1980 to 1985, only 1GWe per year was built during the past five years. Within five years, half of the non-nuclear power stations will have exceeded their designed service lives. Installation of new power lines has also dropped markedly. Russian officials estimate that the country will need US\$3-5 billion in new capital annually from 1998 to 2000, and US\$6-11 billion annually from 2001 to 2005 to carry out capacity expansion plans. Financing of this investment will be difficult to secure internally, especially in the light of continuing payment collection problems by the power companies. Regarding nuclear units, safety is a continuing concern, particularly with respect to the 16 old reactors of the design used at Chernobyl. Reactor maintenance and repairs have been delayed in recent years due to lack of funds. Reduced electricity demand and the recent economic crisis have disrupted plans to build new nuclear plants.

Russia's electricity sector is controlled by the 52.7%-state-owned Unified Electric Systems (UES). The UES controls the country's distribution system, and oversees the 72 regional electricity companies, known as energos. Russia's power sector has been targeted for restructuring, but the introduction of reforms has been slow. In the summer of 1997, President Yeltsin issued a decree, aimed against electricity sales monopolies, giving users the ability to buy power directly from power generators. Since then, however, Yeltsin's decree has largely been ignored by the regional power companies, which continued to block efforts by individual power plants to sell cheaply to users. The power industry has also resisted the closure of inefficient power plants and reductions in the work force. Amongst the priorities identified for UES by mid-1998 are the abolition of payment arrears by customers, the introduction of competition in production and wholesale electricity markets, and the pursuit of more rational pricing policies. The Government plans to introduce competition amongst producers through a new system of payments for electricity from the national grid.

Refining industry demonstrated a large overcapacity compared to the internal demand...

In 1996, refinery capacity (10 million barrels day) represented 12.5% of the world capacity (16% in 1985). Since 1990, the capa-

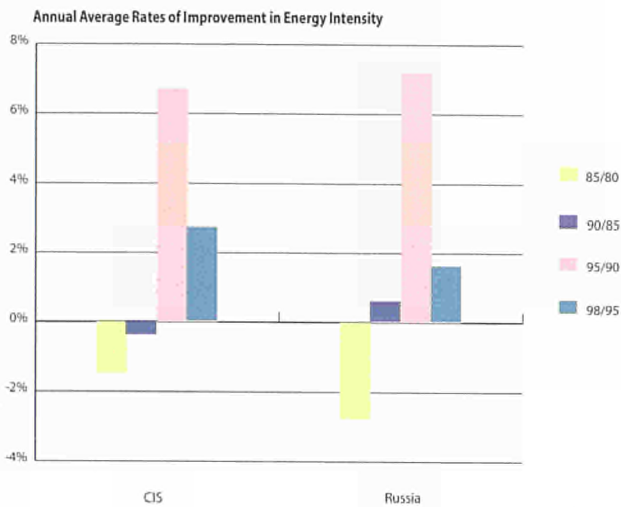
city has declined by 2.5% per year and by 4% in 1998. Most of the refineries were constructed in the 1940s and 1950s and are relatively unsophisticated, oriented towards heavier products, and operating well below capacity. Catalytic cracking accounted for only 4% of primary distillation capacity. Heavy fuel oil now accounts for about half of refinery output. In addition, low investment levels have resulted in poor maintenance and working conditions, leading to inefficient and unsafe plant operation. The utilisation rate of refineries decreased sharply from 79% in 1985 to only 45% in 1998. This resulted directly from the reduction of internal demand and a refining mix poorly adapted to the products mainly required on the international market. In 1990, the internal demand could guarantee a utilisation factor of 66% before production assigned for export. Almost all of these exports consisted of diesel fuel and fuel oil. In 1997 only 37% of the existing refining capacity was required to satisfy the internal demand. Nevertheless, several refineries have undergone modernisation programmes. However, financial constraints still prevent most refineries from undertaking major modernisation work to boost efficiency and the production of high-added value products. The most important recent trend for the petroleum industry in Russia has been vertical integration into companies which combine crude production, refining, distribution and retailing within one integrated structure.

COMPETITIVENESS

Energy intensity increased by 18% since 1990 and the near future appears unfavourable...

From 1980 to 1990, considering all the uncertainties about GDP calculation, the energy intensity decreased very slowly by about 0.2% per year on average. Before its economic collapse, the former Soviet Union had the highest energy intensity in the world. This must be qualified given that the regional GDP is probably underestimated, as it is obvious that the activities of the service sector are only partially reported in statistical data. Artificially low energy prices have encouraged inefficient use of energy in all sectors: industry, power generation, district heating, the tertiary-domestic sector and to a lesser extent transport. The energy intensity increased sharply by 3.6% per year between 1990 and 1996, experienced an improvement of 5.3% in 1997 as GDP demonstrated some limited gain that year, but increased again in 1998 as a result of the mid-year economic and financial crisis. This crisis, with its expected negative impact on GDP for two-three years, may well cause a further deterioration in this indicator.





...But a large potential exists for improvement

Russian energy efficiency is poor compared to other countries. Consumption for space heating and domestic hot water, for example, is about 50% higher in Russia than in OECD countries; while manufacturing energy use per tonne of output is up to twice the level in western European countries. At the micro-economic level, energy efficiency suffered from the small size of many energy efficiency projects which renders the fixed costs of arranging loans prohibitive; from a lack of skilled experts to identify and develop projects in all sectors; from the antiquated structure of buildings and district heating systems; and from the lack of responsibility on the part of homeowners and housing associations. Economic restructuring, combined with the economic downturn, has exacerbated the problem and led to even lower energy efficiency than in the Soviet era. The 1994 Energy Strategy outlined the Government's main policy objectives for enhancing energy efficiency in the energy sector, including the introduction of energy-efficient technologies in production processes and power generation; improvements in oil refining; increased use of natural gas and greater use of hydropower; and use of newer technologies. The Strategy estimated potential savings at 40% to 50% of primary energy consumption; 33% of these savings would occur in the energy sector, 33% in industry, 16% in the residential sector and 10% in the transport sector. It would conserve 240 to 280 Mtoe per year through market mechanisms, government regulations, reduced energy subsidies and appropriate energy prices and tariffs. The consequent improvement of energy intensity would be very substantial. But limitations on Russia's ability to replace obsolete resource-intensive industries and to finance

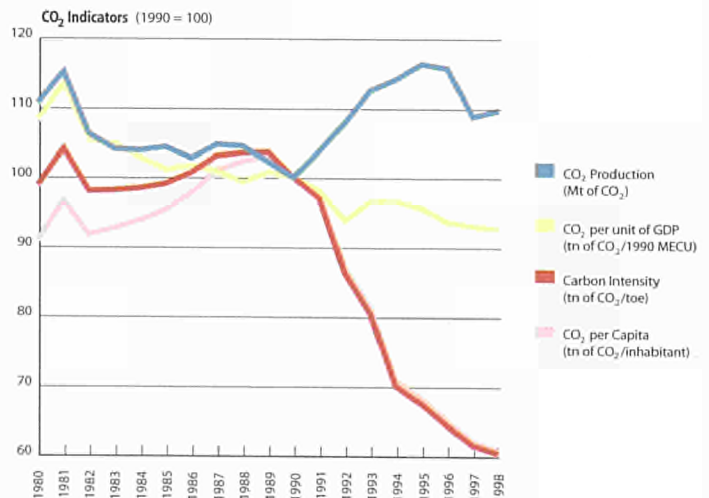
environmental improvements in the energy sector are increasingly evident. Barriers to investment include continued subsidies to gas, electricity and heating prices; the non-enforceability of contracts; an unstable investment environment; and the non-payment of energy bills estimated at US\$85 billion in 1997.

The gross inland consumption per capita, which reached 4.8 toe/capita in 1988, fell to only 3.04 toe/capita in 1998, below the European level. Large discrepancies exist between republics - with higher consumption per capita in Russia (4.0 toe/capita in 1998), intermediate values in Ukraine and Belarus (2.5-2.8 toe/capita) and much lower levels, largely below 1 toe/capita in some cases, in the Central Asian Republics.

ENVIRONMENT

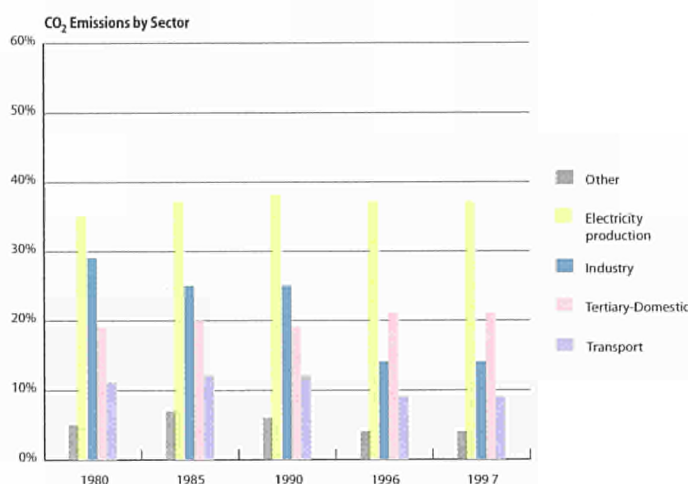
CO₂ emissions have fallen by 39% since 1990...

CO₂ emissions in the CIS increased from 3190 Mt in 1980 to 3507 Mt in 1990 but then declined to 2134 Mt in 1998 (-39% since 1990) in line with the evolution of gross inland consumption. In addition, the CIS as a whole benefited substantially from the increasing contribution of natural gas in reducing CO₂ emissions. The expected decline of GDP in the near future will certainly amplify this reduction. But, after 2000, the evolution of CO₂ emissions will be influenced by two opposing trends: increasing demand for energy associated with the expected economic rebound particularly concentrated on coal and oil; and the will of the Government to implement measures to improve energy efficiency. Although



CO₂ emissions per capita have closely followed the trend in total emissions since 1980, CO₂ intensity per unit of GDP has increased substantially between 1990 and 1995 due to the increasing energy intensity of the economy. The first signs of improvement appeared in 1996 (-0.5%) and 1997 (-6.0%).

The power sector was by far the largest source of CO₂ emissions. After a peak level of 1409 Mt reached in 1991, emissions declined until 1997 by 44 % and represented about 36% of total emissions (35% in 1980). As this sector was still particularly inefficient (with average electrical efficiency of about 25%), any improvement in the power sector will have a significant impact on total CO₂ emissions. All sectors have contributed to the CO₂ emissions reduction recorded since 1990 but to a varying extent: industry declined by 66%, energy branch emissions by 51%, transport by 49%, the power sector by 44% and the tertiary-domestic sector by only 33%.



The CIS, together with Eastern European countries, has become central to the debate on climate change policy. Based on the emissions targets outlined in the Kyoto Protocol, these countries may be able to generate emissions "credits" by virtue of the declines in their emissions levels during the 1990s. Such credits could potentially be used to offset reductions required in other Annex I countries. At present, however, rules for the creation and exchange of credits have yet to be established.

GLOBAL MARKETS

Energy exports peaked in 1998 to generate hard currency earnings...

Exports of energy have always been very important for the economy of the former USSR until 1990 (and for Russia as a major CIS

component since then), being a source of hard currency, mainly from Western Europe. Exports of energy represented about 24% of energy production in 1998 against 16% in 1990 due to the reduction of internal energy demand. Total export volumes increased from 212 Mtoe in 1980 to 260 Mtoe in 1990. They dropped by 22% between 1990 and 1992, but recovered since then to overtake in 1998 the 1990 level by 9%. The largest exported energy remained crude oil, exports of which dropped by 50% between 1990 and 1992; but they recovered their historical 1980s value of about 115 Mtoe in 1997. On the other hand, exports of oil products rose continuously as the share of refinery capacity required to satisfy internal demand declined. During the financial and economic crisis which began in 1998, oil consumption declined while production and exports increased in part to generate hard currency earnings. The main markets for oil exports are Western Europe (93 Mtoe in 1998) and Central Europe (36 Mtoe in 1998) respectively.

Exports of natural gas also reached a peak in 1990 (87 Mtoe) and then decreased by about 5% per year between 1990 and 1992. The decline stopped in 1993, and exports then increased to reach a new absolute peak of about 100 Mtoe in 1996. 1997, as with 1998, experienced a slight decrease of about 5 Mtoe reflecting the reduced demand in Western Europe stemming from warmer climatic conditions. The major exporter remains Russia, which currently exports about 35% of its natural gas production. Of this amount, about 58% is destined for European Union markets and the remainder for Eastern countries and Turkey. Major export markets were Germany (27% of total exports) and Italy (14%). Western Europe relies on Russian gas to meet about a quarter of its total needs. Trade among the CIS Republics has been in decline because of non-payment for supplies and the subsequent amassing of enormous debts for natural gas, causing reluctance on the part of shippers to provide more gas until these outstanding payments are settled.

Gas infrastructure expansion within Eastern countries and CIS Republics is underway to meet projected demand growth. Russia in particular is planning significant infrastructure expansion in order to serve expanding European markets. The most significant developments are of the Yamal gas fields in northern Siberia and the construction of the Yamal-Europe pipeline through Belarus and Poland to move gas to market. Although still awaiting final approval, the Blue Stream pipeline, which would traverse the Black Sea and transport Russian gas to Turkey and Southeast Europe, is expected to become operational in 2001. This project is in competition with another proposal, the trans-Caspian project, which would supply Turkey and western markets with gas from Turkmenistan and Azerbaijan.

RUSSIA : SUMMARY ENERGY BALANCE

Mtoe	1990	1995	1996	1997	1998(2)	95/90	96/95	97/96	98/97
Primary Production	1264.9	951.0	946.7	927.3	933.4	-5.5%	-0.4%	-2.0%	0.7%
Solids	164.9	109.5	106.3	101.1	95.1	-7.9%	-2.9%	-4.9%	-5.9%
Oil	518.8	306.6	301.0	305.5	303.5	-10.0%	-1.8%	1.5%	-0.7%
Natural gas	519.0	476.1	480.1	461.1	477.1	-1.7%	0.8%	-3.9%	3.5%
Nuclear	30.6	26.3	28.8	28.8	27.1	-3.0%	9.4%	0.0%	-5.9%
Hydro & Wind	14.3	15.2	13.3	13.5	13.3	1.1%	-12.4%	1.7%	-1.3%
Geothermal	0.0	0.0	0.0	0.0	0.0	2.3%	-14.3%	0.0%	0.0%
Other	17.3	17.3	17.3	17.3	17.3	0.0%	0.0%	0.0%	0.0%
Net Imports	-364.6	-314.3	-335.1	-333.1	-344.6	-2.9%	6.6%	-0.6%	3.5%
Solids	-0.6	-2.9	-3.3	-3.9	-5.5	35.9%	14.4%	18.6%	41.4%
Oil	-262.0	-157.9	-174.3	-176.1	-181.9	-9.6%	10.4%	1.0%	3.3%
Crude oil	-204.3	-114.4	-120.3	-119.1	na	-11.0%	5.2%	-1.0%	na
Oil products	-57.7	-43.5	-54.0	-57.0	na	-5.5%	24.1%	5.5%	na
Natural gas	-101.6	-151.8	-155.9	-151.4	-155.5	8.4%	2.7%	-2.9%	2.7%
Electricity	-0.4	-1.7	-1.7	-1.7	-1.7	34.2%	-0.6%	1.1%	-0.5%
Gross Inland Consumption	906.7	624.7	611.0	592.3	589.6	-7.2%	-2.2%	-3.1%	-0.5%
Solids	167.0	109.1	110.3	97.2	89.6	-8.2%	1.1%	-11.8%	-7.8%
Oil	264.6	147.0	130.1	127.4	122.3	-11.1%	-11.5%	-2.1%	-4.0%
Natural gas	413.3	311.5	312.9	309.7	321.6	-5.5%	0.5%	-1.0%	3.8%
Other (1)	61.9	57.1	57.7	57.9	56.0	-1.6%	1.0%	0.4%	-3.3%
Electricity Generation in TWh	1082.2	861.6	848.7	833.1	na	-4.5%	-1.5%	-1.8%	na
Nuclear	117.4	99.5	109.0	109.0	na	-3.2%	9.5%	0.0%	na
Hydro & wind	166.8	176.3	154.3	157.0	na	1.1%	-12.5%	1.7%	na
Thermal	797.9	585.8	585.3	567.1	na	-6.0%	-0.1%	-3.1%	na
Generation Capacity in GWe	213.1	210.8	210.8	205.6	na	-0.2%	0.0%	-2.5%	na
Nuclear	20.2	21.2	21.2	21.2	na	1.0%	0.0%	0.0%	na
Hydro & wind	43.3	43.8	43.8	43.9	na	0.2%	0.0%	0.3%	na
Thermal	149.5	145.8	145.8	140.5	na	-0.5%	0.0%	-3.7%	na
Average Load Factor in %	58.0	46.6	45.9	46.2	na	-4.3%	-1.5%	0.6%	na
Fuel Inputs for Thermal Power Generation	267.1	200.3	198.4	193.2	na	-5.6%	-0.9%	-2.6%	na
Solids	65.2	40.5	46.8	41.6	na	-9.1%	15.4%	-11.1%	na
Oil	47.1	6.0	4.6	4.9	na	-33.9%	-22.4%	6.1%	na
Gas	154.8	153.8	147.0	146.7	na	-0.1%	-4.4%	-0.2%	na
Geothermal	0.0	0.0	0.0	0.0	na	0.8%	-7.7%	0.0%	na
Other	0.0	0.0	0.0	0.0	na	-	-	-	na
Average Thermal Efficiency in %	25.7	25.2	25.4	25.2	na	-0.4%	0.9%	-0.5%	na
Non-Energy Uses	55.4	29.3	25.5	25.3	na	-12.0%	-12.9%	-0.7%	na
Total Final Energy Demand	652.1	464.9	393.7	374.0	na	-6.5%	-15.3%	-5.0%	na
Solids	58.5	35.5	31.4	28.7	na	-9.5%	-11.4%	-8.6%	na
Oil	176.8	75.7	70.6	68.9	na	-15.6%	-6.8%	-2.4%	na
Gas	120.8	111.3	80.1	79.9	na	-1.6%	-28.1%	-0.2%	na
Electricity	74.2	53.2	51.7	50.4	na	-6.5%	-2.8%	-2.4%	na
Heat	204.3	171.9	142.6	128.8	na	-3.4%	-17.0%	-9.7%	na
Other	17.3	17.3	17.3	17.3	na	0.0%	0.0%	0.0%	na
CO₂ Emissions in Mt of CO₂	2266.3	1513.8	1468.5	1418.5	na	-7.8%	-3.0%	-3.4%	na
Indicators									
Population (Million)	148.29	148.14	147.74	147.31	146.89	0.0%	-0.3%	-0.3%	-0.3%
GDP (index 1985=100)	109.1	67.8	65.4	65.9	62.9	-9.1%	-3.5%	0.8%	-4.6%
Gross Inl Cons./GDP (toe/1990 MEUR)	1993.3	2210.9	2240.9	2154.9	2248.5	2.1%	1.4%	-3.8%	4.3%
Gross Inl Cons./Capita (toe/inhabitant)	6.11	4.22	4.14	4.02	4.01	-7.2%	-1.9%	-2.8%	-0.2%
Electricity Generated/Capita (kWh/inhabitant)	7297	5816	5744	5655	na	-4.4%	-1.2%	-1.6%	na
CO ₂ Emissions/Capita (t of CO ₂ /inhabitant)	15.3	10.2	9.9	9.6	na	-7.7%	-2.7%	-3.1%	na
Import Dependency %	-40.1	-50.3	-54.8	-56.2	-58.5	4.6%	9.0%	2.5%	3.9%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Estimates.

UKRAINE : SUMMARY ENERGY BALANCE

Mtoe	1990	1995	1996	1997	1998(2)	95/90	96/95	97/96	98/97
Primary Production	135.7	83.0	80.7	81.2	78.5	-9.4%	-2.8%	0.6%	-3.3%
Solids	86.8	44.2	39.0	39.6	38.2	-12.6%	-11.8%	1.6%	-3.5%
Oil	5.3	4.1	4.5	4.6	4.5	-5.0%	10.4%	1.9%	-1.7%
Natural gas	22.6	15.2	15.4	15.2	15.2	-7.6%	1.4%	-1.5%	0.0%
Nuclear	19.9	18.4	20.7	20.7	19.4	-1.5%	12.8%	-0.2%	-6.4%
Hydro & Wind	0.9	0.9	0.7	0.8	1.0	-1.5%	-13.3%	14.3%	14.1%
Geothermal	0.0	0.0	0.0	0.0	0.0	-	-	-	-
Other	0.3	0.3	0.3	0.2	0.2	-2.7%	-2.6%	-2.5%	-3.7%
Net Imports	119.8	82.5	80.8	68.9	63.1	-7.2%	-2.0%	-14.8%	-8.5%
Solids	-5.8	8.3	6.2	3.9	3.9	-	-25.2%	-36.8%	-0.5%
Oil	54.6	21.2	15.7	13.8	13.6	-17.3%	-25.8%	-12.0%	-2.0%
Crude oil	53.4	13.4	9.4	9.0	na	-24.2%	-30.0%	-3.8%	na
Oil products	1.2	7.8	6.4	4.8	na	44.6%	-18.6%	-23.9%	na
Natural gas	73.5	53.2	59.0	51.1	45.8	-6.2%	10.9%	-13.4%	-10.4%
Electricity	-2.4	-0.3	-0.2	0.0	-0.3	-36.4%	-31.5%	-92.5%	1853.8%
Gross Inland Consumption	252.9	165.5	161.5	150.1	141.6	-8.1%	-2.4%	-7.1%	-5.7%
Solids	81.6	52.5	45.2	43.5	42.1	-8.4%	-13.9%	-3.7%	-3.2%
Oil	60.9	25.3	20.2	18.4	18.1	-16.1%	-19.9%	-8.9%	-1.9%
Natural gas	91.8	68.5	74.5	66.3	61.0	-5.7%	8.8%	-11.0%	-8.0%
Other (1)	18.6	19.2	21.6	21.8	20.3	0.6%	12.0%	1.0%	-6.6%
Electricity Generation in TWh	298.8	193.8	182.8	177.8	na	-8.3%	-5.7%	-2.7%	na
Nuclear	76.2	70.5	79.6	79.4	na	-1.5%	12.8%	-0.2%	na
Hydro & wind	10.7	10.0	8.6	9.9	na	-1.4%	-13.3%	14.2%	na
Thermal	212.0	113.3	94.6	88.5	na	-11.8%	-16.6%	-6.4%	na
Generation Capacity in GWe	54.3	54.3	54.2	54.2	na	0.0%	0.0%	0.0%	na
Nuclear	12.8	12.8	12.8	12.8	na	0.0%	0.0%	0.0%	na
Hydro & wind	4.7	4.7	4.7	4.7	na	0.1%	-0.2%	0.0%	na
Thermal	36.8	36.7	36.7	36.7	na	-0.1%	0.0%	0.0%	na
Average Load Factor in %	62.8	40.8	38.5	37.4	na	-8.3%	-5.7%	-2.7%	na
Fuel Inputs for Thermal Power Generation	94.2	29.0	25.9	23.5	na	-21.0%	-10.9%	-9.0%	na
Solids	26.6	17.4	14.3	13.7	na	-8.1%	-17.6%	-4.1%	na
Oil	22.0	2.8	2.1	1.9	na	-33.8%	-24.1%	-9.9%	na
Gas	45.6	8.8	9.4	7.9	na	-28.0%	6.5%	-16.2%	na
Geothermal	0.0	0.0	0.0	0.0	na	-	-	-	na
Other	0.0	0.0	0.0	0.0	na	-	-	-	na
Average Thermal Efficiency in %	19.3	33.6	31.4	32.3	na	11.7%	-6.4%	2.8%	na
Non-Energy Uses	3.4	0.8	1.1	0.9	na	-24.7%	33.2%	-17.7%	na
Total Final Energy Demand	180.3	106.9	102.0	94.7	na	-9.9%	-4.6%	-7.1%	na
Solids	45.6	22.4	19.0	18.0	na	-13.3%	-14.9%	-5.6%	na
Oil	42.6	18.9	14.9	13.7	na	-15.0%	-21.3%	-8.2%	na
Gas	34.5	42.1	46.3	42.1	na	4.1%	10.2%	-9.1%	na
Electricity	19.2	12.3	11.1	10.7	na	-8.5%	-10.0%	-3.9%	na
Heat	38.2	11.0	10.4	10.1	na	-22.1%	-5.7%	-2.7%	na
Other	0.3	0.3	0.3	0.2	na	-2.7%	-2.6%	-2.5%	na
CO₂ Emissions in Mt of CO₂	720.7	405.1	377.6	345.4	na	-10.9%	-6.8%	-8.5%	na
Indicators									
Population (Million)	51.89	51.53	51.11	50.70	50.29	-0.1%	-0.8%	-0.8%	-0.8%
GDP (index 1985=100)	na	na	na	na	na	na	na	na	na
Gross Inl Cons./GDP (toe/1990 MEUR)	2120.8	2813.6	3050.4	2928.4	2810.6	5.8%	8.4%	-4.0%	-4.0%
Gross Inl Cons./Capita (toe/inhabitant)	4.87	3.21	3.16	2.96	2.82	-8.0%	-1.6%	-6.3%	-4.9%
Electricity Generated/Capita (kWh/inhabitant)	5759	3761	3576	3508	na	-8.2%	-4.9%	-1.9%	na
CO ₂ Emissions/Capita (t of CO ₂ /inhabitant)	13.9	7.9	7.4	6.8	na	-10.8%	-6.0%	-7.8%	na
Import Dependency %	47.4	49.9	50.1	45.9	44.5	1.0%	0.4%	-8.3%	-3.0%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Estimates.





AFRICA: Major trends (1980-1998)

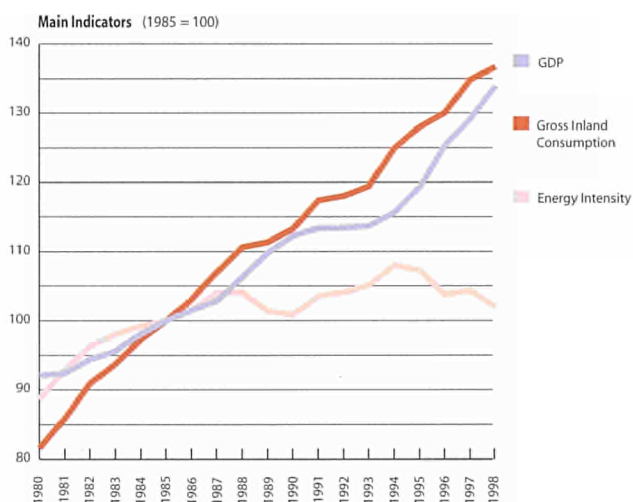
- 1998 accentuated the economic recovery observed since 1994
- Final energy demand largely dominated by the domestic sector, a result of the prevailing rural economy
- The transportation sector has remained largely undeveloped in the African countries
- Biomass met up to 75% of the final energy demand in sub-Saharan Africa
- The contribution of conventional energy, especially electricity, remained very low
- Growth of gross inland consumption closely followed the evolution of final demand
- Sub-Saharan oil production has overtaken North African production since 1996
- Africa accounts for about 7.8% of world fossil fuel reserves
- Coal provided roughly half of the electricity production in 1997
- The refinery capacity still requires upgrading and enhanced processing capability
- Energy intensity has improved since 1995, mainly in sub-Saharan countries
- Gross inland energy consumption per capita was by far the lowest observed in the main world regions
- In 1998 CO₂ emissions, which increased by 60% since 1980, were 19% above the 1990 level
- Africa increased its contribution to world energy markets, led by sub-Saharan Africa

Africa is a diverse continent from both economic and energy perspectives. A natural geographic separation, the Sahara desert, separates the North along the Mediterranean Sea, and all other countries. There are a number of countries with vast resources of oil, gas and coal. However, the energy sector in the region is largely underdeveloped. Africa includes some of the least developed countries in the world and, as a whole, has the lowest average income per capita among the world regions considered in this outlook. Special economic links exist between North African countries and the European Union, particularly concerning oil and gas supplies. For the analysis, two regions are explicitly considered:

North Africa including Algeria, Egypt, Libya, Morocco and Tunisia; and, on the other hand, sub-Saharan Africa which includes all other countries.

1998 accentuated the economic recovery observed since 1994...

Between 1980 and 1998, the African population grew steadily by about 2.7% per annum with about 82% concentrated in sub-Saharan Africa. Over the same period, the annual average **GDP growth** was limited to 2.1%. Though growth was stable during the 1980's at about 2.0% per year, economic growth was marked by stagnation between 1990 and 1993 and by a more sustained evolution since then, reaching 3.3% per year on average and confirmed by a 3.7% increase in 1998. But it must be stressed that GDP is largely underestimated, as a large fraction of the population is self-sufficient and thus much economic activity is not recorded. Nevertheless, the region's average GDP per capita decreased by more than 10% since 1980, being stable in the North Africa region. Improvements in health and education are primary sources of human and economic development. Although sub-Saharan African countries have made significant progress in enhancing education, they are still lagging behind other region in terms of literacy rates and especially with regard to secondary school enrolment. Recent policy efforts have brought sub-Saharan Africa closer to macroeconomic stability and reduced distortions in incentive structures, resulting in some improvements in growth performance. In most case, however, these efforts have not been sufficient to eliminate the obstacles and disincentives to increased capital accumulation.





ENERGY OUTLOOK

Final energy demand largely dominated by the domestic sector, a result of the prevailing rural economy...

The growth of final energy demand has slowed down since 1980 to reach only 2.2% in the 1990's, despite the rebound by 3.3% in 1997, compared to 2.5% on average during the 1980's. Resulting from marked differences in industrialisation, the final demand evolution varies greatly between regions. Since 1980, the growth in North Africa (+100%) has been systematically higher than in sub-Saharan Africa (+42%). Furthermore, in North Africa, the growth was totally met by commercial energies whilst biomass played a major role in sub-Saharan Africa, with the exception of South Africa.

Globally, for the whole continent, the domestic and, to a lesser extent, the tertiary-commercial share in final energy demand is by far the most dominant, and this component has accelerated over time, rising from 63% in 1980 to 67% in 1997. In sub-Saharan Africa, excluding South Africa, which presents a pattern of consumption similar to that of industrialised countries, it reached as high as 81% in 1997. The share of industry fell from 23% to 20% over the same period, while the transport sector decreased from 14% to 13%, corresponding to a slight erosion of industrial and transport infrastructures. This is a result of the rural economy prevailing in sub-Saharan Africa, which excludes almost all forms of conventional industrial activity, with the exception of South Africa. In this region of more than 564 millions inhabitants, industrial energy consumption remained below 26 Mtoe in 1997, or less than 10% of the European Union' industrial consumption. A second reason for this predominance of the domestic sector is the very low efficiency of applications, associated with biomass use. Looking more specifically at North Africa, final energy demand increased from 29.0 Mtoe to 58.1 Mtoe over the period 1980-1997, a growth of about 4.2% per year on average - the last year being characterised by a jump of 6.5%. The structure of energy consumption there was closer to that in industrialised countries with 32% for industry, 24% for transport and 44% for the tertiary-domestic sector in 1997.

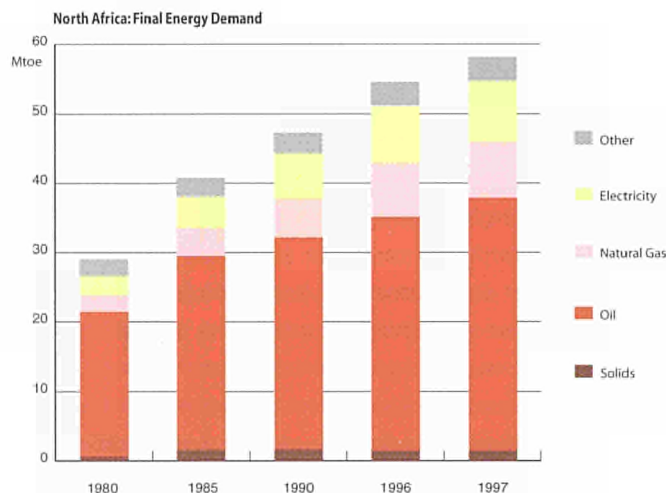
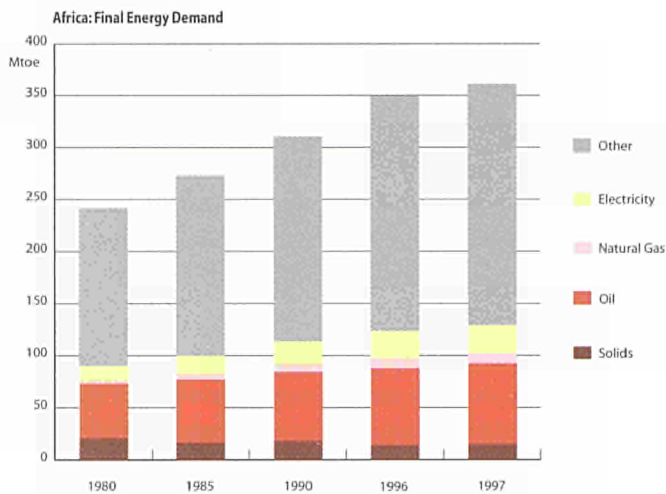
The transportation sector has remained largely undeveloped in the African countries...

The transportation sector has remained largely undeveloped in the African countries, with a limited road network which is not, in general, well maintained. Low per capita incomes have kept the number of vehicles per inhabitant among the lowest in the world.

Main items

Its three main sub-regions exemplify the tremendous diversity of the African continent, in terms of both economic and energy evolution: North, South and Sub-Saharan Africa. In all three sub-regions rapid population growth and urbanisation impose growing strains on economic development and are increasing energy demand. Political instability, weak public administration and burdensome regulation are still endemic, resulting in caution by overseas private investors. Despite recent debt-relief assistance from international financial institutions, debt burdens are still a major constraint in many countries. Sub-Saharan Africa is widely recognised as the toughest global development challenge: two-thirds of the population live in rural areas with virtually no access to commercial energy; 40% subsist on incomes below \$1 a day; and education and health provision remains non-existent or poor. In much of Africa uncontrolled urbanisation is straining inadequate infrastructures of all kinds (electricity, public transport, water and sewage, telecommunications). Such urbanisation, and rising use of unleaded gasoline and diesel, also contributes to deteriorating air quality. Energy sector reform is a high priority (e.g. energy market liberalisation, tariff policies, better corporate management and inward investment). Development in North Africa should aim to diversify these economies, reducing some countries' heavy dependence on oil and gas exports. In central and west Africa there are prospects for significant expansion of indigenous energy resources including on- and off-shore hydrocarbon resources, hydroelectric potential (requiring intra-regional grid connections) and more effective utilisation of biomass and other renewable resources. After the smooth transition to democracy in South Africa, political and economic reform continue to progress but, even here, energy infrastructures are lacking in the rural areas.

For example, in Nigeria, the most populous African country, there are only 12 vehicles per thousand people; and, even in South Africa, the region's most developed economy, there are only 139 vehicles per thousand persons. In much of the region railways are used primarily to transport goods to market, but the locomotives are outdated, and railways lines are in disrepair. Increased economic activity would make an expansion of trade possible, reinforcing the need for efficient infrastructures and pushing up the demand for transport fuels.



Biomass met up to 75% of the final energy demand in sub-Saharan Africa...

Biomass remained the major contributor to final energy demand, with a share of about 64% of energy needs even though the precise levels of use in individual countries are uncertain. For example, some neighbouring countries with similar economic and geographical characteristics show unexplained differences in their level of per capita biomass use. This illustrates the difficulties of establishing reliable energy statistics for non-commercial fuels, especially in less developed countries. Nevertheless the significant differences in economic development, energy endowment and demography between North African countries, South Africa and the rest of sub-Saharan Africa are reflected in the pattern of biomass energy use. Sub-Saharan Africa, excluding South Africa, accounted for 93% of the continent's total final biomass consumption in 1997, but consumed only 25% of the continent's

	Total Biomass in Final Energy Demand	Share of the region's biomass use	Share of biomass in Final Energy Demand	Per capita energy use (Kgoe)	
	(Mtoe)			Biomass	Conv. Fuels
North Africa	3.5	2%	6%	27	411
Sub-Saharan Africa	227.9	98%	75%	377	123
of which South Africa	11.8	5%	22%	291	1025
Total Africa	231.4	100%	64%	315	174

final conventional energy. Most biomass energy is consumed in the household sector. Much of the biomass used in rural households is collected rather than purchased.

The contribution of conventional energy, especially electricity, remained very low...

Oil's share in final energy demand has remained stable since 1980 at about 22% due to the limited increase of transport fuel consumption. The share of solid fuels diminished over the same period from 9% to only 4% while the gas share rose from 1% to 3% and electricity's share from 6% to 8%. The substitution from coal to both oil and gas is largely due to the evolution of South Africa's final demand. Electricity's share remained very low compared to industrialised countries; and consumption of the whole continent represented only 15% of that of the European Union in 1997. This reflects the fact that a large part of Central Africa is not yet electrified. In 1997, South Africa consumed just under 50% of Africa's total final electricity consumption, North Africa 32% and the sub-Saharan Africa, excluding South Africa, only 19%. In per capita terms, the contrast is dramatic: in 1996 South Africa consumed 5116 kWh per capita, North Africa 903 kWh per capita and sub-Saharan Africa only 129 kWh per capita. In North Africa, final energy demand is mainly focused on oil (63%), electricity (15%) and gas (14%), reflecting the importance of oil and gas in the economies of these countries. On the other hand, in the sub-Saharan region, biomass covers 75% of the needs, oil 14%, electricity 6% and solid fuels 4%.

Growth of gross inland consumption closely followed the evolution of final demand...

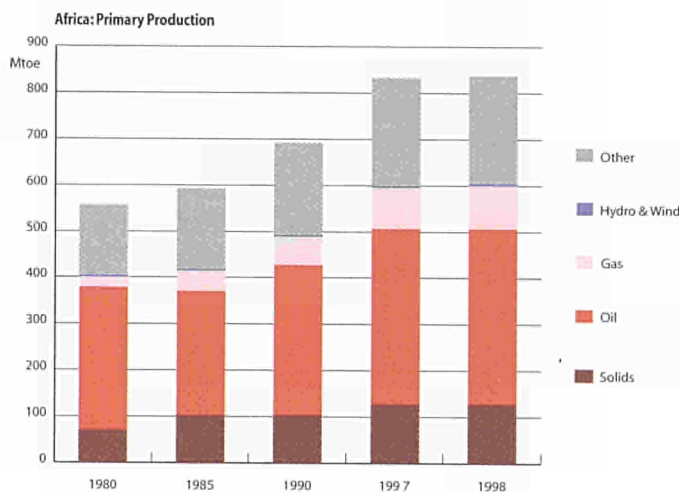
Gross inland energy consumption closely followed the evolution of final demand, with an average annual increase of almost 2.7% during the 1980's, but of only 2.2% since 1990 even though energy consumption growth recovered to 3.3% in 1997 in line with the economic rebound. Preliminary data for 1998 demonstrate a relative stability of demand despite the continuation of the economic



resurgence. There was a general increase for all primary fuels, but with large regional variations. Gas, mainly consumed in North Africa where the production is located, grew on average by 10.2% during the 1980's following the development of local gas networks and by 3.6% per year since 1990. Roughly 70% of Africa's domestic gas consumption and more than 80% of its production occurs in Algeria and Egypt. Within Africa, natural gas remains the least utilised fossil fuel. Low gas consumption reflects a lack of economic growth in much of the region as a result of political instability, which has been severe in sub-Saharan Africa. Domestic use of natural gas in Africa for power generation is considerable, amounting to 40% of regional gas demand. Solid fuels - which increased by about 3.6% during the 1980's but only by 2.4% since 1990 - are mainly consumed in South Africa, the major African producer. Power generation absorbed 57% of solid fuel consumption in Africa and synthetic fuels production in South Africa another 26%. The continent's oil consumption growth declined progressively since 1980 - 3.4% per year between 1980 and 1985, but 2.6% over the period 1985-1990 and 1.6% between 1990 and 1996 - but rebounded in 1997 (+8.4%) and 1998 (+2.4%) sustained by higher economic activity. North Africa, which includes more industrialised countries with better transport infrastructures, absorbed 53.5% of Africa's oil consumption in 1997 against 44.4% in 1980. Oil consumption has grown there by 4.8% during the 1980's and by 2.6% since 1990. Since then, demand growth has been located principally in the tertiary-domestic sector (+55%) while it remained very limited in all other sectors: 11% in the power sector, 5% in transport and only 2% in industry. This means that the share of transport in oil consumption has declined since 1990, contrary to prevailing global trends. In sub-Saharan Africa growth of oil consumption by sector has been more typical since 1990: +32% in power generation, +18% for both transport and the tertiary-domestic sector and -15% for industry. Transport remained by far the largest consumer of oil products with about 60% of total consumption in 1997.

Sub-Saharan oil production has overtaken North African production since 1996...

Indigenous energy production in Africa increased by almost 52%, or 285 Mtoe, over the period 1980 to 1998, but with considerable uncertainty relating to the statistical accounting of biomass production. Excluding biomass, energy production still increased by 206 Mtoe. Over the period, oil remained the major contributor, although its share in primary production decreased from 56% to about 45%. Whilst the major oil producers (Algeria, Libya and Egypt) are located in North Africa it must be stressed that sub-Saharan production, driven by Nigeria, Angola and Gabon, has increased more rapidly to overtake that of North Africa since 1996.



This evolution will continue as vast areas of offshore West Africa are now considered to be promising oil provinces for future development. Several West African producers (Angola, Cameroon, Chad, Congo, Gabon, and Ivory Coast) are expected to reap the benefits of substantial exploration activity, especially in the context of more sustained oil prices. Natural gas, mainly produced in North Africa (Algeria and to a lesser extent Egypt), has seen its production multiply by 4.5 since 1980 to contribute 11% of primary production in 1998. Almost 93% of gas production were located in North Africa, Nigeria being the only sub-Saharan country having a significant production. Its output is expected to increase in the near future with the first delivery of LNG planned in 1999 and prospects to export the currently-flared Nigerian gas to Ghana, Togo and Benin. Solid fuels' share has increased slowly since 1980, from 12.5% to 15.3% in 1998 though output increased by 84% since 1980, 97% of the total being produced in South Africa with about 125 Mtoe in 1998. Nuclear, hydro and wind, as well as geothermal, remain marginal even though their contribution has increased slowly since 1990. Given that in some sub-Saharan regions biomass remained the only energy source accessible to most people, its use continued to grow. Biomass remained the second largest energy source, covering 28% of primary production in 1998.

Africa accounts for about 7.8% of world fossil fuel reserves...

Africa's oil **reserves** at end 1998 amounted to about 7% of the world's proven oil reserves. Three OPEC Members accounted for most of these reserves: Libya, Nigeria and Algeria with a share of 39%, 30% and 12% of the total respectively. Major additions of new reserves occurred in Nigeria (+34%) during 1998; other countries remaining almost unchanged. Gas reserves, about 7% of world reserves as for crude oil, were highly concentrated with over



half in North Africa (mainly Algeria) and more than one third in Nigeria. Major reserve reassessments were observed in Egypt (+14%) and Nigeria (+8%) in 1998. Finally the continent's coal reserves, mainly located in South Africa, accounted for 8% of world coal reserves.

Coal provided roughly half of the electricity production in 1997....

Electricity generation in Africa grew by 5.7% per year during the 1980's. After a relative slow down at 2.5% per annum between 1990 and 1993, growth was re-established to reach 3.8% in 1996 and 4.3% in 1997 with the improvement in economic circumstances. South Africa accounted for more than half of the electricity generated on the African continent, and South Africa, Egypt, Algeria, Libya and Morocco together accounted for roughly 82% of the continent's total electricity production. Consequently the world's lowest electricity consumption per capita, at only about 543 kWh/inhabitant, demonstrated the current low level of electrification in many sub-Saharan countries. Only around one quarter of African households yet have access to electricity. Even in South Africa only 40% of the population had access to electricity in 1995 and consumed over half the continent's electricity. With the exception of some nuclear power in South Africa, all the incremental electricity production has been provided by thermal generating units, which multiplied output by about 2.4 since 1980. Thermal power units are mainly fed by coal in South Africa, gas in Algeria, Egypt, Nigeria and Tunisia and oil in the rest of Africa. Coal provided roughly half of the region's electricity production in 1997. Despite an increase of 48% in hydropower capacity since 1980, hydro production grew by only 32% due to unfavourable climatic conditions and the uncertain political situation in some sub-Saharan countries. Africa, particularly sub-Saharan Africa, has a large hydro potential, which could supply about 1300 TWh per year - or twenty times the present production. However, poor integration of the power networks at the sub-regional level limits the development of these hydro resources. Nevertheless, there are plans to link the electricity supply grids of some countries. Furthermore several African countries have recently opened up their electricity sectors to private investment. Morocco, Egypt, Ivory Coast, Nigeria and Ghana have pioneered such privatisation efforts leading to the first private investment for more than 4 GW of new capacity.

The refinery sector still requires upgrading and enhanced processing capability...

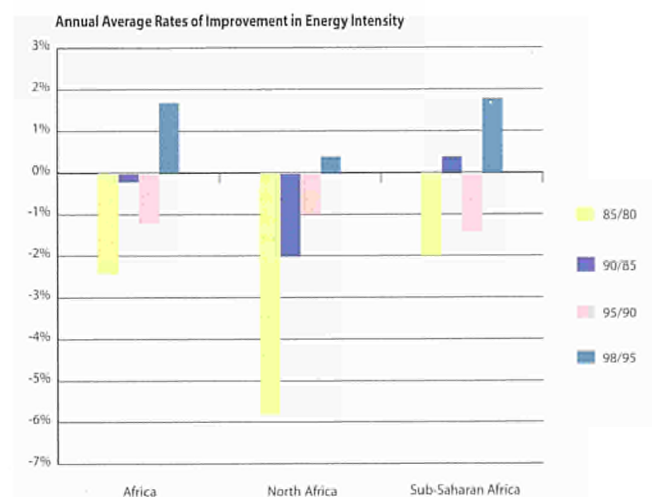
In 1997, the **refinery capacity**, slowly increasing since 1988 to reach 2.9 millions barrels day, represented only 3.7% of world capacity (2.5% in 1980). At the same time, the refinery utilisation rate increased from 71% to 83%, though still remaining below the

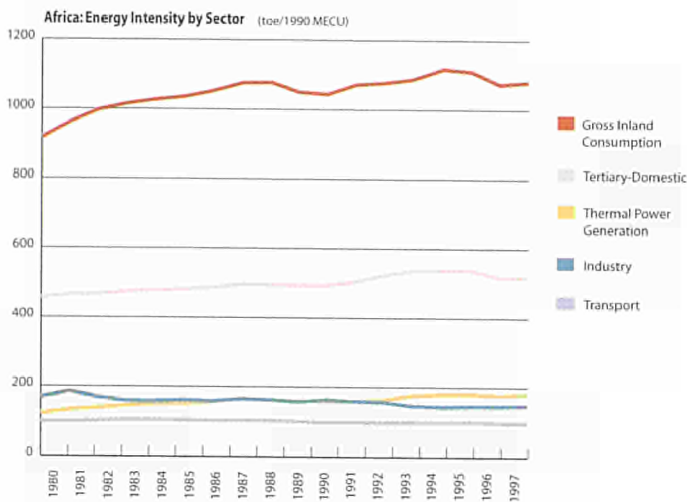
world average except in 1995 and 1996. Major refineries are located in Algeria, Egypt, Nigeria, Libya (the major oil producers) and in South Africa. These five countries accounted for about 75% of installed refining capacity. In addition, the refining sector is characterised by its relative technical simplicity and age. It requires foreign investment to upgrade and enhance processing capability so as to improve its efficiency and permit production of higher value and cleaner oil products.

COMPETITIVENESS

Energy intensity improved since 1995, mainly in sub-Saharan countries...

Energy intensity for the continent as a whole increased by roughly 1.4% per year on average between 1980 and 1994, but improved on average by 1.4% per year since then in association with better economic environment. Improvement reached 2.3% in 1998. Significant differences occurred between the two main regions. In North Africa energy intensity peaked in 1993 demonstrating a growth of about 3.6% per year on average between 1980 and 1993. Since 1994 energy intensity has oscillated with no firm trend at about 5% below the earlier peak. Energy intensity in sub-Saharan Africa improved by only 1.2% on average between 1980 and 1994 but has accelerated significantly since then, at about 1.9% per year on average, to reach in 1998 a level comparable with the 1985 level. In the more fully developed countries, with the exception of South Africa, economic performance was heavily influenced by oil and gas revenues. Consequently, as in the Middle East, the evolution of GDP has been seriously affected by the low price of crude oil on international markets since 1986, resulting in a limited GDP growth of only 2.1% per year on average.





ge since 1980; 2.3% in North Africa and only 2.0% in sub-Saharan Africa. As population grew by more than 2.7% per year since 1980, this means that GDP grew less than population and thus Africa had a GDP per capita ratio 10% lower in 1998 than in 1980. This trend reversed in 1997 and 1998, the growth of GDP reaching 3.1% and 3.7% respectively.

The contribution of the various sectors to overall energy demand varied substantially between regions depending on whether or not the industrialisation rate favoured increased living standards and industrial production. The contribution of domestic energy demand and power generation is evenly distributed in North Africa, each of them accounting for about 20% in 1980 and 26% in 1997 whilst the share of transport declined from 20% to only 15% and of industry from 24% to 18%. This illustrates the increasing weight of services and improving quality of life. On the other hand, the contribution of mainly domestic applications climbs to 55% in the sub-Saharan countries and even to 85% in some smaller countries where energy needs are limited to essential ones, mainly cooking requirements. In this region the contribution of the different sectors has not really changed since 1980, save for the decline of industry from 17% to only 13% in 1998 for the region as a whole.

Gross inland energy consumption per capita was by far the lowest observed in the main world regions...

Per capita gross inland energy consumption data emphasise the very low level of energy use: fluctuating between 0.61 and 0.66 Toe/inhabitant between 1980 and 1998, the lowest consumption observed in any of the world's main regions. The figures show relative stability since 1990 resulting from two opposing trends: the continuous decline in sub-Saharan Africa where living standards have generally declined since 1985 due to the economic

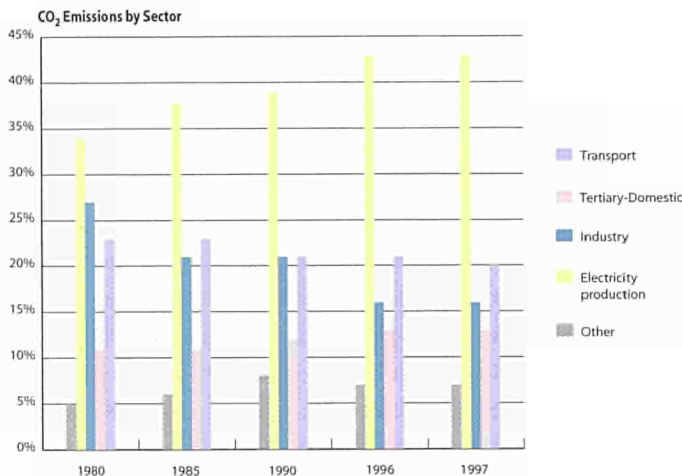
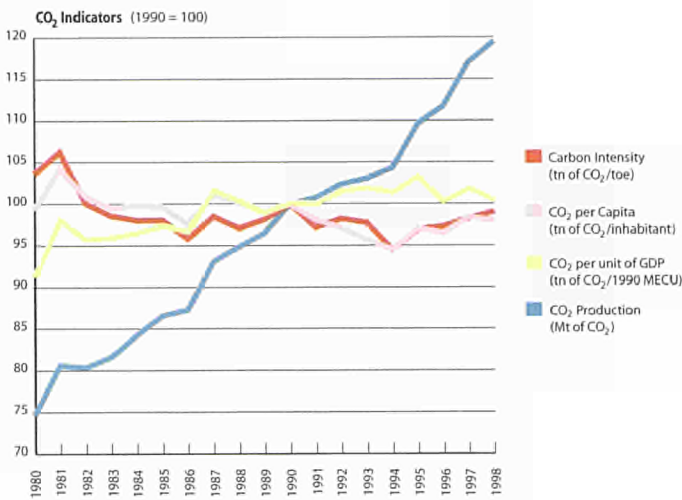
situation and political instability, while in North Africa consumption per capita has increased by more than 7% since 1990. For Africa as a whole, the main contribution comes largely from domestic applications which stabilised their share at about 48% of total consumption per capita in the period 1980-1998. The contributions of industry and transport declined continuously since 1980 to represent in 1997 only 14% and 9% respectively, demonstrating the very low level of industrialisation for the whole continent. But it must be stressed that in absolute terms, consumption per capita of industry increased by about 5% between 1995 and 1997 as a result of the recent economic upturn.

ENVIRONMENT

In 1998 CO₂ emissions, which increased by 60% since 1980, were 19% above the 1990 level...

CO₂ emissions in Africa increased by 60% since 1980 to reach 662 Mt of CO₂ in 1998, 19% above the 1990 level. Over the period, considering the particular structure of energy consumption, the fastest growing sources were power generation and the tertiary-domestic sector which doubled their contribution. CO₂ emissions from industry, stable during the 1980's, declined sharply between 1990 and 1994 due to the economic recession but have rebounded since 1995. Emissions from the transport sector grew by only 38% since 1980, reflecting the poor state of transport infrastructure. North Africa, which accounted for 18% of total population and 40% of economic activities, contributed 39% of the continent's total CO₂ emissions. Power generation contributed 31% of the total, the tertiary-domestic sector 21%, and industry and the transport sector each about 17%. In the sub-Saharan region, South Africa accounted for just over 70% of CO₂ emissions due to its economic activities and high dependence on solid fuels. The rest of the sub-Saharan region where 77% of the African population live, accounted for only 18% of total CO₂ emissions and with a quite different structure of emissions given the major role played by biomass in the domestic sector. Here transport was responsible for 45% of total emissions, power generation and the domestic sector for 17% each, and industry for only 12% reflecting principally the structure of oil consumption - the main commercial energy form in this region.

Overall CO₂ emissions per capita remained stable in the period 1980-1998 but vary widely by region. In 1998, they reached a maximum of 7.0 tonnes of CO₂ per inhabitant in South Africa, an average value of 1.9 tonnes in North Africa as a whole and only 0.2 tonne per head for the rest of sub-Saharan Africa. Although CO₂ emissions per capita remained broadly stable since 1990 in South



Africa, these emissions increased by about 8% in North Africa but fell by about 5% in the rest of sub-Saharan Africa. As overall gross inland energy consumption, based on fossil fuels, grew more rapidly than GDP since 1980, this implies that the CO₂ content per unit of GDP also increased over the whole period considered, except in 1996.

GLOBAL MARKETS

Africa increased its contribution to world energy markets, led by sub-Saharan Africa...

Africa has continued to increase its contribution to world energy markets. Between 1980 and 1998, energy exports grew from 260 Mtoe to 350 Mtoe with sub-Saharan Africa overtaking North Africa in 1996 and contributing 54% of the whole region's exports in 1998. Oil is by far the major product, accounting for 74% of total energy exports in 1998, compared with 14% for natural gas and 11% for coal. Although coal exports, wholly supplied by South Africa, increased slowly since 1985 (+32%), gas exports - only from North Africa until now but Nigerian exports will start soon - have multiplied by 2.5 since then. Since 1996, oil exports have stabilised at about 260 Mtoe. In 1998 Africa was exporting 42% of its total energy production, but 58% of its fossil fuel production. This share has declined since 1980 (65%) given increased consumption within the African continent. In 1998 North Africa exported 64% of its oil production (74% in 1990) and 58% of its gas production (52% in 1990), mainly to the European market. Sub-Saharan Africa's oil exports have now overtaken those of North Africa by about 30%. They represented in 1998 about 73% of its production (70% in 1990). Coal exports from South Africa, relatively stable since 1996, accounted for the balance of sub-Saharan exports.



AFRICA : SUMMARY ENERGY BALANCE

Mtoe	1980	1985	1990	1996	1997	1998(2)	85/80	90/85	96/90	97/96	98/97
Annual % Change											
Primary Production	556.9	594.2	694.4	802.8	837.2	841.9	1.3%	3.2%	2.4%	4.3%	0.6%
Solids	69.9	103.1	104.6	121.0	128.5	128.7	8.1%	0.3%	2.5%	6.2%	0.1%
Oil	310.5	269.6	324.0	368.4	379.8	379.6	-2.8%	3.7%	2.2%	3.1%	0.0%
Natural gas	20.4	42.5	61.8	78.7	88.2	92.6	15.8%	7.8%	4.1%	12.1%	5.0%
Nuclear	0.0	1.4	2.2	3.1	3.3	3.6	-	9.7%	5.7%	7.4%	7.9%
Hydro & Wind	4.1	4.1	4.7	5.2	5.4	5.4	0.2%	2.4%	2.0%	3.2%	0.1%
Geothermal	0.0	0.0	0.3	0.4	0.4	0.4	30.4%	47.1%	1.9%	13.3%	0.0%
Other	152.0	173.4	196.7	226.0	231.6	231.6	2.7%	2.6%	2.3%	2.5%	0.0%
Net Imports	-259.7	-241.0	-294.9	-330.7	-347.9	-349.9	-1.5%	4.1%	1.9%	5.2%	0.6%
Solids	-18.4	-30.1	-31.0	-36.8	-39.5	-39.7	10.3%	0.6%	2.9%	7.3%	0.5%
Oil	-233.9	-190.1	-234.1	-254.5	-261.1	-260.2	-4.1%	4.3%	1.4%	2.6%	-0.4%
Crude oil	-231.3	-178.0	-212.5	-236.3	-245.0	na	-5.1%	3.6%	1.8%	3.7%	na
Oil products	-2.7	-12.1	-21.6	-18.3	-16.2	na	35.5%	12.3%	-2.8%	-11.5%	na
Natural gas	-8.2	-20.8	-29.6	-39.2	-47.1	-50.0	20.6%	7.3%	4.8%	20.0%	6.3%
Electricity	0.8	0.1	-0.2	-0.2	-0.2	-0.1	-39.0%	-	2.4%	24.0%	-76.0%
Gross Inland Consumption	285.8	350.3	396.8	455.7	472.5	478.8	4.2%	2.5%	2.3%	3.7%	1.3%
Solids	51.6	72.8	73.8	86.1	87.4	89.0	7.1%	0.3%	2.6%	1.4%	1.9%
Oil	65.1	76.9	87.3	95.7	103.7	106.3	3.4%	2.6%	1.6%	8.4%	2.4%
Natural gas	12.2	21.7	32.2	39.5	41.2	42.6	12.1%	8.2%	3.5%	4.2%	3.5%
Other (1)	156.9	179.0	203.6	234.3	240.3	240.9	2.7%	2.6%	2.4%	2.5%	0.3%
Electricity Generation in TWh	184.0	261.5	320.6	382.8	399.2	na	7.3%	4.2%	3.0%	4.3%	na
Nuclear	0.0	5.3	8.4	11.8	12.6	na	-	9.7%	5.7%	7.4%	na
Hydro & wind	47.5	48.0	54.1	60.9	62.8	na	0.2%	2.4%	2.0%	3.1%	na
Thermal	136.5	208.2	258.0	310.1	323.7	na	8.8%	4.4%	3.1%	4.4%	na
Generation Capacity in GWe	45.4	62.9	82.4	94.8	96.0	na	6.8%	5.6%	2.4%	1.3%	na
Nuclear	0.0	1.0	1.8	1.8	1.8	na	-	13.8%	0.0%	0.0%	na
Hydro & wind	14.5	17.6	20.4	21.6	21.5	na	4.0%	3.0%	1.0%	-0.3%	na
Thermal	30.9	44.3	60.2	71.4	72.6	na	7.5%	6.3%	2.9%	1.8%	na
Average Load Factor in %	46.3	47.5	44.4	46.1	47.5	na	0.5%	-1.3%	0.6%	3.0%	na
Fuel Inputs for Thermal Power Generation	38.9	52.1	61.6	77.0	80.8	na	6.0%	3.4%	3.8%	4.8%	na
Solids	26.9	32.6	39.0	47.6	49.9	na	3.9%	3.7%	3.4%	4.7%	na
Oil	7.9	11.2	12.1	13.4	14.4	na	7.3%	1.5%	1.8%	7.0%	na
Gas	4.1	8.2	10.1	15.6	16.1	na	15.2%	4.2%	7.4%	3.4%	na
Geothermal	0.0	0.0	0.3	0.4	0.4	na	30.4%	47.1%	1.9%	13.3%	na
Other	0.0	0.0	0.0	0.0	0.0	na	-	-	-	-	na
Average Thermal Efficiency in %	30.2	34.4	36.0	34.6	34.5	na	2.6%	0.9%	-0.7%	-0.4%	na
Non-Energy Uses	5.3	9.1	9.0	14.1	14.4	na	11.7%	-0.3%	7.8%	1.8%	na
Total Final Energy Demand	242.2	273.3	310.5	349.8	361.2	na	2.4%	2.6%	2.0%	3.3%	na
Solids	21.2	16.9	18.2	14.3	15.2	na	-4.4%	1.5%	-3.9%	6.2%	na
Oil	52.2	60.4	66.5	73.6	77.3	na	3.0%	1.9%	1.7%	4.9%	na
Gas	3.0	5.1	7.1	9.7	9.9	na	11.4%	6.9%	5.2%	2.4%	na
Electricity	13.8	17.6	22.1	26.3	27.4	na	4.9%	4.8%	2.9%	4.1%	na
Heat	0.0	0.0	0.0	0.0	0.0	na	-	-	-	-	na
Other	152.0	173.3	196.6	225.8	231.4	na	2.7%	2.5%	2.3%	2.5%	na
CO₂ Emissions in Mt of CO₂	413.5	479.5	553.6	618.8	648.0	662.0	3.0%	2.9%	1.9%	4.7%	2.2%
Indicators											
Population (Million)	465.25	537.65	618.78	716.41	735.68	755.09	2.9%	2.9%	2.5%	2.7%	2.6%
GDP (index 1985=100)	92.1	100.0	112.3	125.4	129.2	133.9	1.7%	2.3%	1.9%	3.1%	3.7%
Gross Inl Cons./GDP (toe/1990 MEUR)	918.3	1036.4	1045.7	1075.3	1082.0	1057.6	2.4%	0.2%	0.5%	0.6%	-2.3%
Gross Inl Cons./Capita (toe/inhabitant)	0.61	0.65	0.64	0.64	0.64	0.63	1.2%	-0.3%	-0.1%	1.0%	-1.3%
Electricity Generated/Capita (kWh/inhabitant)	396	486	518	534	543	na	4.2%	1.3%	0.5%	1.6%	na
CO ₂ Emissions/Capita (t of CO ₂ /inhabitant)	0.89	0.89	0.89	0.86	0.88	0.88	0.1%	0.1%	-0.6%	2.0%	-0.5%
Import Dependency %	-89.2	-67.8	-73.2	-71.3	-72.5	-71.9	-5.3%	1.5%	-0.4%	1.7%	-0.8%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Estimates.

NORTH AFRICA : SUMMARY ENERGY BALANCE

Mtoe	1980	1985	1990	1996	1997	1998(2)	85/80	90/85	96/90	97/96	98/97
	Annual % Change										
Primary Production	205.7	199.4	238.5	260.3	270.2	269.6	-0.6%	3.6%	1.5%	3.8%	-0.3%
Solids	0.4	0.4	0.3	0.3	0.2	0.2	1.3%	-7.8%	-0.9%	-25.4%	4.9%
Oil	182.9	156.0	177.7	183.3	183.6	178.2	-3.1%	2.6%	0.5%	0.2%	-2.9%
Natural gas	19.1	39.4	56.6	72.2	81.7	86.3	15.6%	7.5%	4.1%	13.2%	5.7%
Nuclear	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-
Hydro & Wind	1.0	0.9	1.0	1.2	1.2	1.3	-3.1%	2.7%	3.2%	3.3%	4.3%
Geothermal	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-
Other	2.3	2.7	3.0	3.4	3.5	3.5	2.9%	2.1%	2.4%	1.8%	0.0%
Net Imports	-157.0	-131.3	-158.9	-156.6	-162.5	-161.7	-3.5%	3.9%	-0.2%	3.8%	-0.5%
Solids	0.6	1.9	2.3	3.0	2.9	2.8	27.6%	3.7%	4.3%	-2.4%	-1.9%
Oil	-149.4	-112.4	-131.6	-120.4	-118.3	-114.4	-5.5%	3.2%	-1.5%	-1.7%	-3.3%
Crude oil	-140.8	-93.6	-105.5	-95.1	-93.0	na	-7.8%	2.4%	-1.7%	-2.3%	na
Oil products	-8.6	-18.8	-26.1	-25.2	-25.3	na	16.8%	6.8%	-0.6%	0.5%	na
Natural gas	-8.2	-20.8	-29.6	-39.2	-47.1	-50.1	20.6%	7.3%	4.8%	20.0%	6.6%
Electricity	0.0	0.0	0.0	0.0	0.0	0.0	-	-7.8%	-10.9%	600.0%	0.0%
Gross Inland Consumption	44.2	65.4	80.0	92.3	97.3	101.0	8.1%	4.1%	2.4%	5.4%	3.8%
Solids	1.1	2.2	2.7	3.3	3.0	3.1	14.7%	4.2%	3.2%	-9.2%	2.0%
Oil	28.9	41.1	46.4	51.4	54.9	56.9	7.3%	2.5%	1.7%	6.8%	3.7%
Natural gas	10.9	18.6	26.9	32.9	34.6	36.2	11.2%	7.7%	3.4%	5.1%	4.5%
Other (1)	3.3	3.5	4.0	4.6	4.7	4.8	1.3%	2.3%	2.5%	2.4%	1.3%
Electricity Generation in TWh	39.1	66.9	91.5	113.2	118.6	na	11.4%	6.5%	3.6%	4.8%	na
Nuclear	0.0	0.0	0.0	0.0	0.0	na	-	-	-	-	na
Hydro & wind	11.6	9.9	11.3	13.7	14.2	na	-3.1%	2.7%	3.2%	3.5%	na
Thermal	27.5	57.0	80.2	99.5	104.5	na	15.7%	7.1%	3.7%	5.0%	na
Generation Capacity in GWe	10.9	17.7	23.9	32.9	32.9	na	10.2%	6.2%	5.5%	-0.1%	na
Nuclear	0.0	0.0	0.0	0.0	0.0	na	-	-	-	-	na
Hydro & wind	3.4	3.4	3.7	4.1	4.0	na	0.2%	1.6%	1.6%	-1.5%	na
Thermal	7.6	14.3	20.2	28.9	28.9	na	13.6%	7.2%	6.1%	0.1%	na
Average Load Factor in %	40.8	43.1	43.7	39.2	41.1	na	1.1%	0.3%	-1.8%	4.9%	na
Fuel Inputs for Thermal Power Generation	9.0	15.0	18.6	25.7	26.9	na	10.8%	4.4%	5.5%	4.9%	na
Solids	0.4	0.3	0.7	1.3	1.4	na	-1.1%	15.4%	11.1%	6.5%	na
Oil	5.5	8.2	9.6	10.4	11.1	na	8.4%	3.2%	1.3%	6.5%	na
Gas	3.1	6.4	8.3	13.9	14.4	na	15.5%	5.2%	9.0%	3.6%	na
Geothermal	0.0	0.0	0.0	0.0	0.0	na	-	-	-	-	na
Other	0.0	0.0	0.0	0.0	0.0	na	-	-	-	-	na
Average Thermal Efficiency in %	26.2	32.6	37.0	33.3	33.4	na	4.5%	2.5%	-1.7%	0.1%	na
Non-Energy Uses	1.9	3.3	3.7	5.6	5.9	na	11.4%	2.7%	7.0%	5.0%	na
Total Final Energy Demand	29.0	40.8	47.2	54.6	58.1	na	7.1%	3.0%	2.4%	6.5%	na
Solids	0.7	1.6	1.7	1.5	1.5	na	18.9%	0.7%	-1.5%	-2.1%	na
Oil	20.8	27.9	30.5	33.6	36.4	na	6.0%	1.8%	1.6%	8.4%	na
Gas	2.4	4.1	5.5	7.8	8.1	na	11.6%	5.7%	6.1%	3.4%	na
Electricity	2.8	4.5	6.6	8.3	8.7	na	10.3%	8.0%	3.7%	5.5%	na
Heat	0.0	0.0	0.0	0.0	0.0	na	-	-	-	-	na
Other	2.3	2.7	3.0	3.4	3.5	na	2.9%	2.1%	2.3%	1.7%	na
CO₂ Emissions in Mt of CO₂	114.9	168.5	203.8	231.6	246.1	256.1	8.0%	3.9%	2.2%	6.3%	4.1%
Indicators											
Population (Million)	88.35	101.09	114.07	128.96	131.39	133.89	2.7%	2.4%	2.1%	1.9%	1.9%
GDP (index 1985=100)	89.5	100.0	110.5	124.9	128.1	134.4	2.2%	2.0%	2.1%	2.5%	5.0%
Gross Inl Cons./GDP (toe/1990 MEUR)	366.8	485.8	537.5	548.6	563.9	557.9	5.8%	2.0%	0.3%	2.8%	-1.1%
Gross Inl Cons./Capita (toe/inhabitant)	0.50	0.65	0.70	0.72	0.74	0.75	5.3%	1.6%	0.3%	3.4%	1.9%
Electricity Generated/Capita (kWh/inhabitant)	442	662	803	878	903	na	8.4%	3.9%	1.5%	2.9%	na
CO ₂ Emissions/Capita (t of CO ₂ /inhabitant)	1.3	1.7	1.79	1.80	1.87	1.91	5.1%	1.4%	0.1%	4.3%	2.1%
Import Dependency %	-343.5	-195.0	-193.3	-163.7	-161.6	-155.4	-10.7%	-0.2%	-2.7%	-1.2%	-3.9%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Estimates.

NORTH AFRICA : MAIN INDICATORS

	1980	1985	1990	1995	1996	1997	85/80	90/85	96/90	97/96
	Annual % Change									
Gross Inland Consumption (Mtoe)	44.2	65.4	80.0	90.3	92.3	97.3	8.1%	4.1%	2.4%	5.4%
Public Thermal Power Generation	8.4	14.3	17.7	24.5	24.6	25.9	11.1%	4.4%	5.6%	4.9%
Autoprod. Thermal Power Generation	0.6	0.8	0.9	1.0	1.0	1.1	5.0%	3.8%	1.8%	5.0%
Energy Branch	6.4	9.2	14.6	12.0	12.1	12.8	7.7%	9.6%	-3.1%	6.0%
Final Energy Consumption	28.9	40.7	47.1	52.7	54.4	58.0	7.1%	3.0%	2.4%	6.5%
Industry	11.0	14.8	17.4	16.7	17.5	18.6	6.2%	3.2%	0.1%	6.8%
Transport	8.9	12.8	12.7	13.3	13.9	14.1	7.7%	-0.2%	1.5%	1.7%
Tertiary-Domestic	9.0	13.0	17.0	22.7	23.1	25.2	7.6%	5.5%	5.2%	9.3%
Energy Intensity (toe/1990 MEUR)	366.8	485.8	537.5	565.2	548.6	563.9	5.8%	2.0%	0.3%	2.8%
Public Thermal Power Generation	69.9	106.0	119.2	153.1	146.5	149.9	8.7%	2.4%	3.5%	2.3%
Autoprod. Thermal Power Generation	4.9	5.6	6.1	6.1	6.0	6.1	2.7%	1.7%	-0.2%	2.4%
Industry	90.9	110.0	116.6	104.7	103.8	108.0	3.9%	1.2%	-1.9%	4.1%
Transport	73.5	95.4	85.2	83.2	82.4	81.7	5.3%	-2.2%	-0.6%	-0.8%
Tertiary-Domestic	75.0	96.9	114.5	141.9	137.3	146.3	5.3%	3.4%	3.1%	6.5%
Energy per Capita (Kgoe/inhabitant)	501	647	702	714	716	740	5.3%	1.6%	0.3%	3.4%
Industry	124	147	152	132	135	142	3.4%	0.8%	-1.9%	4.8%
Transport	100	127	111	105	107	107	4.8%	-2.6%	-0.6%	-0.2%
Tertiary-Domestic	102	129	149	179	179	192	4.8%	3.0%	3.1%	7.2%
Electricity Share (%)										
Final Energy Consumption	9.5%	11.1%	14.1%	15.5%	15.2%	15.0%	3.0%	4.9%	1.3%	-1.0%
Industry	13.0%	12.5%	14.3%	18.3%	17.5%	17.9%	-0.8%	2.8%	3.4%	1.8%
Transport	0.1%	0.2%	0.3%	0.4%	0.4%	0.4%	9.7%	13.1%	4.6%	-0.1%
Tertiary-Domestic	14.6%	20.2%	24.1%	22.4%	22.3%	21.1%	6.6%	3.6%	-1.3%	-5.2%
Total Renewable Consumption (Mtoe)	3.3	3.5	4.0	4.4	4.6	4.7	1.2%	2.3%	2.5%	2.1%
Hydro	1.0	0.9	1.0	1.0	1.2	1.2	-3.1%	2.7%	3.2%	3.3%
Biomass	2.3	2.7	3.0	3.3	3.4	3.5	2.9%	2.1%	2.3%	1.7%
Other	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-
Renewable intensity (toe/1990MEUR)	27.6	26.2	26.6	27.2	27.3	27.2	-1.0%	0.3%	0.5%	-0.4%
Renewable per capita (Kgoe/inhabitant)	37.6	34.9	34.7	34.4	35.6	35.7	-1.5%	-0.2%	0.4%	0.2%
CO₂ Emissions (Mt of CO₂)	114.9	168.5	203.8	226.1	231.6	246.1	8.0%	3.9%	2.2%	6.3%
Public Thermal Power Generation	24.4	40.5	50.4	68.7	69.0	72.5	10.6%	4.5%	5.4%	5.1%
Autoprod. Thermal Power Generation	1.8	2.3	2.8	3.0	3.1	3.2	5.0%	3.8%	1.8%	5.0%
Energy Branch	16.0	23.3	36.7	30.6	30.9	32.5	7.7%	9.6%	-2.8%	5.4%
Industry	27.5	37.7	43.1	38.8	41.0	43.6	6.5%	2.7%	-0.8%	6.3%
Transport	27.2	39.3	38.8	40.3	42.0	42.7	7.7%	-0.3%	1.3%	1.6%
Tertiary-Domestic	17.9	25.3	31.9	44.7	45.6	51.5	7.1%	4.8%	6.1%	12.9%
Carbon Intensity (tn of CO₂/toe)	2.6	2.6	2.5	2.5	2.5	2.5	-0.2%	-0.2%	-0.2%	0.8%
Public Power Generation	2.6	2.7	2.7	2.7	2.7	2.7	0.7%	0.1%	-0.1%	0.2%
Public Thermal Power Generation	2.9	2.8	2.8	2.8	2.8	2.8	-0.4%	0.0%	-0.2%	0.2%
Autoprod. Power Generation	3.1	3.1	3.1	3.1	3.1	3.1	0.0%	0.0%	0.0%	0.0%
Autoprod. Thermal Power Generation	3.1	3.1	3.1	3.1	3.1	3.1	0.0%	0.0%	0.0%	0.0%
Energy Branch	2.5	2.5	2.5	2.6	2.6	2.5	0.0%	-0.1%	0.3%	-0.6%
Industry	2.5	2.5	2.5	2.3	2.3	2.3	0.3%	-0.5%	-0.9%	-0.4%
Transport	3.1	3.1	3.1	3.0	3.0	3.0	0.0%	0.0%	-0.1%	-0.1%
Tertiary-Domestic	2.0	1.9	1.9	2.0	2.0	2.0	-0.5%	-0.7%	0.9%	3.4%
CO₂ per Capita (kg of CO₂/inhabitant)	1300	1666	1787	1787	1796	1873	5.1%	1.4%	0.1%	4.3%
Industry	311	373	378	307	318	332	3.7%	0.3%	-2.9%	4.4%
Transport	308	389	340	319	326	325	4.8%	-2.7%	-0.7%	-0.3%
Tertiary-Domestic	203	250	280	353	354	392	4.3%	2.3%	4.0%	10.9%
CO₂ per unit of GDP (tn of CO₂/1990 MEUR)	953	1251	1369	1416	1377	1427	5.6%	1.8%	0.1%	3.6%
Public Thermal Power Generation	203	301	339	430	410	421	8.2%	2.4%	3.2%	2.5%
Autoprod. Thermal Power Generation	15	17	19	19	18	19	2.7%	1.7%	-0.2%	2.4%
Energy Branch	133	173	247	192	184	189	5.4%	7.4%	-4.8%	2.7%
Industry	228	280	290	243	244	253	4.2%	0.7%	-2.8%	3.7%
Transport	225	292	261	252	250	248	5.3%	-2.3%	-0.7%	-0.9%
Tertiary-Domestic	149	188	214	280	271	299	4.8%	2.7%	4.0%	10.1%



SUB-SAHARAN AFRICA : SUMMARY ENERGY BALANCE

Mtoe	1980	1985	1990	1996	1997	1998(2)	85/80	90/85	96/90	97/96	98/97
Annual % Change											
Primary Production	351,1	394,8	455,9	542,5	567,0	572,3	2,4%	2,9%	2,9%	4,5%	0,9%
Solids	69,5	102,6	104,3	120,7	128,3	128,5	8,1%	0,3%	2,5%	6,3%	0,1%
Oil	127,5	113,6	146,3	185,1	196,1	201,4	-2,3%	5,2%	4,0%	6,0%	2,7%
Natural gas	1,3	3,1	5,3	6,6	6,5	6,3	18,7%	11,2%	3,7%	-0,6%	-3,9%
Nuclear	0,0	1,4	2,2	3,1	3,3	3,6	-	9,7%	5,7%	7,4%	7,9%
Hydro & Wind	3,1	3,3	3,7	4,1	4,2	4,1	1,2%	2,4%	1,6%	3,2%	-1,1%
Geothermal	0,0	0,0	0,3	0,4	0,4	0,4	30,4%	47,1%	1,9%	13,3%	0,0%
Other	149,7	170,7	193,7	222,6	228,1	228,1	2,7%	2,6%	2,3%	2,5%	0,0%
Net Imports	-102,7	-109,7	-136,0	-174,1	-185,4	-190,2	1,3%	4,4%	4,2%	6,5%	2,6%
Solids	-19,0	-32,0	-33,3	-39,7	-42,4	-42,5	11,0%	0,8%	3,0%	6,6%	0,4%
Oil	-84,5	-77,8	-102,6	-134,2	-142,8	-147,8	-1,6%	5,7%	4,6%	6,4%	3,5%
Crude oil	-90,5	-84,4	-107,0	-141,1	-152,0	na	-1,4%	4,9%	4,7%	7,7%	na
Oil products	6,0	6,7	4,4	7,0	9,2	na	2,2%	-7,8%	7,8%	32,2%	na
Natural gas	0,0	0,0	0,0	0,0	0,0	0,1	-	-	-	-	-
Electricity	0,8	0,1	-0,2	-0,2	-0,2	-0,1	-40,2%	-	2,1%	30,5%	-75,3%
Gross Inland Consumption	241,6	284,9	316,8	363,4	375,3	377,8	3,4%	2,1%	2,3%	3,3%	0,7%
Solids	50,5	70,6	71,0	82,8	84,4	86,0	6,9%	0,1%	2,6%	1,9%	1,9%
Oil	36,2	35,8	40,9	44,3	48,8	49,3	-0,2%	2,7%	1,3%	10,2%	1,0%
Natural gas	1,3	3,1	5,3	6,6	6,5	6,4	18,7%	11,2%	3,7%	-0,6%	-2,3%
Other (1)	153,6	175,4	199,6	229,7	235,6	236,2	2,7%	2,6%	2,4%	2,5%	0,2%
Electricity Generation in TWh	144,9	194,6	229,1	269,6	280,6	na	6,1%	3,3%	2,8%	4,1%	na
Nuclear	0,0	5,3	8,4	11,8	12,6	na	-	9,7%	5,7%	7,4%	na
Hydro & wind	35,9	38,1	42,8	47,2	48,7	na	1,2%	2,4%	1,6%	3,0%	na
Thermal	109,0	151,2	177,8	210,6	219,3	na	6,8%	3,3%	2,9%	4,1%	na
Generation Capacity in GWe	34,4	45,2	58,5	61,9	63,1	na	5,6%	5,3%	0,9%	2,0%	na
Nuclear	0,0	1,0	1,8	1,8	1,8	na	-	13,8%	0,0%	0,0%	na
Hydro & wind	11,1	14,2	16,7	17,5	17,5	na	5,0%	3,3%	0,8%	0,0%	na
Thermal	23,3	30,0	40,0	42,5	43,7	na	5,2%	5,9%	1,0%	2,9%	na
Average Load Factor in %	48,0	49,2	44,7	49,7	50,7	na	0,5%	-1,9%	1,8%	2,1%	na
Fuel Inputs for Thermal Power Generation	29,8	37,1	43,0	51,4	53,8	na	4,4%	3,0%	3,0%	4,8%	na
Solids	26,5	32,2	38,3	46,3	48,4	na	4,0%	3,5%	3,2%	4,6%	na
Oil	2,4	3,0	2,5	3,0	3,3	na	4,7%	-3,8%	3,5%	8,7%	na
Gas	0,9	1,8	1,8	1,6	1,7	na	14,2%	0,4%	-1,9%	1,5%	na
Geothermal	0,0	0,0	0,3	0,4	0,4	na	30,4%	47,1%	1,9%	13,3%	na
Other	0,0	0,0	0,0	0,0	0,0	na	-	-	-	-	na
Average Thermal Efficiency in %	31,4	35,1	35,6	35,3	35,0	na	2,2%	0,3%	-0,2%	-0,7%	na
Non-Energy Uses	3,4	5,9	5,3	8,6	8,5	na	11,8%	-2,1%	8,4%	-0,3%	na
Total Final Energy Demand	213,2	232,5	263,3	295,2	303,0	na	1,7%	2,5%	1,9%	2,6%	na
Solids	20,5	15,3	16,5	12,8	13,8	na	-5,7%	1,6%	-4,1%	7,2%	na
Oil	31,4	32,5	36,0	40,1	40,9	na	0,7%	2,1%	1,8%	2,0%	na
Gas	0,6	1,0	1,7	1,9	1,9	na	10,5%	11,5%	2,1%	-1,9%	na
Electricity	11,0	13,1	15,5	18,0	18,7	na	3,4%	3,5%	2,5%	3,5%	na
Heat	0,0	0,0	0,0	0,0	0,0	na	-	-	-	-	na
Other	149,7	170,7	193,6	222,4	227,9	na	2,7%	2,6%	2,3%	2,5%	na
CO₂ Emissions in Mt of CO₂	298,6	311,0	349,8	387,2	401,9	405,8	0,8%	2,4%	1,7%	3,8%	1,0%
Indicators											
Population (Million)	376,89	436,56	504,71	587,46	604,29	621,20	3,0%	2,9%	2,6%	2,9%	2,8%
GDP (index 1985=100)	93,8	100,0	113,4	125,7	129,9	133,6	1,3%	2,5%	1,7%	3,4%	2,8%
Gross Inl Cons./GDP (toe/1990 MEUR)	1267,0	1400,9	1373,7	1422,0	1420,0	1390,5	2,0%	-0,4%	0,6%	-0,1%	-2,1%
Gross Inl Cons./Capita (toe/inhabitant)	0,64	0,65	0,63	0,62	0,62	0,61	0,4%	-0,8%	-0,2%	0,4%	-2,1%
Electricity Generated/Capita (kWh/inhabitant)	385	446	454	459	464	na	3,0%	0,4%	0,2%	1,2%	na
CO ₂ Emissions/Capita (t of CO ₂ /inhabitant)	0,8	0,7	0,69	0,66	0,67	0,65	-2,1%	-0,6%	-0,8%	0,9%	-1,8%
Import Dependency %	-41,8	-38,1	-42,5	-47,3	-48,9	-49,8	-1,9%	2,2%	1,8%	3,3%	1,9%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Estimates.

SUB-SAHARAN AFRICA : MAIN INDICATORS

	1980	1985	1990	1995	1996	1997	85/80	90/85	96/90	97/96
	Annual % Change									
Gross Inland Consumption (Mtoe)	241.6	284.9	316.8	358.3	363.4	375.3	3.4%	2.1%	2.3%	3.3%
Public Thermal Power Generation	25.7	33.5	40.1	45.7	48.0	50.4	5.5%	3.6%	3.1%	4.9%
Autoprod. Thermal Power Generation	4.1	3.5	2.5	3.1	3.0	3.1	-3.3%	-6.3%	2.7%	2.8%
Energy Branch	2.8	4.0	3.8	7.5	7.4	7.3	7.5%	-1.2%	11.8%	-2.6%
Final Energy Consumption	198.0	214.3	242.1	265.5	270.8	278.1	1.6%	2.5%	1.9%	2.7%
Industry	42.4	40.7	45.7	43.2	45.4	47.1	-0.8%	2.4%	-0.1%	3.7%
Transport	22.3	23.2	25.4	28.1	28.9	29.6	0.8%	1.8%	2.2%	2.6%
Tertiary-Domestic	133.3	150.3	171.0	194.3	196.5	201.4	2.4%	2.6%	2.3%	2.5%
Energy Intensity (toe/1990 MEUR)	1267.0	1400.9	1373.7	1470.0	1422.0	1420.0	2.0%	-0.4%	0.6%	-0.1%
Public Thermal Power Generation	134.7	164.9	173.9	187.4	187.9	190.6	4.1%	1.1%	1.3%	1.4%
Autoprod. Thermal Power Generation	21.8	17.2	11.0	12.8	11.6	11.6	-4.6%	-8.6%	1.0%	-0.6%
Industry	222.2	200.2	198.3	177.1	177.7	178.2	-2.1%	-0.2%	-1.8%	0.3%
Transport	116.8	114.2	110.0	115.2	113.0	112.1	-0.5%	-0.7%	0.4%	-0.8%
Tertiary-Domestic	699.2	739.2	741.5	797.1	769.0	762.1	1.1%	0.1%	0.6%	-0.9%
Energy per Capita (Kgoe/inhabitant)	641	653	628	626	619	621	0.4%	-0.8%	-0.2%	0.4%
Industry	112	93	91	75	77	78	-3.7%	-0.6%	-2.6%	0.8%
Transport	59	53	50	49	49	49	-2.1%	-1.1%	-0.4%	-0.3%
Tertiary-Domestic	354	344	339	340	335	333	-0.5%	-0.3%	-0.2%	-0.4%
Electricity Share (%)										
Final Energy Consumption	5.6%	6.1%	6.4%	6.6%	6.7%	6.7%	1.8%	1.0%	0.6%	0.8%
Industry	16.6%	20.1%	20.4%	21.6%	22.3%	21.9%	3.8%	0.3%	1.6%	-1.9%
Transport	1.7%	1.7%	1.3%	1.3%	1.3%	1.3%	0.3%	-4.6%	-0.8%	3.9%
Tertiary-Domestic	2.7%	3.0%	3.4%	4.0%	3.8%	3.9%	1.8%	2.8%	1.9%	3.0%
Total Renewable Consumption (Mtoe)	152.8	174.0	197.6	221.3	226.8	232.5	2.6%	2.6%	2.3%	2.5%
Hydro	3.1	3.3	3.7	3.9	4.1	4.2	1.2%	2.4%	1.6%	3.2%
Biomass	149.7	170.7	193.6	217.0	222.4	227.9	2.7%	2.6%	2.3%	2.5%
Other	0.0	0.0	0.3	0.3	0.4	0.4	30.4%	47.1%	1.9%	13.3%
Renewable intensity (toe/1990MEUR)	801.2	855.5	856.8	907.9	887.6	879.8	1.3%	0.0%	0.6%	-0.9%
Renewable per capita (Kgoe/inhabitant)	405.4	398.5	391.5	386.9	386.1	384.8	-0.3%	-0.4%	-0.2%	-0.4%
CO₂ Emissions (Mt of CO₂)	298.6	311.0	349.8	380.8	387.2	401.9	0.8%	2.4%	1.7%	3.8%
Public Thermal Power Generation	98.1	127.4	153.3	175.3	184.4	193.4	5.4%	3.8%	3.1%	4.9%
Autoprod. Thermal Power Generation	15.9	13.2	9.7	12.0	11.3	11.6	-3.6%	-6.1%	2.7%	2.5%
Energy Branch	6.0	7.7	6.8	13.2	13.3	12.6	4.9%	-2.3%	11.7%	-4.6%
Industry	82.4	64.5	71.0	51.7	55.0	58.8	-4.8%	1.9%	-4.2%	7.0%
Transport	68.5	70.7	77.0	85.0	87.5	89.7	0.6%	1.7%	2.2%	2.5%
Tertiary-Domestic	27.7	27.3	31.8	43.5	35.7	35.7	-0.3%	3.1%	1.9%	0.0%
Carbon Intensity (tn of CO₂/toe)	1.2	1.1	1.1	1.1	1.1	1.1	-2.5%	0.2%	-0.6%	0.5%
Public Power Generation	3.5	3.4	3.3	3.3	3.3	3.3	-0.5%	-0.2%	0.1%	0.0%
Public Thermal Power Generation	3.8	3.8	3.8	3.8	3.8	3.8	-0.1%	0.1%	0.1%	0.0%
Autoprod. Power Generation	3.5	3.3	3.4	3.4	3.3	3.3	-1.0%	0.5%	-0.4%	-1.7%
Autoprod. Thermal Power Generation	3.8	3.8	3.8	3.8	3.8	3.8	-0.3%	0.2%	0.0%	-0.3%
Energy Branch	2.1	1.9	1.8	1.8	1.8	1.7	-2.4%	-1.1%	-0.1%	-2.1%
Industry	1.9	1.6	1.6	1.2	1.2	1.2	-4.0%	-0.4%	-4.0%	3.2%
Transport	3.1	3.0	3.0	3.0	3.0	3.0	-0.2%	-0.1%	0.0%	-0.1%
Tertiary-Domestic	0.2	0.2	0.2	0.2	0.2	0.2	-2.7%	0.5%	-0.4%	-2.4%
CO₂ per Capita (kg of CO₂/inhabitant)	792	712	693	666	659	665	-2.1%	-0.6%	-0.8%	0.9%
Industry	219	148	141	90	94	97	-7.5%	-1.0%	-6.5%	4.0%
Transport	182	162	152	149	149	148	-2.3%	-1.2%	-0.4%	-0.4%
Tertiary-Domestic	73	62	63	76	61	59	-3.2%	0.2%	-0.6%	-2.7%
CO₂ per unit of GDP (tn of CO₂/1990 MEUR)	1566	1529	1517	1562	1515	1521	-0.5%	-0.2%	0.0%	0.4%
Public Thermal Power Generation	515	626	665	719	722	732	4.0%	1.2%	1.4%	1.4%
Autoprod. Thermal Power Generation	83	65	42	49	44	44	-4.8%	-8.4%	0.9%	-0.9%
Energy Branch	32	38	30	54	52	48	3.5%	-4.7%	9.8%	-7.8%
Industry	432	317	308	212	215	223	-6.0%	-0.6%	-5.8%	3.5%
Transport	359	348	334	349	342	339	-0.6%	-0.8%	0.4%	-0.9%
Tertiary-Domestic	145	134	138	178	140	135	-1.6%	0.6%	0.2%	-3.3%





MIDDLE EAST: Major trends (1985-1998)

- Regional economic development is becoming less dependent on oil revenues
- Diversification and increasing welfare sustained final energy demand growth of 44% since 1990
- Tertiary-domestic sector largely dominated final demand for structural reasons, but industry has increased rapidly
- The share of electricity in final demand seems to have stabilised since 1994
- Hydrocarbons dominated the energy market with gas progressively substituting oil
- Oil production overtook the historical peak of 1974
- Middle East accounted for 50% of world hydrocarbon reserves but only 18% of world fossil reserves
- Grid interconnection is on the way
- Upgrading and expansions were continuing in oil refineries
- Growth in energy intensity has slowed down progressively since 1990
- CO₂ emissions have increased by 50% since 1990
- Despite financial crises, Asia remained by far the largest market for oil exports

This region includes 13 different countries: Bahrain, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, the United Arab Emirates and Yemen. These countries together have a population of 160 million inhabitants, growing by about 2.6% per year since 1990. Over this period, the region has undergone several wars, involving two or more countries (Lebanon, Iran-Iraq, Gulf War...) inflicting severe damage upon basic industrial or energy infrastructure targets. The situation has become progressively more peaceful and clear progress in welfare and industrial activity is noticeable. The region is also one of contrasts, including some developing countries and some others that show many characteristics of highly-industrialised countries. Some very small states, with only a few hundred thousand inhabitants, are neighbours of very large and powerful countries.

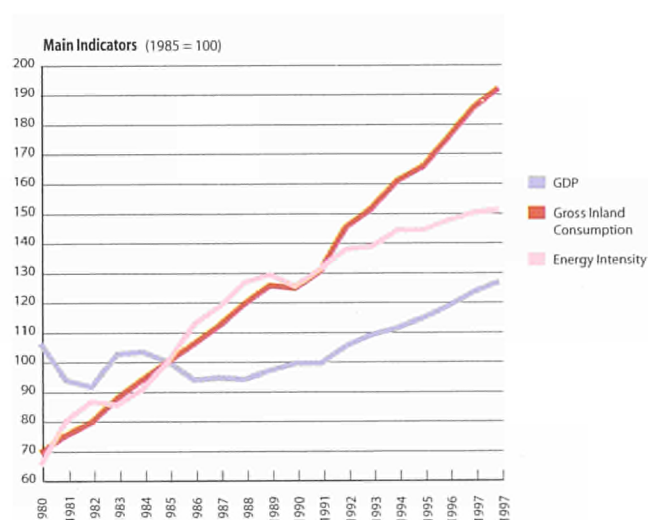
Regional economic development is becoming less dependent on oil revenues...

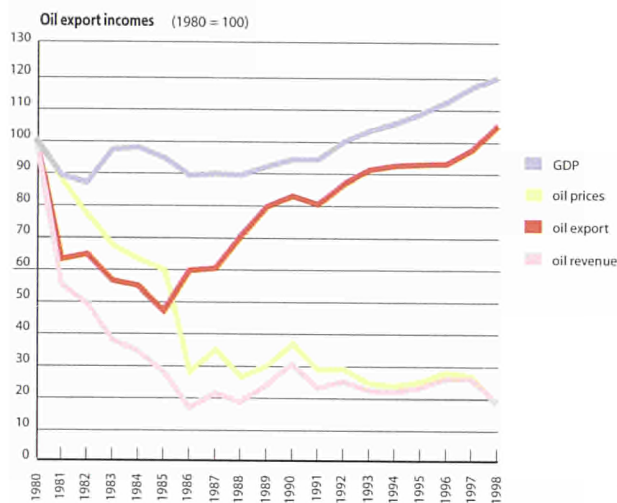
Economic development in this region continues to be heavily influenced by crude oil prices and production as many of these economies effectively rely on production and exportation of a single commodity. Saudi Arabia, despite attempts to diversify its economic activities, illustrates this situation very well: it remains heavily dependent on oil revenues for around 90% of total export earnings, about 70% of state revenues and 40% of GDP. Nevertheless, the marked decline of oil prices in 1998 had a limited impact on the GDP evolution at the regional level even though falling oil prices threw that year's budgets for oil producing countries into chaos, as they scrambled to cut expenditures, raise revenues and reduce budget deficits. Increasing oil exports, by 8% in 1998, helped to minimize these effects.

World oil prices declined sharply in late 1997, and continued to remain extremely low throughout 1998 and into early 1999. Beginning in late 1997, the OPEC "basket" price fell rapidly, from near-

ly \$19 per barrel in November 1997 to under \$10 per barrel in December 1998. Low oil prices were caused by several main factors, including: OPEC's December 1, 1997 agreement to raise the group's production quota by 10%, which was later reversed by a series of production cuts beginning in March 1998; warmer than normal winters in 1997/1998 and 1998/1999 in the northern hemisphere; increasing Iraqi oil exports; and depressed oil demand due to the continuing economic crisis in East Asia.

In other words, oil price and production fluctuations continued to influence the major components of the economy of oil producing countries (budgets, revenues, GDP...) but to a lesser extent. Between 1980 and 1985, the combined reduction of oil prices and oil exports cut oil revenues by 40% leading to a GDP reduction of about 10%. The rapid fall in oil prices in 1986 by more than 50% was coupled with a GDP slump of about 5.5%. After four years of stagnation, GDP started to increase regularly in 1990 at an average yearly rate of 3.1% until





1998. At the same time, oil prices remained quite low even during the Gulf War but exports increased regularly to overtake their 1980's level in 1998. Fortunately, the progressive diversification of the regional economy beyond the oil industry reduced the sensitivity of GDP to oil revenues, principally during the 1990's when GDP increased by 27% whereas oil revenues declined by 40%. In particular, the regional GDP still increased by 2.7% in 1998 despite a collapse in oil revenues of about 30%.

In many countries of the region, an informal social contract exists whereby the general population benefits from the fact that their country is a large net oil exporter. Much of the benefit comes in the form of low domestic energy prices. One of the main benefits of the region's low energy prices has been the development of a thriving chemicals industry. Converting the region's substantial energy reserves into chemicals not only helps to diversify the region's economy away from energy, and oil in particular, but also adds value, provides well-paid employment and stimulates economic development.

ENERGY OUTLOOK

Diversification and increasing welfare sustained final energy demand growth of 44% since 1990...

As a result of the industrial diversification experienced over the last ten years, combined with higher living standards, **final energy demand** has increased by about 44% since 1990 on a regular basis over the whole region - excepting Iran and Qatar which both grew substantially faster; and Kuwait which remained stable for factors other than those of the Gulf War. The share absorbed by Iran and Saudi Arabia, the two major contributors, increased continuously to reach 62% of the whole region's consumption in 1997 against 58% in 1980.

Main items

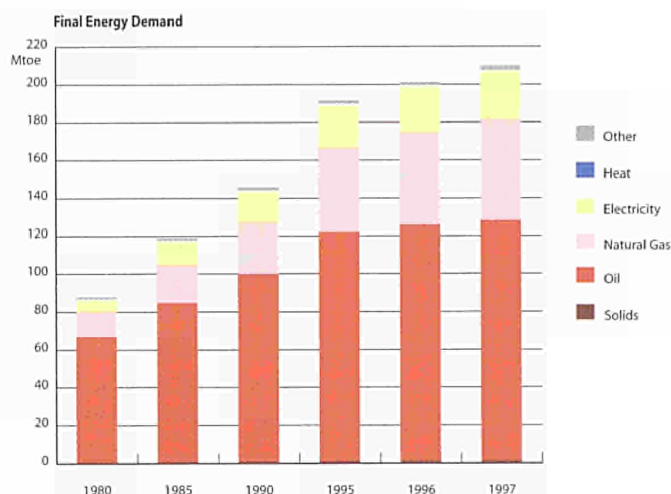
With some 64% of global oil and 34% of total gas reserves, the Middle East is the world's most energy-orientated region. These geological realities dictate that the Middle East will increase its significance in global energy markets over the next few decades; and much of the region will continue to rely heavily upon export revenues from oil and gas. In recent years the development of non-OPEC sources of oil and falling real oil prices (especially in 1997/99) have reduced oil-related export earnings and government revenues. Population growth is broadly matching that of GDP so that average regional per capita incomes are rising quite slowly. Huge income inequalities remain given the control of oil revenues by states and royal households. Efforts continue to diversify many economies away from crude oil exports - particularly by adding value to basic natural resources through refining, petrochemicals and iron and steel, but also by an emerging electrical/electronic goods sector. Population growth and economic development are swelling regional energy demand. Gas use is expanding (in part to substitute for oil destined for export markets), especially in power generation but also in final end use sectors. Gas production is rising steeply and, in future, gas exports to Asia and Europe will assume much greater economic and strategic importance. Regional electricity demand is also growing and moves are in hand to interconnect national grid networks. Some electric utilities' are unable to self-finance capacity expansion, exacerbated by subsidised electricity prices. Power sector liberalisation and privatisation are under active review in some countries. But, to provide adequate incentives to attract external private capital, these measures will need to be accompanied by pricing and regulatory reforms.

MIDDLE EAST : FINAL ENERGY CONSUMPTION (MTOE)

	1980	1985	1990	1995	1996	1997
Middle East	87.3	118.6	145.2	191.1	200.6	209.0
Industry	35.0	39.1	27.3	48.4	51.9	54.7
Transport	30.0	42.1	41.1	58.8	59.7	60.8
Tertiary-Domestic	22.2	37.3	76.7	83.8	88.9	93.3
Iran	28.5	43.1	47.7	73.0	78.9	82.6
Industry	10.5	16.9	5.7	21.0	24.2	25.9
Transport	4.6	6.2	7.1	19.3	19.4	20.1
Tertiary-Domestic	13.4	20.0	34.9	32.6	35.1	36.5
Saudi Arabia	22.3	26.5	38.3	43.5	46.6	47.7
Industry	12.6	6.7	4.7	4.1	4.8	4.3
Transport	7.6	12.5	9.9	12.1	12.8	12.9
Tertiary-Domestic	2.1	7.2	23.8	27.3	29.0	30.4



Consumption per fuel highlights the major contributions of hydrocarbons and electricity, the shares of both solid fuels and biomass being less than 1% of total final demand. Since 1980, of the incremental energy demand of about 121 Mtoe, half was met by oil products, natural gas contributed one third and electricity covered the remaining 17%. During the same period, the consumption of oil products doubled whilst those of natural gas and electricity quadrupled. This means that the contribution of oil products in final consumption declined significantly: from 76% in 1980 to 61% in 1997. During the same period the share of gas increased from 15% to 26% and that of electricity from 9% to 13%. But very large differences existed between countries: the share of oil ranging from 18% in Qatar to 92% in Yemen. Only some national governments have been successful in their efforts to develop indigenous gas consumption to substitute for oil products, thus increasing oil exports and consequently oil export revenue. This was particularly the case in Iran and Saudi Arabia which together represented 73% of the region's gas consumption in 1997 against only 40% in 1980.



Tertiary-domestic sector largely dominated final demand for structural reasons, but industry increased rapidly...

The evolution of final demand by sector was largely dominated by the tertiary-domestic sector which more than quadrupled its consumption since 1980, but recent trends demonstrate a marked slowdown of this evolution with an annual growth of around 2.8% since 1990. As a consequence its share in total final demand increased from 25% in 1980 to 45% in 1997, with a maximum of 53% in 1990. But any analysis that includes the years 1990 to 1992 must be very cautious as clearly some switch occurred between industry and the tertiary-domestic sectors in the Iranian energy statistics. Estimated corrections suggest an annual growth rate of 5.6% since 1990, compared to an average yearly increase by 11% during the 1980's. Although this

MIDDLE EAST - FINAL ENERGY DEMAND CORRECTED

Middle East	1989	1990	1991	1992	1993
Final Energy Consumption	147.3	144.9	151.4	167.2	176.9
Industry	40.9	27.0	30.1	37.7	45.3
Transport	44.5	41.1	40.0	42.7	54.9
Tertiary-Domestic	61.9	76.7	81.3	86.9	76.8

Middle East corrected	1989	1990	1991	1992	1993
Final Energy Consumption	147.3	144.9	151.4	167.2	176.9
Industry	40.9	35.0	37.1	43.7	45.3
Transport	44.5	46.1	48.0	51.7	54.9
Tertiary-Domestic	61.9	63.7	66.3	71.9	76.8

results from a general phenomena of rapidly increasing living standards during the 1980's in a region where some countries enjoyed the world's highest per capita incomes, it was certainly reinforced by the low energy prices in force in some countries and growing population that increased by 73% since 1980. Industrial energy consumption was heavily affected by the Gulf War which reduced the 1990 energy demand to the 1980 level (corrected values), but grew by 6.5% on average since 1990, sustained by industrial development in the region. Iran was responsible for more than 60% of the increasing consumption, even though large increases also occurred in Lebanon, Qatar, Syria and the United Arab Emirates. This impressive diversification away from oil, combined with the emergence of associated services (banks, insurance...) became the driving force of GDP in almost all countries. Industrial energy consumption remained very low in Saudi Arabia, a level comparable to that of Qatar, underlining the continuing large dependence of the Saudi Arabian economy on the oil industry. Energy consumption for transport has only doubled since 1980 driven by Iranian demand which grew more than four times. Regional transportation infrastructures have not been extensively developed and motorisation levels remain fairly low, at about 100 vehicles per thousand people. There are two reasons for this. First, car ownership levels are highly dependent on income distribution. Second, women are actively discouraged from driving in some countries and this policy will inevitably limit the part of the population able to own automobiles.

The share of electricity in final demand seems to have stabilised since 1994...

Electricity's share in final demand reached 12.3% in 1997 from 7.6% in 1980 but seems to have stabilised since 1994. Analysis must be prudent, as there are some statistical uncertainties about the sectoral allocation of electricity consumption in some countries. The share of electricity in industry increased from 4.3% in 1980 to 8.4% in 1997 due to the development and modernisation of industrial infrastructures. But this contribution remained particularly low compared to industrialised countries. Use of electricity increased mainly in Saudi





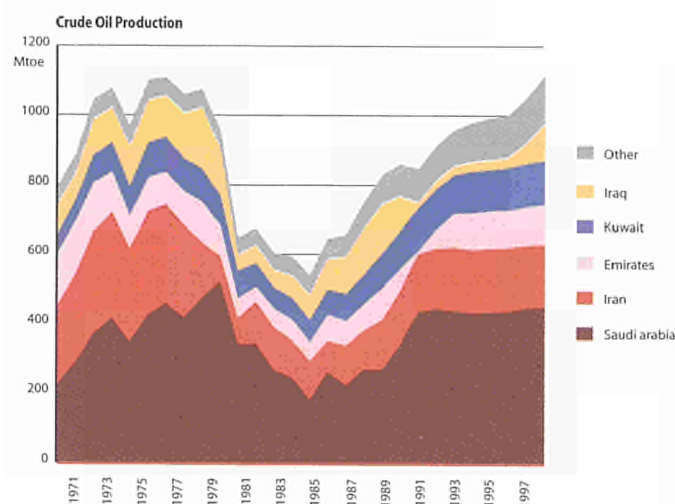
Arabia, Syria, Israel and Jordan. On the other hand, the share in the tertiary-domestic sector stabilised at 23% during the whole period. In addition, the contribution of electricity to final energy demand varied widely, depending on the prosperity, geographical location and economic activity of the countries. The highest levels were observed in Kuwait (32%), Israel (25%), and the United Arab Emirates (23%). The lowest levels were in Iran (7%) and Yemen (5%).

Hydrocarbons dominated the energy market with gas progressively substituting oil...

Gross inland energy consumption has grown in the period 1980-1997 by about 5.8% on average. In that context, the 1990's growth rate, limited to 3.3%, seemed quite low. It was a consequence of the slowdown of GDP caused by the East Asia economic crisis. The Middle East is usually considered as an energy supplier, rather than an energy consumer. This traditional approach obscures the fact that the region's energy demand has grown quickly in recent years and is likely to continue to do so. Oil products dominated the energy market, about 60% of total energy consumption in 1998, even though their contribution diminished in favour of natural gas, the share of which increased from 25% in 1980 to 38% in 1998. Hydrocarbons together covered about 97% of all energy requirements in 1997. One way for the region's governments to earn additional oil export revenues is to substitute gas for oil in the internal market. Sectors in which this policy has been applied include households, industry and power generation. Solids contributed a little less than 2%. Israel and Iran accounted for most of the 7.3 Mtoe of coal consumed in 1997, mainly for power generation. Renewables, mainly limited to hydro, represented less than 1%. Two countries, Iran and Syria, produced about 90% of the region's hydroelectricity.

Oil production overtook the historical peak of 1974...

Indigenous energy production is heavily dominated by oil, with 88% of total production in 1998 against 96% in 1980. This production has fluctuated widely over the last 25 years, depending upon the world economic climate, the share of OPEC countries in the world oil market and local circumstances (Iran-Iraq War and Gulf War). Peaking in 1974 at a level of 1106 Mtoe, oil production fell to 548 Mtoe in 1985 or 51% below this peak. Since then, a sustained increase, except for a drop of 1.5% in 1991 (production losses in Iraq and Kuwait not totally compensated by strong increases in Iran and Saudi Arabia), was observed to reach in 1998 a new peak output of 1120 Mtoe. Historically, Saudi Arabia has assumed the role of swing producer, thus experiencing significantly greater output fluctuations than those observed at the regional level. But since 1991, the output from the three main producers, Saudi Arabia, Iran and the Emirates has remained stable, all of the increment coming from Kuwait and the more marginal producers. Over the last two years Iraqi production



doubled each year to reach a level of 107 Mtoe - still 25% below the pre-Gulf War level. This resulted from the relaxation of the United Nations' embargo. Much of the revenue from these oil sales was allocated for the purchase of humanitarian supplies for distribution in Iraq under the United Nations' supervision.

Oil production costs in Persian Gulf nations are less than \$1.5 per barrel, and the capital investment required to increase their production by 1 barrel per day is less than \$5,000. Thus Persian Gulf producers can expand capacity at a cost that is a relatively small percentage of projected gross revenues. Nevertheless, given budget deficits, expansion of oil production implies aggressive efforts by some producing countries to attract investment capital to implement a wide range of production capacity expansion projects.

Regional production of natural gas has more than quadrupled since 1980. The main producers, Iran with 41 Mtoe, Saudi Arabia with 39 Mtoe and the United Arab Emirates with 31 Mtoe, accounted for 74% of total production against only 59% in 1980. Almost one-half of the Middle East's gas reserves are in Iran, where many natural gas projects moved ahead in 1998. In August the Iranian Oil Company announced that 43 oil and gas projects worth over \$5 billions would be opened to international firms on a buyback basis. A \$2 billion project to develop the 321 trillion cubic feet South Pars Field, which accounts for an estimated 40% of Iran's gas reserves, was proposed by a consortium of France's Total, Malaysia's Petronas and Russia's Gazprom in 1997. The project was opposed by the United States as a violation of the Iran-Libya Sanctions Act, which imposes sanctions against companies that invest more than \$20 million in energy ventures in the two countries. In May 1998, the United States agreed to waive its sanctions, and gas production from the project is expected to begin in June 2001.

Middle East accounted for 50% of world hydrocarbon reserves but only 18% of world fossil reserves...

Middle East oil reserves at end 1998 amounted to about 64% of world reserves, due to the major contributors: Saudi Arabia (24.8%), Iraq (10.7%), UAE (9.3%), Kuwait (9.2%) and Iran (8.5%). The reserves/production ratio reached 83 years, more than twice the world average. As a region, the Middle East has the second largest natural gas reserves after the former Soviet Union. Iran, Qatar and the United Arab Emirates have the second, third and fourth largest reserves in the world, respectively, after Russia. Middle East gas reserves, which expanded rapidly in the late 1980s and early 1990s, include the super-giant gas structure involving Qatar's North Field and Iran's South Pars. They represented 33.8% of world gas reserves, mainly located in Iran (15.7%), and a reserves/production ratio well above 100 years. Finally, coal reserves are negligible. This means that the Middle East accounts for 50% of global hydrocarbon reserves but only 17.6% of total fossil fuel reserves.

Grid interconnection is on the way...

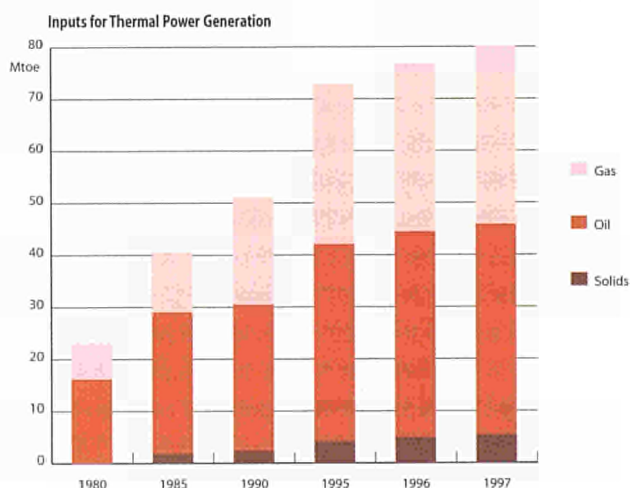
Electricity generation in the region grew on average by about 8.2% per year since 1980, but by only 6.4% per year on average since 1990 and less than 6% in 1997. The region's electricity mix was dominated by oil and gas, which in 1997 accounted for 88% of total generation. Since 1980, the most interesting feature has been the switch from oil to gas-fired generation, as countries in the region seek to free oil for export. Most of the existing power plants use steam boilers and burn heavy fuel oil, natural gas and crude oil. Gas turbines and diesel engines are used for mid-merit and peaking duty. The share of oil-fired generation fell from 64% in 1980 to 48% in 1997. The majority of the Middle East's new capacity is likely to be gas-fired. This increasing contribution of gas opens the door to the future use of high efficiency combined cycle power stations. Israel is the only country in the

region to use coal-fired power stations. Coal-based capacity in 1997 was 3460 MWe and a further 1060 MWe were under construction. Hydroelectric capacity in the region was limited to about 5 GWe in 1997, most of it in Iran and Syria. These two countries accounted for 91% of hydroelectricity generation in 1996.

In recent years, a lack of power generation capacity has resulted in electricity shortages in some countries. The summer peak load for air conditioning places a heavy strain on available capacity, and power shortages usually occur in the summer. Many of the countries in the region have experienced financial difficulties in their power generation sectors because of rapid growth in electricity demand and subsidised tariff structures. Given that the power budget for many Middle East countries was often a significant proportion of annual government expenditure, governments are increasingly forced to examine full-cost pricing and private sector involvement. Since 1998, Iran has welcomed the participation of private investors in the planned privatisation of the country's power generation industry. Breaking up the state power generation monopoly into competing private companies and reducing large state subsidies are two important proposed measures aimed at increasing electricity generation and transmission efficiency to attract foreign investment. In Saudi Arabia new industrial projects have been delayed, leading to brownouts due to inadequate power supplies. Consequently, privatisation of Saudi Arabia's electricity sector is under consideration, as is its division into three parts: generation, transmission and distribution. In December 1997, leaders of the GCC (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates) discussed a \$1.7 billion plan to connect their power grids. The first phase of this project will connect Bahrain, Kuwait, Qatar and Saudi Arabia and should be completed by 2002. The idea is to cut the cost of electric power generation and to utilise surplus power more effectively. The second phase will link Oman and the United Arab Emirates, and should be completed in 2007. In December 1998, Egypt and Saudi Arabia began discussions on connecting their electricity grids, as well as developing renewable power sources such as solar and wind.

Upgrading and expansions were continuing in oil refineries...

In 1998, **the refinery capacity** (5.9 millions barrels day) represented 7.4% of the world capacity (4.4% in 1980). Since 1980, the capacity grew on average by 2.9% per year under Saudi Arabian (7.2% per year) leadership. At the same time, the refinery utilisation rate remained largely above 96%, the highest world level. Due to Saudi Arabia's ongoing financial difficulties some refinery upgrade and expansion projects were delayed in 1998. Iran optimistically hopes to boost its refining capacity in the near future. Two planned green-field refineries are the 225,000 bbl/d plant at Shah Bahar and a 120,000 bbl/d unit on Qeshm Island. The Shah Bahar project was approved by the government and will be built by private investors.





COMPETITIVENESS

Growth in energy intensity has slowed down progressively since 1990...

The energy intensity indicator was particularly difficult to analyse as GDP was heavily influenced by oil revenues, especially during the 1980's. Fortunately, since then development of both industry and services, independent of oil activities, have tended to stabilise and reinforce GDP growth. As a result of flat GDP and increasing gross inland consumption, energy intensity increased significantly since 1980; about 9% per year during the first part of the 1980's and by about 5% in the second part. However, because of the regular GDP increase during the 1990's, the energy intensity growth rate slowed down progressively to reach only 2.4% per year on average since 1990 and only 0.6% in 1998. In addition very large discrepancies exist between

countries. In Saudi Arabia the major increase in energy intensity occurred principally at the beginning of the 1980's but energy intensity has improved regularly since then. In contrast, Iran showed an acceleration of energy intensity during the second part of the 1980's after the Iran-Iraq War and demonstrated improvements since 1990. In other countries major increases occurred in Iraq (13.6% per year on average since 1980), the United Arab Emirates (+6.3%) and Oman (5.2%), as a result of rapid and diversified industrialisation in many countries and improving living standards. Since 1990, it was improving in Syria and Israel. All sectors contributed to the energy intensity growth but the major increase occurred in the tertiary-domestic sector where it has nearly quadrupled since 1980, resulting from the growing share of services in GDP and improved living standards in the whole region. At the same time, the energy intensity of industry, despite the rapid industrialisation of the whole region, increased by only 34% since 1980. The energy intensity of transport which increased sharply between 1980 and 1995, by more than 80%, declined by more than 2% in both 1996 and 1997.

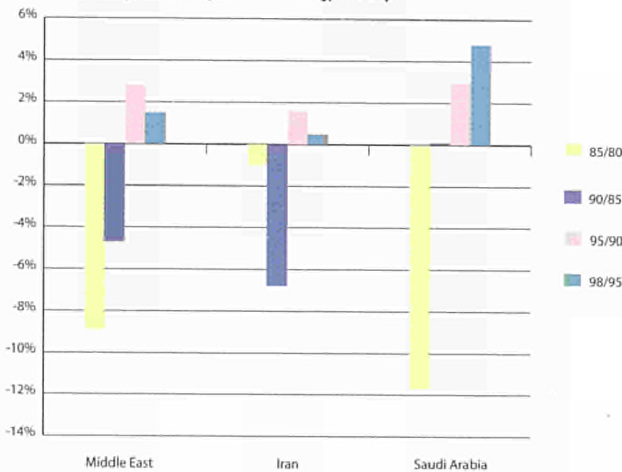
Energy consumption per capita (2.3 Toe/inhabitant) increased at a much slower rate, due to the demographic pressure prevailing in the Middle East (3.5% yearly increase during the 1980's, and 2.6% since 1990). Since 1980, the domestic and tertiary contribution (0.6 Toe/inhabitant in 1997) has more than doubled due to rising living standards; that of industry reduced by 10%; while transport consumption per capita has remained stable since 1985. Extreme discrepancies are found between countries with a maximum consumption of 18.8 toe per capita in Qatar and a minimum of only 0.2 toe per capita in Yemen, or one hundred times less.

ENVIRONMENT

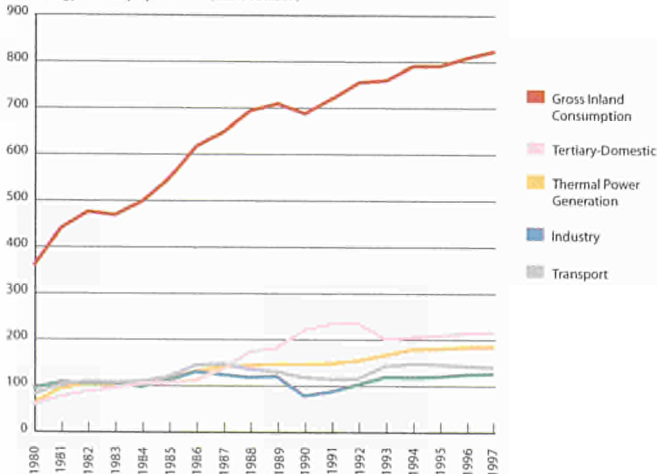
CO2 emissions have increased by 50% since 1990...

The CO2 emissions of the Middle East countries have increased regularly by about 5.6% per year since 1980 with an acceleration in the beginning of the 1990's. Since 1990 they have increase by some 50%. Iran and Saudi Arabia together contributed 58% of the total CO2 emissions of the region, with an increasing share since 1980 (54%). The United Arab Emirates and Iraq, each contributing 8%, follow them. The emissions from the tertiary-domestic have multiplied by four since 1980, those of the power generation and the energy branch mainly represented by the refinery sector by 3, those of transport by 2 while industry's emissions increased by only 43%. Power generation is now the major contributor with 26% of total emissions in 1997, followed by the tertiary-domestic sector and transport. Industry, the major contributor in 1980, now appears in last position.

Annual Average Rates of Improvement in Energy Intensity



Energy Intensity by Sector (toe/1990 MEUR)

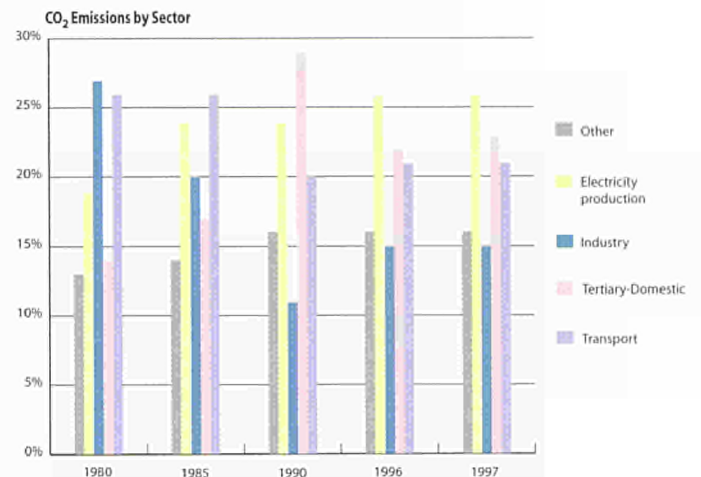
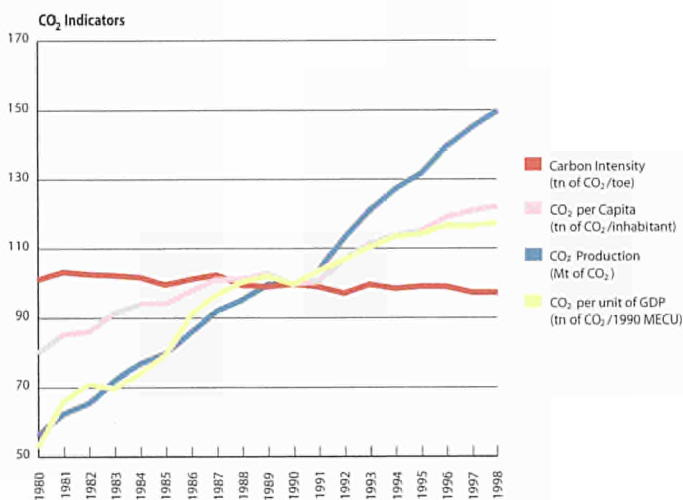


The carbon intensity (tn CO₂/toe) remained quite stable, confirming the overall stability of the fuel mix in the Middle East between 1980 and 1997. CO₂ emissions per capita grew on average by 2.5% per year since 1980. Industry's contribution has declined by 16% since 1980 reflecting the evolution of industrial energy consumption per capita. The contribution of transport increased by 20% since 1980 but remained relatively constant since 1985, corresponding to stable motorization in the region. The CO₂ emissions per unit of GDP have increased on average by 4.8% per year since 1980 but the growth rate slowed down continuously and stabilised in 1997.

GLOBAL MARKETS

Despite the financial crises, Asia remained by far the largest market for oil exports...

The Middle East is the **most important net exporter of energy in the world**. This results mainly from exports of crude oil and, to a lesser extent, oil products. 80% of the 1120 Mtoe of oil produced during 1998 was exported, 88% as crude. The volume of oil exported has increased since 1985 at an average rate of about 6.5% per year although it stabilised between 1993 and 1996. Oil exports increased again by 4.8% in 1997 and 8.0% in 1998. This represented an increase of more than 1.3 million barrels per day in 1998. Iraq's exports alone increased by 1 million barrels per day as increases in the United Nation' 'oil-for-food' deal allowed Iraq to export more oil in the context of low oil prices. The United Arab Emirates, Kuwait, Qatar and even Yemen all exported slightly more oil in 1998 than in 1997. The exceptions were Saudi Arabia and Iran, the two main exporters, which stabilised their exports in 1998 as did Oman. Saudi Arabia still accounted for about 44% of Persian Gulf oil exports, with Iran, the United Arab Emirates, Kuwait and Iraq each accounting for between 10-15%.



Asia, excluding Japan, remained the foremost importer of oil from the Middle East (33% of oil exports from this region against 35% in 1997), followed by Western Europe (23% in 1998 against 21% in 1997), Japan (23%), with the United States absorbing only 11% of Middle East oil exports. Western Europe imported nearly 4.0 million barrels per day from the Persian Gulf in 1998, an increase of about 0.5 million barrels per day from 1997. Nearly half of Persian Gulf oil exports to Western Europe came from Saudi Arabia (48%), with significant amounts also coming from Iran (25%) and Iraq (19%). After declining steadily between 1993 and 1996, Western Europe's oil imports from the Persian Gulf as a percentage of its total oil demand increased significantly in 1997 and 1998.

With its large gas reserves, the Middle East is a major producer and growing exporter of natural gas. Gas is presently exported as LNG through projects in Abu Dhabi, Qatar and Oman. Oman LNG announced that construction of a \$2 billion plant at Qalhat will begin at end 1999, with two trains each with a capacity of 3.3 million tonnes per year. All the production will be sold to Japan, Korea and India. Abu Dhabi exports gas through its Das Island LNG project, mostly to Japanese customers, which account for over 5 million tonnes of LNG per year. There were plans to increase the Das Island capacity by some 200 billion cubic feet, but the Asian economic crisis makes it unlikely that the plans will now go ahead in the short term. However, several pipeline projects to supply gas to Asian countries such as India and Pakistan, as well as to western European countries using Turkey as a transit, have been proposed or are under development.





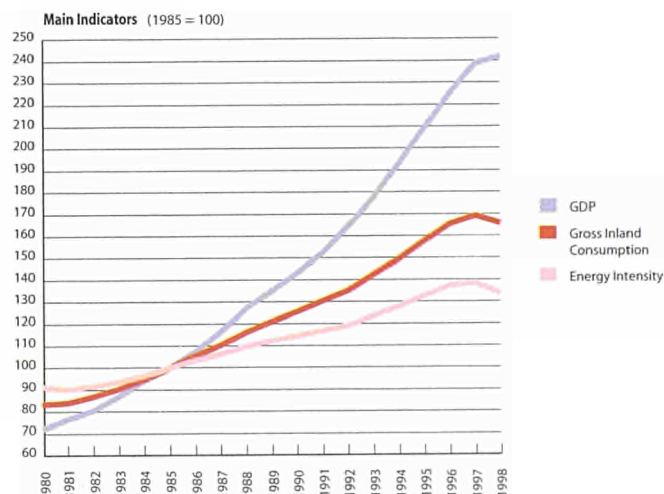
ASIA: Major trends (1980-1998)

- Severe financial crises limited GDP growth to only 1.5% in 1998...
- ... but GDP growth will recover in 1999 and 2000 stimulated by structural reforms
- Final energy demand increased on average by 3.3% per year since 1980, but by only 0.9% in 1997
- The transport sector has become the driving force in the growth of final energy consumption
- First setback of industrial energy consumption since 1982 occurred in 1997
- Household income and development of services will be the key drivers of tertiary-domestic demand
- Increasing contribution of electricity, the fastest growing source of end-use energy
- Solid fuels still dominated gross inland energy consumption despite a marked contraction in China
- Primary energy requirements were based on indigenous energy sources, with the exception of oil
- Asia represented 16.1% of world fossil fuel reserves, principally solid fuels
- Electricity generation is largely dominated by solid fuels, locally available at low cost
- Rapid expansion of generation capacity argues in favour of foreign investment
- ... even if the financial crisis has delayed many planned projects in Southeast Asia
- Development of power generation from renewables continued despite inherent difficulties
- Refinery expansion programmes necessary to meet increasing domestic oil products demand
- Marked by impressive Chinese improvement, energy intensity has improved by 2.9% per year since 1980
- ... But Chinese performance remained questionable
- Energy consumption per capita reached only 20% of the European Union level
- CO₂ emissions declined by 5.3% in 1998 but have still increased by 35% since 1990
- The contributions of the power sector and industry, roughly the same in 1997, reached 67% of total CO₂ emissions
- Regional low energy dependency, even if oil dependency reached 48%

Severe financial crises limited GDP growth to only 1.5% in 1998...

Asia is the largest world region, characterised by a population that grew by 1.8% per year on average during the 1980s but by only 1.5% on average since 1990. This is a result of the sharp reduction in the Chinese population growth rate which grew by only 1% per year since the beginning of the 1990s whilst the Indian population continued to grow at more than 1.8% per year. These two countries accounted for 70% of the region's population and 38% of the world's population. Over the past three decades, the economies of Asia have made remarkable economic progress. All the main countries experienced sustained economic growth at rates that exceeded those earlier thought achievable, with some attaining growth of 8 to 10% a year for a decade. The rapid growth of the Asian economies, especially East Asian ones, was accompanied by impressive advances in social development: poverty, infant mortality and adult illiteracy all declined significantly, while life expectancy at birth rose considerably. Between 1990 and 1997, GDP still grew at an average of 7.6% per year on average for the whole region. Since mid-1997, however, a number of southeast Asian economies and Korea have been in the grip of severe financial crises that have thrown the region into a deep recession. The downturns have been led by the reduction of domestic demand, as large exchange rate depreciations, equity price declines and increases in interest rates have cut real income and wealth and boosted debt-servicing costs. Demand and activity have also been reduced by a tightening of bank credit resulting from the deterioration of banks' balance sheets. Consequently,

regional GDP growth was reduced to only 1.5% in 1998 with a large number of countries experiencing deep recessions: Indonesia (-13.7%), Hong Kong (-5.1%), Korea (-5.8%), Malaysia (-6.7%) and Thailand (-9.4%). Other major countries were less affected: China (+7.8%) and India (+5.8%), these two countries accounting for about 50% of the region's GDP. The impetus for recovery will most likely come from two sources: an expansion of exports and import-substituting production in response to the real exchange rate depreciations that have occurred; and a recovery of confidence among domestic and external investors once financial stability is restored.



... but GDP growth will recover in 1999 and 2000 stimulated by structural reforms

First indicative numbers showed that positive GDP growth is expected in almost all countries in the region, GDP at the regional level again reaching 4 to 5% against only 2% in 1998. Exports were generally increasing, supported by competitive exchange rates and improved growth in regional trading partners. The partial recovery of capital inflows has eased financing constraints in most cases and the rise in confidence, along with declining inflation, has permitted further monetary easing. Fiscal policy also continues to play an important supportive role. Stronger growth is projected for 2000 in most countries as the recent improvements in economic confidence and activity are followed by a broader-based pickup in domestic demand. For the recovery to be sustainable, however, an agenda of structural reforms still has to be completed. Plans for financial sector restructuring are generally well advanced, with more stringent and prudential standards in place, bank recapitalisation proceeding, and plans adopted for the privatisation of state-owned institutions.

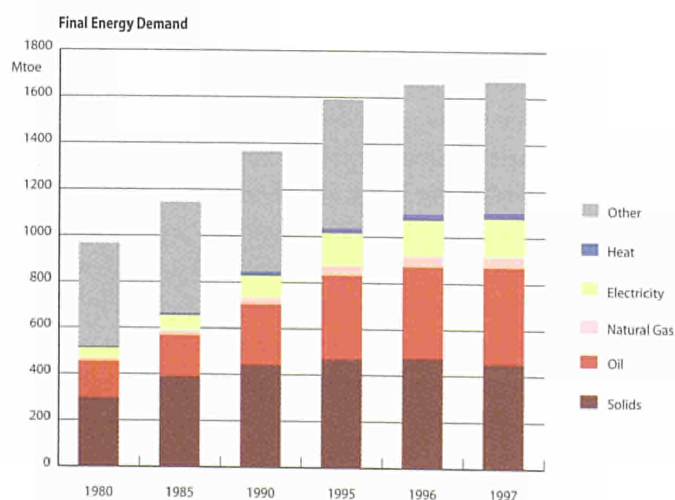
ENERGY OUTLOOK

Final energy demand increased on average by 3.3% per year since 1980, but by only 0.9% in 1997...

The financial crises, starting in mid-1997, affected **final energy demand**, which increased by 0.9% in 1997 before an estimated decline of about 3% in 1998. During the 1990-96 period, before the onset of the crisis, final energy demand had increased steadily by 3.3% per year on average, or by about 42% of the GDP growth rate. Biomass still remained the largest single component of final energy demand even though its contribution has been declining continuously from 46% in 1980 to 34% in 1997. Biomass consumption was concentrated in three major countries: China (208 Mtoe), India (193 Mtoe) and Indonesia (45 Mtoe), these three countries accounting for 80% of the regional biomass consumption. Despite a continuous slowing down of growth, punctuated by a real decline of about 5% in 1997, solid fuel remained the second largest component, its share declining from 34% in 1985 to only 27% in 1997. All the reduction in coal consumption occurred in China where the restructuring of the coal industry resulted in the closure of very many small mines dedicated to local markets and in price increases resulting from the reduction in subsidies. Oil demand has increased by 7.2% per year on average since 1985, and still by 5.5% in 1997. This continued growth was driven by the transport sector (55% of oil demand in 1997), by the tertiary-domestic sector (25%) and finally by industry (20%). Demand for other fuels has been increasing since 1985 in line with GDP: natural gas at 7.1% per year on average, and distributed heat and elec-

Main items

Asia was the main engine of the global economy over much of the past 15 years. But many regional economies were seriously affected by the financial crisis which commenced in mid 1997 and accelerated in 1998. East Asia, in particular, was hard hit. Large-scale movement of funds and poor financial oversight exacerbated the crisis. It led to currency depreciation, liquidity shortages, falling incomes and rising unemployment. In turn, these caused social unrest; but they also stimulated long overdue reforms of financial systems and of corporate governance. Two regional giants, China and India - comprising nearly 38% of the global population - continued their impressive growth; even though falling intra-regional trade caused second-round effects on their economies. Mainly for other reasons, Japan experienced its most severe and prolonged recession since 1945. In many countries progress towards fully market-based economies remains modest - with continuing, heavy state regulation and energy prices set below costs, particularly for oil products and electricity. These factors have stimulated energy demand. But they have also reduced investment resources, leading to financing difficulties for utilities and to cancellation or deferral of some projects, especially in the power sector. Biomass and coal dominate the energy balances of China and India. Elsewhere energy use is more diversified. Strong growth in regional gas demand is expected as pipeline infrastructures develop. Oil demand has slackened recently but transport requirements will accelerate in the future as car ownership expands. CO₂ emissions have soared since 1990 and now dominate incremental global emissions - a course expected to continue with further industrialisation of the populous Asian economies.



tricity both at 8.3%. Consequently incremental demand since 1990 was satisfied mainly by oil products (50% of the overall increment), followed by electricity (22%), biomass (15%), gas (7%), solid fuel (3%) and derived heat (3%). China accounted for about 47% of the total regional final energy demand in 1997 (51% in 1990) but for only 29% of incremental demand since 1990. It was followed by India with 21% as in 1990 (19% of incremental demand) and the NICs with only 10% (7.6% in 1990) but 22% of incremental demand.

The transport sector has become the driving force in the growth of final energy consumption...

Growing industrial activity, combined with increasing household incomes and expanding urban populations, have led to a rising demand for transport across Asia even though the transportation sector is still underdeveloped in China and India. In particular the Chinese government has not addressed transportation sector issues in its economic plans for several years. To redress this lack of planning, China now intends major investment in its transportation infrastructure, including railway, road and inland waterway projects. Projects are underway to increase railroad route length from 64,000 km in 1995 to 69,000 km in 2000 and to construct 112,000 km of new roads between 1995 and 2000. Personal motor vehicles are still a very small part of China's vehicle fleet, which consists mainly of heavy commercial vehicles. Motorisation levels in China remain low, at 10 vehicles per thousand persons, as compared with 228 in South Korea and 240 in Taiwan. Although privately owned motor vehicles are expected to be the fastest-growing part of China's transportation sector, public transport is expected to remain the primary form of transportation for most people. Although India has an estimated 825,000 km of paved roads and highways and 65,000 km of railways, they are not adequate to meet the economic development needs of some parts of the country. Congestion in the urban centres of the country, as in many other cities of developing Asia, increasingly creates market access problems for the country's industry. Vehicle ownership in India is estimated at about 9 per thousand persons. Most privately owned vehicles are located in the larger cities of the countries. The transportation sector underwent rapid growth in Asia in the 1990s. In fact, several countries in this region, including South Korea, Malaysia and Thailand, had growth rates of more than 10% per year in the first part of the decade. Although the economic slowdown that began in 1997 and continued through 1998 has dampened the short-term expectations for transportation use, the transport sector will remain, in the near future, the driving force of final energy demand growth. Since 1990, the transport sector has accounted for one third of total incremental final energy demand against only 16% during the 1980s. About 50% of the

increase in oil demand since 1990 has arisen in the transport sector, the energy consumption of which has grown by about 7.6% per year since 1990.

First setback of industrial energy consumption since 1982 occurred in 1997...

Energy demand growth by the industrial sector resulted from the region's strong economic performance. Consequently the share of industry in final energy demand grew significantly during the 1980s. Generally speaking, the current economic programmes of Asian countries appear to be committed to further gradual liberalisation of industrial sectors and market orientation of the economy. In this fast-changing economic context, agriculture is losing its once high share, industry is now declining slowly in importance and services are growing rapidly. In addition, progressive liberalisation of energy markets has favoured the alignment of energy prices with international prices. This increase in prices, coupled with increasing foreign investment, contributed to the modernisation of industrial equipment - implying better use of energy. This explains the relative slowdown of industrial energy consumption since the beginning of the 1990s. In the second half of 1997 an industrial slowdown occurred in many countries as a result of the financial crises. Consequently industrial energy consumption declined by 0.8%, the first setback since 1982. In most countries, the industrial sector continued to be dominated by coal but significant increases in oil and gas demand occurred especially in East Asian countries. Energy-intensive industries, such as iron and steel, chemicals, cement and pulp and paper, accounted for 50% to 80% of final industrial energy demand. As a consequence of the rapid expansion of the basic chemical industry, the consumption related to non-energy uses, mainly petrochemical feedstocks, exploded between 1990 and 1997, multiplying by 3 to reach 116 Mtoe. This recent development accelerated oil product consumption in the region.

Household income and development of services will be the key drivers of tertiary-domestic demand...

The share of the tertiary-domestic sector in final energy consumption declined from 58% in 1980 to 48% in 1997 given growth of both the transport sector (from 8% to 14%) and industry (from 34% to 38%). In the domestic-tertiary sector, the consumption of non-commercial biomass energy is far larger in absolute terms than the consumption of commercial energy: biomass accounted for 74% of this sector's energy consumption in 1980 and still for 62% in 1997. This consumption was mainly located in China and South Asia (India, Pakistan and Bangladesh). Since 1997, oil became the second contributor with only 13%, followed by solid fuel



(11%), electricity (9%), natural gas (2%) and distributed heat (1%). Since 1980 incremental demand has been covered by: biomass (83 Mtoe), oil (63 Mtoe), electricity (56 Mtoe), solid fuel and distributed heat (both 5 Mtoe). Energy needs of the commercial sector were mainly satisfied by oil (43%), electricity (32%) and to a lesser extent by solid fuel (20%). Household income, combined with the development of services, is expected to continue to be the major determinant of both the amount of energy consumed and the choice of fuel used. Demographic trends, such as urbanisation, also affect energy use levels in the tertiary-domestic sector.

Increasing contribution of electricity, the fastest growing source of end-use energy...

The sustained growth in electricity demand reflects the very low level of consumption per capita: 800 kWh in 1997 compared to 6480 kWh in the European Union. Electricity's share in final consumption reached 10% in 1997 from 7% in 1990 and 5% in 1980. In industry, still its primary market, the share of electricity grew from 10% in 1980 to 16% in 1997. This rapid expansion was partly due to a shift toward less labour-intensive activities, modernisation of production equipment and the increased penetration of electric technologies such as arc furnaces in iron and steel production. In the tertiary-domestic sector the contribution of electricity remained more modest, growing from only 3% in 1980 to 9% in 1997. The rapid increase in ownership of electrical appliances and the continuing electrification of rural areas have both contributed to the sustained growth of electricity demand in this sector.

Solid fuels still dominated gross inland energy consumption despite a marked contraction in China...

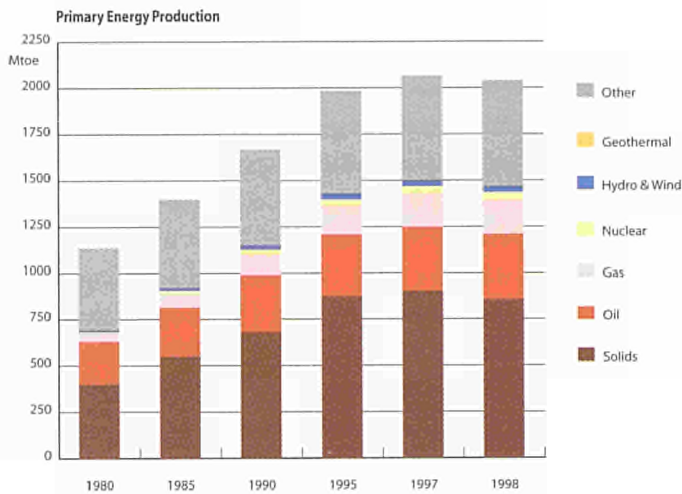
Gross inland energy consumption has grown in the period 1980-1997 by about 4.3% per year on average with all primary fuels contributing. This trend was reversed in 1998 with a decline of about 2%, resulting from the contraction of demand generated by the economic situation. Coal remained the dominant fuel in the region, bolstered by the strong growth registered since 1980 in China and India, although it has the lowest growth rate of the three major fossil fuels. But coal demand has contracted since 1997 and the fall in consumption was 7% in only two years. This focused on the Chinese energy situation, characterised by a cut in coal consumption of more than 11% since 1997 for two main reasons: restructuring of the coal industry and growing concerns about environmental impacts. The contribution of coal remained particularly important in China where its share in gross inland energy consumption reached 57% in 1998, after a peak of 62% in 1996 and a continuous increase from 52% in 1980. Even if its

growth rate was limited to 2.0% per year on average since 1980, biomass remains the second main contributor at a level now comparable with oil. Biomass consumption was widely distributed in the region, the major contribution being registered in countries with a large potential and limited economic development: Nepal (90% of total energy consumption), Myanmar (78%), Bangladesh (65%), Vietnam (57%), Sri Lanka (55%) and India (41%). But the major consumers by far remained China (35% of regional biomass consumption) and India (31%). The NICs and South East Asian countries rely most heavily upon oil although natural gas consumption in some of these countries has been growing at an explosive rate. Since 1985, the region's oil consumption has increased by about 6.8% per year on average, despite a reduction of 1.5% in 1998. For natural gas the progression was still more impressive with an average growth rate of 8.5% per year since 1985. Nuclear energy developed rapidly in the 1980s (growing over 20% per year on average) but stabilised in the early 1990s before new plants were constructed in China and South Korea after 1993. In 1998 each primary fuel contributed to gross inland consumption as follows: solid fuels with 38% (36% in 1980), biomass with 29% (40% in 1980), oil with 27% (21% in 1980); natural gas with 6% (2% in 1980), nuclear with 2% (almost nil in 1980) and hydro with 1% (as in 1980).

Primary energy requirements were based on indigenous sources, with the exception of oil...

Primary energy production in Asia has evolved on the basis of indigenous energy sources, with the exception of oil which has led to growing oil imports since 1985. Primary production was largely dominated by solid fuels with 42% of total production in 1998 (35% in 1980). China and India represented about 74% and 17% of the region's total production respectively in 1998 due to their large reserves (11.6% of total world reserves for China and 7.6% for India). China's coal industry, the largest world producer, is currently beset by a serious oversupply problem and the government is implementing major reforms. Large state-owned coal mines have experienced buildups of unused inventories and many of them are operating at a financial loss. A larger number of small unlicensed mines also operate, adding to the oversupply. In 1998 the government launched a large-scale effort to close down the small mines and has slated 25,800 of them for closure. In contrast to the past, China is becoming more open to foreign investment in the coal sector, particularly in modernisation of existing large-scale mines and the development of new ones. Areas of interest for foreign investment focus upon new technologies only recently introduced in China or with environmental benefits, including coal liquefaction, coal bed methane production and slurry pipeline transportation projects.





The share of biomass decreased substantially from 39% in 1980 to 28% in 1998, as biomass production increased on average by 1.4% per year since 1980 while total primary energy production increased by 3.3% per year. The major biomass producers in 1998 were China (209 Mtoe), India (195 Mtoe), Indonesia (45 Mtoe), Pakistan and Vietnam (both 23 Mtoe). Since 1990, however, stable production in China means that biomass production has increased more rapidly in other countries, except in the NICs where its use remained negligible.

The share of oil decreased from 20% in 1980 to 17% in 1998 with a growth rate slowing down progressively since the beginning of the 1990s. Over the last two years the growth rate has rebounded above 2%. China was the biggest oil producer in 1998 (161 Mtoe) followed by Indonesia (78 Mtoe), Malaysia (42 Mtoe) and India (37 Mtoe). Together these four countries account for 90% of the region's oil production. Oil producers in Far East Asia are beginning to reap the benefits of enhanced exploration and extraction technologies. A significant increase in output potential is projected for many countries (India, deepwater offshore fields in the Philippines, Vietnam, Malaysia, Papua New Guinea...). As a net crude importer since 1993, China's petroleum industry is focused on meeting domestic demand. Most Chinese oil production capacity, approximately 90%, is located onshore. One field, Daqing, alone accounts for more than 30% of China's production. It is a mature field and is expected to experience declining output in future years. Government priorities focus on stabilizing production in the eastern regions of the country at current levels, increasing production in new fields in the west, and developing the infrastructure required to deliver western oil and gas to consumers in the east. Foreign investment has been encouraged by the Chinese in exploration and infrastructure development, provided

that the Chinese partner holds a controlling interest. The main foreign firms involved include Agip, Exxon, Shell, Texaco and Mitsubishi.

Natural gas production has increased continuously by 7.8% per year on average since 1980, to reach 183 Mtoe in 1998 or about half that of crude oil production. Indonesia (60 Mtoe), Malaysia (36 Mtoe), China (22 Mtoe) and India (19 Mtoe) were the four main producers responsible for this increase. Although some of the major emerging markets of developing Asia, including South Korea, Thailand, and Indonesia, were still in economic recession, natural gas developments in China and India seemed to be moving forward strongly at the end of 1998. China is becoming increasingly interested in pursuing the development of a natural gas infrastructure as it becomes more heavily dependent on crude oil imports and as the pollution problems resulting from heavy reliance on coal use worsen. Beijing was studying plans for several natural gas pipeline projects with Russia. In October 1998, China and Australia announced intentions to build China's first LNG facility to serve Southern China's Guangdong province. There are also plans to build two regasification terminals in India. First deliveries of the LNG are expected to begin in 2002. The success of these LNG projects will have an impact on the development of natural gas projects throughout India. At the same time, the economic troubles of Southeast Asia have had a dampening effect on natural gas development in many countries. In South Korea the state-owned gas importer and supplier revised downwards its projections for LNG imports. In Thailand the state power company reduced expected investment in gas projects by 30% for the 1998-2006 period. Planned activity in Indonesia has been hit even harder.

Nuclear energy production was dominated by the NICs which accounted for 93% of total nuclear energy in 1990 but only 82% in 1998 due to new commissioning in other countries. Countries currently operating nuclear power plants include China, South Korea, Taiwan, India and Pakistan, and all expect some growth in the future. Two units were completed in South Korea during 1997 and 1998. Wolsong 2, a 650 MWe pressurised heavy water reactor, began commercial operation in July 1997 and a third unit at the site was completed in early 1998. The fourth and final unit at the Wolsong site should be brought on line during 1999. In China construction is underway for the next two units at the Qinshan site, 600 MWe PWRs of a Chinese design. Construction had also begun on two PWRs of French design at Lingao. Russia and China finally signed a contract for two 1000 MWe units based on a modernised Russian design. In Taiwan, two 1350 MWe advanced boiling water reactors are under construction at the Lugmen power station.





Asia represented 16.1% of world fossil fuel reserves, principally solid fuels...

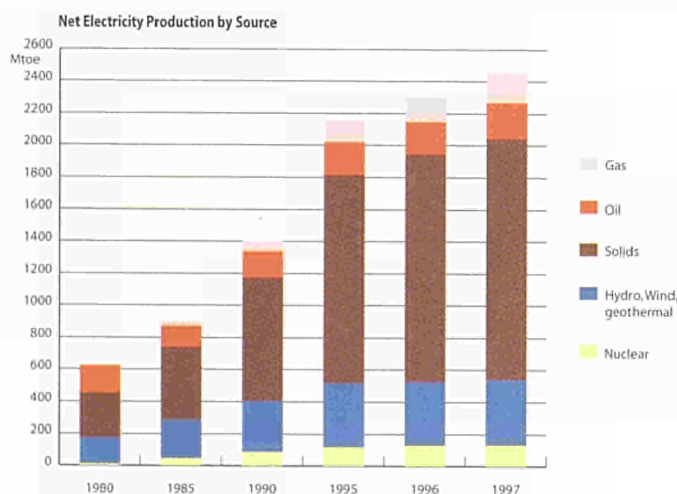
In late 1998, Asian oil reserves amounted to only about 4.2% of world reserves, mostly located in China (2.3%). The oil reserves/production ratio was only 15.6 years, significantly below the world average. The situation for gas reserves was more comfortable, with about 5.7% of world reserves and a reserves/production ratio close to 38 years. Finally, coal reserves, mainly located in China (11.8%) and India (9.8%), accounted for only 22.4% of world reserves. As a result of this, Asia represented 16.1% of total world fossil fuel reserves.

Electricity generation largely dominated by solid fuels, locally available at low cost...

Electricity generation in Asia grew steadily by 8.3% per year over the period 1980-1997, though this growth rate slowed down progressively. Thermal generation dominated electricity production (79% in 1997) with nuclear and hydro accounting for 6% and 15% of total generation respectively. Solid fuels, which are widely produced across the region at low cost, dominated thermal generation of electricity. In 1997, solid fuels accounted for 77% of thermal generation (60% in 1980); oil and gas representing 12% and 10% respectively (37% and 2% in 1980). The contribution of natural gas is growing, sustained by the exploitation of indigenous resources in producing countries and by the development of IPP projects, mainly located in Southeast Asia, often associated with the importation of LNG.

Rapid expansion of generation capacity argues in favour of foreign investment...

The total generation capacity reached 544 GWe in 1997 and the rate of expansion was very substantial: 7.6% per year on average



or about 31 GWe of new capacity per year since 1990. Conventional thermal plants dominate this market, mainly steam coal power units (the bulk of Chinese generation capacity) but combined cycle units are being built where indigenous gas resources are available. In 1997, thermal units accounted for 75% of total generation capacity (69% in 1980), hydro and wind for 21% (29% in 1980) and nuclear for 4% (2% in 1980). In order to raise the investment capital needed to support Asia's rapid growth in electricity demand, many Asian nations have privatised their electricity assets. Most private investment has been limited to electricity projects typically under build-operate-transfer (BOT) or build-operate-own (BOO) arrangements. Malaysia, Indonesia, Pakistan and Thailand have favoured the BOO approach, whereas China and the Philippines have favoured BOT arrangements. For the 1990-1997 period, the world's top ten national targets of foreign investment in electricity included China (ranked second), the Philippines (fourth), Indonesia (fifth), India (sixth), Pakistan (seventh), Malaysia (eighth) and Thailand (tenth). The focus of foreign investment has been on the construction of new generation facilities. Between 1990 and 1997, foreign participation was involved in 57% of the total investment in the region's generation projects. Foreign investment has played a critical role in financing the expansion of China's electric power infrastructure and is expected to fulfil an even more important role in the future. In China, most foreign investment in electricity has been restricted to joint ventures. Private participation in relatively large electricity projects has generally involved less than 50% ownership. For the 1997-2000 period, China expects foreign investment to supply 20% of its electric power investment capital.

... even if the financial crisis delayed many planned projects in Southeast Asia

The Asian economic crisis has had a variety of negative effects on a number of projects, mainly located in Indonesia, Thailand and Malaysia. First, the reduced rate of economic growth has slowed electricity consumption, undermining the need for capacity expansion. Second, the crisis also led to a sharp drop in currency values, effectively raising the cost of imported fuels. Third, many of the foreign investments are to be paid back in foreign currencies against which many of the region's currencies have depreciated. In total an estimated 11 GWe of new capacity has recently been postponed or cancelled.

Development of power generation from renewables continued despite inherent difficulties...

The economic downturn will no doubt have some negative impact also on near-term development of renewable projects. However long-term projects begun before the crisis, such as



China's Three Gorges Dam, have continued for the most part on schedule. Asia remains one region where large-scale hydroelectric projects are still being pursued, despite the controversy that usually surrounds them. In China, about 20 GWe of other hydroelectric projects are currently under construction in addition to the 18 GWe Three Gorges Dam on the Yangtse River. In spite of the high potential for hydroelectric development in India, the environmental issues and high costs involved have until now limited projects to 11.3 GWe of new hydro capacity. Major projects were also under construction in Myanmar, Indonesia, Laos... On the other hand, India is one of the world's largest producers of wind energy but the market stagnated in 1997 largely because of difficulties in securing finance for new developments. The American Wind Energy Association forecasts that India and China will be amongst the five top growth markets for wind energy over the period to 2005.

Refinery expansion programmes necessary to meet increasing domestic oil products demand...

In 1998 **the refinery capacity** (13.4 millions barrels per day) represented 16.6% of world capacity (7.6% in 1980). Since 1980, the capacity has grown by 4.3% per year largely under China's leadership (5.5% per year). In 1998 China represented about 37% of the total refinery capacity of the region, against 30% in 1980. Infrastructure development in China centres primarily on upgrading existing refineries rather than building new ones. A major issue in the Chinese downstream sector is the lack of adequate refining capacity suitable for heavier Middle Eastern crude, which will become a necessity as Chinese import demand rises in the medium-term future. Since 1990, South Korean refinery capacity has increased by 189%, China's by 74%, and all other Asian countries together by 34%. At the same time, the utilisation rate of the refineries increased from 79% in 1990 to 83% in 1998, consistent with the world average but well below the performance registered in 1997 (92%). In order to meet increasing domestic oil demand the region has embarked on an ambitious refinery expansion programme, partially based on joint ventures with foreign investors.

ASIA : ENERGY INTENSITY

toe/1990 MEUR	1980	1985	1990	1996	1997	1998(1)
ASIA	1776.8	1536.6	1346.1	1130.5	1089.4	1052.9
China	4645.2	3382.2	2810.8	1864.7	1717.9	1531.5
India	1778.6	1654.1	1497.3	1358.2	1316.2	1271.0
NICs	438.2	388.1	393.9	434.0	439.3	426.8
Other	2332.8	2025.7	1803.5	1441.0	1378.8	1318.6
European Union	285.5	271.5	248.0	244.5	237.7	235.1

(1) Estimates

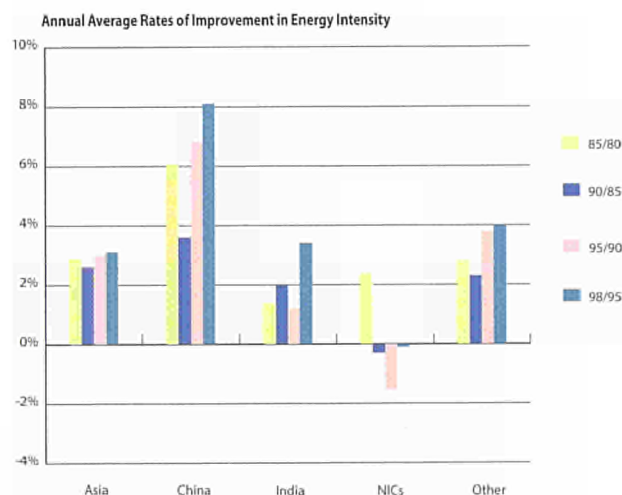
COMPETITIVENESS

Marked by impressive Chinese improvement, energy intensity has improved by 2.9% per year since 1980...

The **energy intensity** indicator for the region has improved significantly (by about -2.9% per year on average) since 1980 and this trend has accelerated since the early 1990s. This improvement continued over the last two years with respectively -3.6% in 1997 and -3.4% in 1998. This trend was mainly sustained by the Chinese improvement observed since 1980 (-6.0% per year on average) reinforced by the performance in 1997 (-7.9%) and in 1998 (-10.9%). Other countries also registered significant improvements: Nepal (-2.2%), Sri Lanka (-1.8%), India (-1.7%) and Bangladesh (-1.7%). However, energy intensities in some other developing countries, such as Malaysia, Philippines, Singapore and Thailand, have increased regularly since 1980. Apart from the CIS, China currently has an energy intensity that is amongst the highest in the world but the gap between China and both industrialised and developing was diminishing rapidly. Though China was 16 times more energy intensive than the European Union in 1980, this ratio had declined to 11 in 1980 and 6.5 in 1998. But the Asian region presents widely differing patterns as the energy intensity of the NICs was close to that of the United States in 1996 and still 70% higher than that of the European Union.

...But Chinese performance remained questionable

The exceptionally rapid decrease of China's energy intensity has been questioned by several authorities. The World Bank, along with a number of other sources, claims that official statistics tend to underestimate the level of national income mainly for the following reasons: official statistics for some service sectors are still



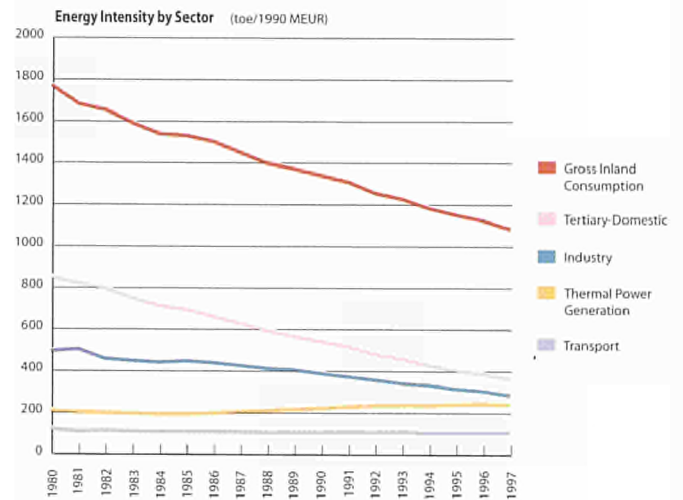


weak; the national accounting system provides incomplete coverage of the national economy; and the added value of agriculture is underestimated. In addition inflation rates have been underestimated and real economic growth rates overestimated in official Chinese statistics. This explains the very high energy intensity observed for China in the early 1980s. Using the GDP estimates of the World Bank for energy intensity calculations provides a "more typical" picture: then China's commercial energy intensity decline over the last 15 years falls to -3.4% per year.

The continual improvement of energy intensity has been mainly sustained, at both the regional and Chinese level, by the tertiary-domestic sector (-57% since 1980) in spite of improving standards of living both in cities and rural zones, and by the industrial sector (-42% since 1980) notwithstanding the rapid industrialisation of the region. On the other hand, the contribution of transport remained stable but, as is often the case for developing economies, increased personal wealth has resulted in the desire for more individual and comfortable means of transport. This will prove a major challenge in the future. Many of the countries in the region, including China and India, still have very low levels of per capita motorisation as the average level of the region was only 18 vehicles per thousand persons in 1997. Because the region accounts for a substantial portion of the world's population, however, even the smallest rise in per capita vehicle ownership, and consequently fuel use, will have a very significant impact on the evolution of sectoral and total energy intensity. Finally the weight of power generation was increasing as the share of electricity in final demand rose continuously, but also due to the thermal inefficiency of the power sector.

Energy consumption per capita reached only 20% of the European level...

The gross inland consumption per capita increased by 46% between 1980 and 1998 but remained at the rather low level of 0.76 toe/capita - only 20% of the European Union level. As a result of the financial and economic crisis, gross inland consumption per capita declined by 3.5% in 1998 for the region as a whole with reductions above 4.5% in Thailand, China, Indonesia, Singapore, South Korea and Brunei. This indicator demonstrated large variations between countries. The NICs' consumption per capita progressively approached the EU level at about 3.7 toe/capita with a regional peak in Singapore where consumption reached 8 toe/capita. Southeast Asia, including China, ranged from 2.3 to 0.5 toe/capita and the poorest countries, such as Bangladesh or Myanmar, only reached 0.2-0.3 toe/capita.



ENVIRONMENT

CO₂ emissions declined by 5.3% in 1998 but have still increased by 35% since 1990...

CO₂ emissions were increasing continuously until 1997 (5507 Mt of CO₂ in 1997, compared to 3852 Mt in 1990 and 2263 Mt in 1980), resulting in a 43% rise since 1990. The reduced energy consumption observed in 1998, caused by the economic crisis, led to a decline of CO₂ emissions by 5.3%. As the increasingly dominant position of solid fuels induced an increase in the carbon intensity of fossil fuels, emissions increased 24% more rapidly than gross inland energy consumption between 1990 and 1997. Consequently, the share of Asia in total world CO₂ emissions has doubled since 1980, increasing from 12.5% to 25%. This share was slowly declining in 1998 but this trend will only be temporary. With the rebound of Asian economies expected already in 1999 the historical trend will again return. This evolution must nevertheless be compared with other indicators. Per capita CO₂ emissions stemming from higher standards of living increased by 3% since 1980, with a more sustained growth since 1990, 1998 excepted. But CO₂ intensity per unit of GDP declined by only 1.8% per year on average since 1980, with an acceleration during the 1990s.

China and India are presently the world's first and second fastest growing sources of greenhouse gases, respectively. The air quality deterioration and the pollution from the growing use of coal as a fuel is expected to worsen, especially as much additional coal-fired power capacity is put on stream, unless adequate regulatory measures are built-in from the design stage. Public concern over pollution is likely to increase as living standards rise but, at present, the emphasis is on increasing electricity generation to satisfy demand and underpin economic growth.





Contributions of power sector and industry, roughly the same in 1997, reached 67% of total CO₂ emissions...

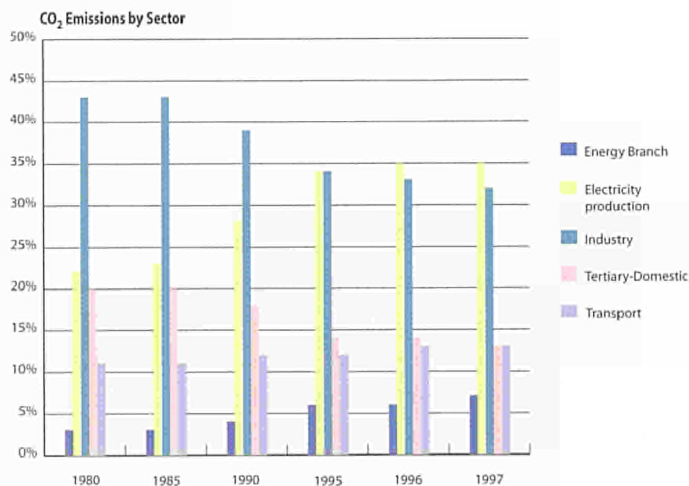
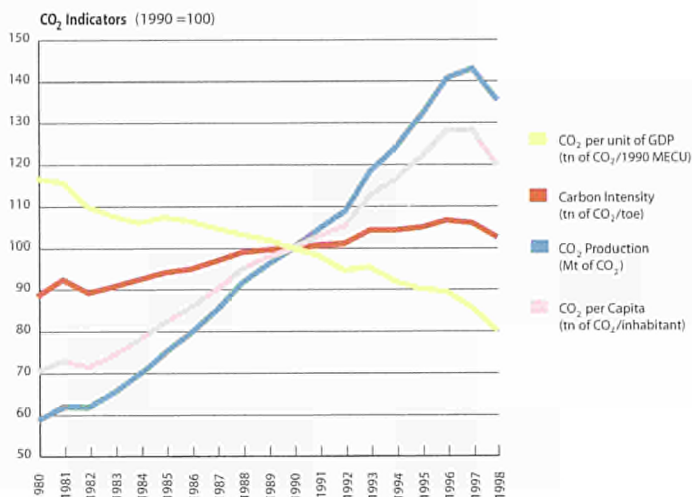
Looking at sectoral CO₂ emissions at the regional level, the power sector, mainly based on solids, just overtook industry in 1996, its share reaching 35% in 1997, having increased continuously since 1980 (22%). This is the consequence of both the growing demand for electricity and the low conversion efficiencies of old power plant units. On the other hand, the share of industry, now the second contributor, declined regularly with 32% of total emissions in 1997 against 43% in 1980. The tertiary-domestic sector, where renewable energy continued to make a significant impact, reduced its share of emissions from 20% in 1980 to only 13% in 1997 though its emissions volume increased by about 55% over this period. More significantly, the CO₂ emissions growth rate of this sector declined continuously from 5.3% per year on average bet-

ween 1980 and 1985 to only 0.6% per year on average in the 1990s despite a general increase in living standards. The contribution of the transport sector has increased slowly since 1980, from 11% of total emissions to 13% though transport's total emissions have multiplied by 2.8 since 1980.

GLOBAL MARKETS

Regional low energy dependency, even if oil dependency reached 48%...

With an energy dependency in 1998 of about 12%, Asia is increasingly a net **importer of energy**. This is true for oil (net imports of 295 Mtoe, supplied mainly by the Middle East) and solid fuels (net imports of 10 Mtoe). But Asia remained a net exporter of natural gas (about 35 Mtoe since 1990). Natural gas exports accounted for 31% of indigenous production in 1990, but this share fell to only 10% in 1998 in line with increasing indigenous consumption. Exports consisted mainly of LNG to Japan. At a national level, this broad picture differs widely. China, with an overall energy dependence near zero, is a net exporter of solid fuels with increasing volumes over the last few years but has become a net importer of oil since 1993. Oil imports represented about 23% of its oil consumption in 1998 and this share was increasing steadily. Due to the refinery deficit for processing heavy crude oil, imports of oil products have increased, and represented about 45% of all imports in 1998. Crude oil was mainly imported from the Middle East region, but oil products were supplied mainly from regional refineries. India remained a net importer of all commercial energy sources except natural gas, with oil accounting for 90% of total energy imports in 1998. The NICs, without significant fossil fuel reserves, are all major net energy importers. Indeed, they depended on foreign supplies for 86% of their gross inland consumption in 1997, the remainder being supplied mainly by nuclear power. The situation of other developing Asian countries was a little more complex. Their apparent net export balance resulted in fact from a balancing of their oil imports (30 Mtoe in 1998) by their exports of coal (15 Mtoe) and natural gas (48 Mtoe).





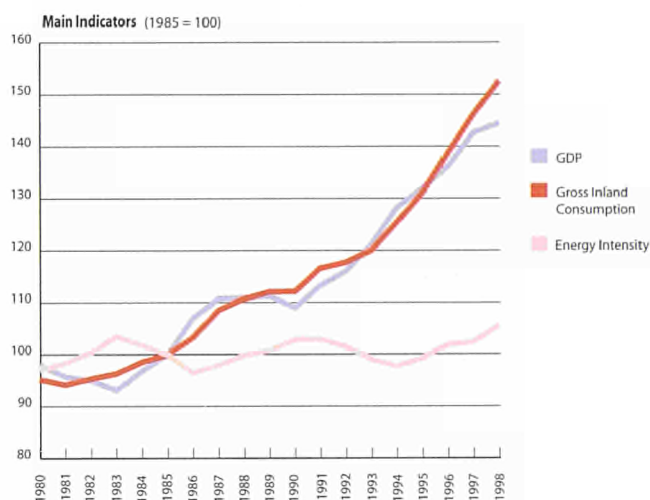
LATIN AMERICA: Major trends (1980-1998)

- The financial crisis limited GDP growth to only 1.3% in 1998
- Increasing final energy consumption, driven by growing economic activities, peaked in 1997
- The structure of final energy demand by sector has remained stable since 1980 but transportation was growing
- Electricity demand has increased by 40% since 1990
- Gross Inland Consumption dominated by oil and renewable energy sources but the gas contribution increased rapidly
- Oil producers have significant potential for increasing output
- Latin America represented only 3.6% of world fossil fuel reserves
- Hydro dominated electricity generation but development of natural gas accelerated
- Development of a continent-wide electricity market is on the way
- Privatisation and deregulation have created a major competitive arena
- Refining capacity increasing slowly with utilisation rate close to the world average
- Energy intensity peaked in 1997 pushed by transport
- CO₂ emissions increased by 46% since 1990
- Net exports, mainly oil, have more than doubled since 1990

The financial crisis limited GDP growth to only 1.3% 1998...

Latin America includes all the countries of Central and South America (excluding Mexico) and the Caribbean islands. It is a mix of large and medium countries, such as Brazil and Venezuela, located in South America; and a multitude of smaller ones with different economic structures and energy resources, mainly located in Central America. In general, the level of economic development is intermediate between the OECD members and the less developed countries of Africa and Asia. Latin America experienced rather modest economic growth during the 1980s of about 1% per annum. GDP growth accelerated during the 1990s to peak at 4.3% in 1997. In mid 1998, following the South East Asian and Russian financial crises, a new wave of financial market pressures affected many emerging market economies, especially in Latin America. This was particularly the case of Brazil which accounts for one third of the region's total GDP. The Latin American economy began to slow in late 1998, mainly due to Brazil's economic downturn and currency devaluation, low energy and other commodity prices, declining stock markets, higher interest rates, rising unemployment, and continuing emerging market uncertainty. Consequently, the GDP increase was limited to 1.3% in 1998 for the whole region and prospects for 1999 were quite pessimistic.

A key aspect of the Latin American economy is the process of trade liberalisation. This has already had significant effects on economic and energy developments in the region. Many countries are striving to stabilise inflation and modernise their industry



using imported technology and capital. Liberalisation is likely to have a significant impact on energy use, through the upgrading of the technological infrastructure of the region.

Brazil's financial crisis has made the process of further regional integration more difficult. Launched in January 1995, Mercosur is a regional trade pact comprising Brazil, Argentina, Paraguay, and Uruguay, with Chile and Bolivia as associate members. Since its inception, intra-regional trade and investment within the pact has grown significantly. Mercosur has also resulted in greater co-ordination of regional issues, including energy matters. Nonetheless,

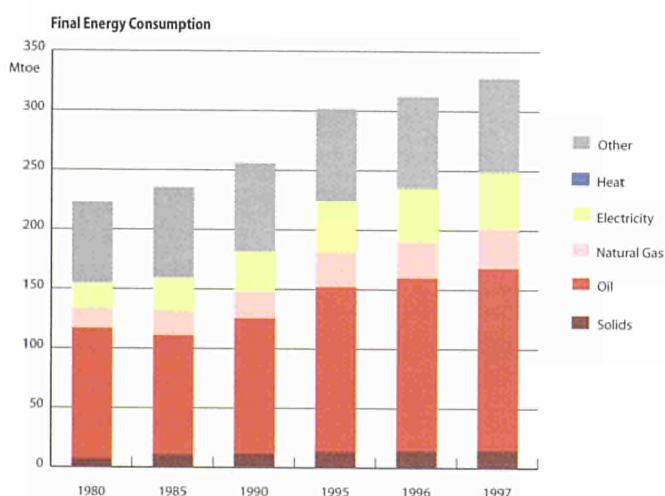
¹ Excluding Mexico

the crisis has raised tensions among Mercosur members since now-cheaper Brazilian goods have flowed into neighbouring countries such as Argentina, worsening their trade accounts with Brazil.

ENERGY OUTLOOK

Increasing final energy demand, driven by growing economic activities, peaked in 1997...

Final energy demand increased steadily by about 1.4% during the 1980s, marked by a depressed economy mainly during the first part of the decade. Since 1990, sustained by a growing economy, final energy demand growth averaged 3.6% per year after 1990 and jumped 4.9% in 1997. First indications suggested that final energy demand growth will exceed 4% in 1998. Since 1990, additional consumption was mainly covered by oil (55% of the overall increment), electricity (19%) and gas (16%) although biomass consumption demonstrated relative stability due to the progressive slowdown of the Brazilian alcohol programme resulting from market deregulation. This programme has favourably influenced the development of biomass but has suffered from low oil prices on the international market since the early 1990s. Consumption of conventional energy forms increased very rapidly: +4.3% per year on average for oil, +6.0% for gas and +4.9% for electricity. One country, Brazil, absorbed about 42% of total final energy demand in Latin America and its share has been relatively stable since 1980. Argentina with only 12% of total final consumption and Venezuela with 11% followed it. Therefore, developments in



Main items

The MERCOSUR common market agreement - which came fully into force in 1995 - now embraces a free trade area of some 200 million people in Argentina, Brazil, Paraguay and Uruguay, with associate membership of Bolivia and Chile. Trade liberalisation has underpinned their progressive transformation into more modern, industrialised economies. However, from mid 1998 another financial crisis affected much of the region, especially its largest economy - Brazil. Prior to this, many countries were undertaking substantial reforms aimed to improve economic stability, reduce inflation and attract inward investment. A key element of these reform programmes are liberalisation and privatisation of energy sectors, particularly the electricity and downstream gas industries. Gas production is rising very steeply, based upon expanding reserves in Argentina, Peru and Venezuela. Hydropower meets 75% of the region's electricity generation and there remains huge unexploited potential. Interconnection of electricity and gas networks is proceeding. Venezuela, an OPEC member, has huge petroleum reserves especially in the form of heavy oil deposits; and Argentina, Brazil and Colombian are emerging as significant oil producers. Whilst regional coal production still remains low in global terms, exports are rising. A distinctive characteristic of the Latin American regional energy balance (especially that of Brazil) is the industrial use of biomass in various forms - such as charcoal in steel making, bagasse in steam raising and sugar-cane alcohol in the transport sector. But the traditional heavy dependence upon biomass, other than in the remoter rural areas, has declined with the rapid expansion of fossil fuel production, urbanisation and growing car ownership. These developments have also led to the dramatic acceleration in regional CO₂ emissions since 1990.

regional final energy demand were dominated by those of Brazil, except in the case of natural gas whose development was determined by Argentina and Venezuela which are the region's main gas producers and consumers. In 1997, Brazil accounted for 67% of Latin America's total coal demand, with Colombia, Chile and Argentina responsible for much of the remainder. In Brazil, the steel industry absorbed almost two-thirds of the country's total coal consumption, relying on imports of coking coal to produce coke for use in its blast furnaces.

The structure of final energy demand by sector remained stable since 1980 but transportation was growing...

The structure by sector of final energy consumption has remained largely unchanged since 1980. The industrial sector's share went from 37% in 1980 to 38% in 1997; transportation from 29% to 31%; whilst the tertiary-domestic sector remained stable. This is the result of a number of phenomena. Over the past twenty years, the region has embarked on a programme of industrialisation, often led by the most energy intensive sectors based upon exploitation of the large resources of raw materials. More recently the region has used its resource industries as the base for moving into higher value-added products. Consequently the region occupied a medium position between industrialised countries where the weight of industry in the structure of final energy consumption steadily declined and developing areas where it increased. Sustained by economic growth and higher incomes, transport sector consumption has increased by more than 5% per annum on average since 1990, accounting for more than 70% of the incremental oil demand since 1990. Compared to other developing regions, Latin America has a relatively high degree of vehicle ownership, reflecting higher per capita incomes, high levels of urbanisation, a history of low, subsidised prices for transport fuels across the region and large distances between cities. But there are marked differences within the region and a substantial potential for increased vehicle ownership still exists as income rises. Since 1990, energy consumption of the tertiary-domestic sector rose more slowly than final energy demand. Driving forces of this sector were increasing demand for specific uses and improving efficiency stimulated by higher prices. In particular the increasing energy consumption per employee in the service sector follows improvements in infrastructure (building, computing facilities, air conditioning...); and the evolution of domestic energy demand depends on per capita income levels, the urbanisation rate and the speed of substitution of non-commercial fuels by commercial energy. In some Latin American countries, there has already been a restructuring of energy prices in recent years to bring them closer to international levels. In other countries, however, end-use prices remain below international levels.

Electricity demand has increased by 40% since 1990...

Electricity demand grew by 4.8% on average since 1980, twice as fast as GDP but, more recently, this elasticity has declined appreciably. The share of electricity in final energy demand reached 15% in 1997 from 12% in 1985 and only 10% in 1980. Half of regional electricity consumption occurred in Brazil where its share rose to 18%. In 1997, about 46% of this electricity was consumed

in industry and 54% in the tertiary-domestic sector (of which 55% by the residential sector and 39% by services). Since 1990, electricity demand increased respectively by 3.8% per year on average in industry, and by 6.0% in the residential sector and in services. In all sectors, but mainly in residential and services, the share of electricity in total final demand was expanding, reflecting rising income levels, urbanisation, structural and technological shifts in the industrial sector and the increasing use of electrical appliances in the residential/commercial sector.

The fuel structure of final energy demand has changed significantly since 1980. Oil and gas now account for 57% of total final energy demand and 75% of commercial energy demand. While oil has continued to be the dominant fuel, its share diminished slowly from 49% in 1980 to 47% in 1997. Over the same period, the share of gas increased from 7% to 10%. This shift between hydrocarbons has been the outcome of changes in relatively few countries. The major impetus has been to conserve oil supplies for export or to reduce dependence on imported oil. To limit the impact of transport demand growth many initiatives have encouraged the use of alternative fuels in the region. These include an alcohol fuels programme in Brazil and promotion of compressed gas in Argentina, Colombia and Chile. These programmes have affected the fuel mix in these countries to varying degrees, mainly through incentives provided by governments. The deregulation process in the region's energy markets is expected to affect such programmes adversely.

Gross Inland Consumption dominated by oil and renewable energy sources, but the gas contribution increased rapidly...

Gross inland energy consumption was dominated by oil (48% of the total in 1998 from 55% in 1980). After oil, renewable energy sources, mainly biomass (83 Mtoe in 1998) and hydro (45 Mtoe in 1998), came second in satisfying 28% of total demand in 1998 against 30% in 1980. The natural gas contribution more than doubled in the past fifteen years, representing 18% of the total in 1998 (11% in 1980). Solid fuels remained marginal with only 6% of the 1998 total, two thirds of this consumption occurring in Brazil. There is also some use of nuclear energy in Argentina and Brazil but it represents less than 1% of the total in 1998. Since 1990, additional consumption of energy of about 123 Mtoe has been covered respectively by oil (49%), natural gas (26%), hydro (11%), solid fuels (8%) and biomass (5%). In 1997, natural gas became the second fuel in importance, just overtaking biomass.

In the future gas consumption, which increased by 10% in 1997 and another 6% in 1998, will continue to expand rapidly. Several





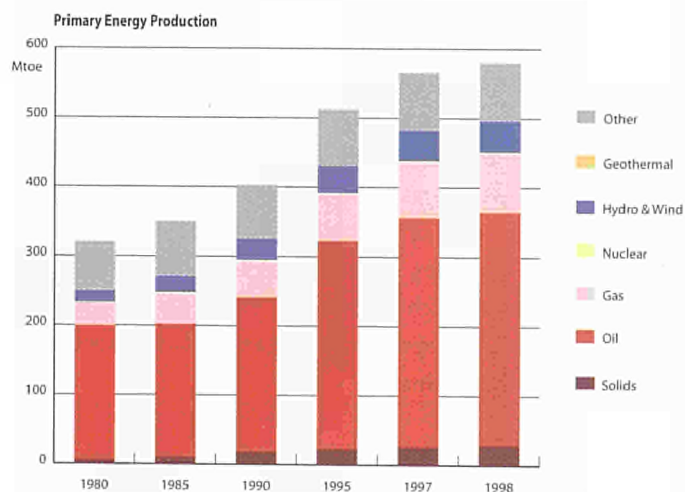
pipelines connecting Argentina and Uruguay, Brazil and Chile were completed. In Argentina, now the largest regional producer just ahead of Venezuela, natural gas use has increased by more than 80% over the past decade. At the same time, the liberalisation of energy markets in South America as a whole has given Argentina an opportunity to supply growing gas demand in Brazil, Chile and Uruguay. In October 1998, the first Argentina to Uruguay natural gas pipeline was inaugurated. In Brazil total demand for natural gas grew by 10.7% in 1997 and 3.6% in 1998. With the first stage of the Bolivia to Brazil natural gas pipeline completed at the end of 1998, potential gas supply increased significantly. There are also moves to bring LNG to Brazil. In November 1998, Petrobras and Royal Dutch formed a joint venture to develop a regasification plant near Recife, which will be South America's first LNG regasification terminal.

The predominance of oil and the importance of hydro in the generation of electricity are two other striking features of the region as a whole. However, the energy systems of individual countries are quite distinct, with Argentina being one of the most gas-intensive countries in the world, while the energy systems of the poorest countries are still dominated by biomass. In the near future oil consumption growth will be concentrated in transportation and to a lesser extent in other end-use sectors, but a decline in the share of oil in gross inland consumption is expected. In Central and South America, the electricity sector currently relies heavily on hydro power, which accounted for about 8% of primary energy use. Because dependence on hydro resources in the region has led to problems in maintaining electricity supply during times of drought, fuel diversification is now being pursued. It will reinforce gas use in the region and, to a very limited extent, coal use.

Oil producers have significant potential for increasing output...

Indigenous **energy production** has grown since 1980 on average by more than 3.4% per year, and was accelerating regularly to reach 4.7% in the 1990s even though growth was limited to 2.6% in 1998. Production was dominated by oil (58% of total in 1998) followed by natural gas (15%), biomass (14%), hydro and wind (8%), solid fuels (5%) and nuclear (less than 1%). In 1998 Venezuela dominated oil (48%) production. Other major oil producers were Brazil (16%), Argentina (14%) and Colombia (11%). Though Venezuelan production grew slowly since 1995 (+4.2%), stronger growth occurred in other big producers: Brazil (+40%), Colombia (+24%) and Argentina (+17%). Oil producers in Central and South America have significant potential for increasing out-

put over the next decade. Brazil has just recently become a million barrel per day producer and has considerable production potential waiting to be tapped. Argentina and Colombia are expected to reach this level of production within five years. The oil sector in this region is benefiting from a more favourable climate for attracting foreign investment. In 1998, Argentina became the largest gas producer just ahead of Venezuela with a production of about 30 Mtoe in both countries. Development of natural gas production and infrastructure has accelerated since the early 1990s, influenced both by privatisation of former state gas companies and increasing private foreign investment in pipelines. Brazil was mainly responsible for hydro and biomass production (56% and 51% respectively of the region's production). Finally, several new low-cost coal producers, including Colombia and Venezuela, have entered the coal supply picture in recent years and are rapidly penetrating world coal markets.



Latin America represented only 3.6% of world fossil fuel reserves...

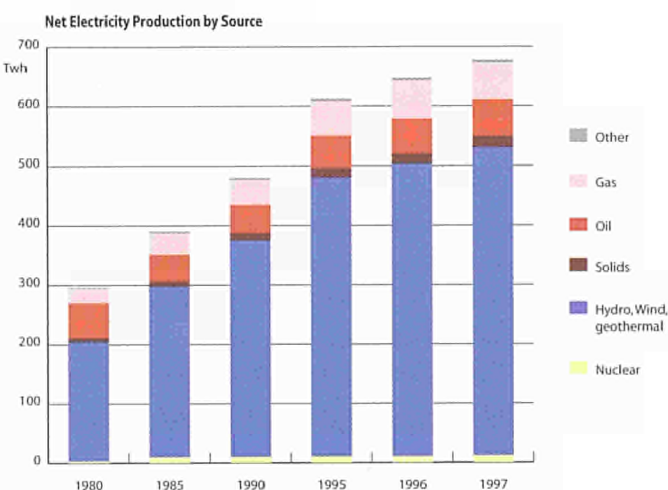
Latin America's oil reserves at end 1998 amounted to about 8.5% of world reserves, with a major part (6.9%) located in Venezuela, the only OPEC member in this region. If its extra-heavy deposits in the Orinoco belt are included in reserves, then its oil resources are comparable to those of Saudi Arabia. The reserves/production ratio reached 37.4 years, a little below the world average. Gas reserves represented only 4.3% of world reserves, more than 65% of these also being concentrated in Venezuela. Finally, coal reserves, mainly located in Colombia and Brazil, accounted for only 1.8% of world reserves. As a result of this, Latin America represented only 3.6% of total world fossil fuel reserves.





Hydro dominated electricity generation but development of natural gas accelerated...

Electricity generation in the region grew steadily by 5.0% per year on average in the period 1980-1997. This sustained growth will continue in the near future given that currently roughly 30% of the population has no access to the grid and per capita electricity consumption for the region is roughly 26% of that in the European Union. For several decades, hydroelectric power has dominated electricity supply meeting 75% of total production in 1997 (67% in 1980). Brazil supplied more than half of hydro production. But a lack of suitable sites, long lead times, cost overruns, and concerns over displaced populations and environmental damage have all served to diminish the attractiveness of further hydropower investment. The reliability of hydroelectric power also became a growing concern during the drought years of the late 1990s. Thermal generation, 24% of the total in 1997, grew by 1.6 % on average during the 1980s but by 5.2% on average since 1990. Input needs are covered mainly by gas (39% in 1997) and oil (37%), followed by solid fuels (12%) and biomass (9%). Oil has been a significant fuel in electricity generation but its importance has been declining in favour of all other fuels, especially gas. The growing role of natural gas in electricity production was contingent on the completion of several major pipeline operations linking producing countries, such as Argentina and Bolivia, with consuming countries, such as Chile and Brazil. Once these projects are completed, a regional natural gas pipeline network will be operational in Latin America.



Development of a continent-wide electricity market is on the way...

In addition, a continent-wide market for electricity is also evolving in South America. Currently, Argentina, Brazil, Venezuela, Chile and

Ecuador are completing a unified electricity transmission system. Uruguay, in an attempt to establish itself as a hub of regional electricity trade, is promoting a number of transmission and generation projects that will connect Argentina with Brazil through Uruguay. Foreign companies, such as Enron and National Grid, are playing a growing role in the development of the transmission network. A regional electricity grid is also evolving in Central America, although at a hesitant pace. In December 1995, the presidents of Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama endorsed a proposal to interconnect their grids in order to alleviate periodic power shortages, reduce operating costs, optimise regional use of hydroelectric power, create a competitive market in the region and attract foreign investment.

Privatisation and deregulation have created a major competitive arena...

Latin America has been particularly active in attracting foreign investment which has had profound impacts on the landscape of its electric power industry. The need to attract foreign investment in order to expand and upgrade electricity infrastructure has inspired a wave of privatisation. For many countries privatisation has become the only effective method of raising capital on favourable terms. High levels of past public sector borrowing have saddled many countries with large levels of debt. As a consequence, they have had little option but to sell state assets to reduce debt, generate revenue and raise investment capital. South America has also undergone a wave of energy deregulation and has turned into a major competitive arena for some of the world's largest multinational energy companies. Although Chile was the first nation in the region to embark upon energy privatisation and deregulation, it was Argentina's move toward energy reform and privatisation, which occurred 10 years after Chile's, that precipitated a continent-wide sea change in energy policies and a massive inflow of foreign investment. In the mid-to late 1990s, the continent saw a virtual swallowing up of newly privatised South American energy companies, many by newly privatised and/or deregulated energy companies from abroad, in particular from the United Kingdom and United States. This first wave opened the door to cross-border investments by other European companies and by indigenous South American companies. Between 1990 and 1997, foreign investors channelled more than \$45 billion into Latin American electricity investment; and, over the next few years, Latin America could surpass Asia as the largest target for foreign investment in electricity.

Total generation capacity reached 161 GWe in 1997, of which 66% was hydro (56% in 1980), 33% thermal units (43% in 1980) and 1% nuclear. Since 1980, new commissioning has been shared bet-





ween hydro for 62 GWe (74% of the total), thermal for 20 GWe and nuclear for 1 GWe. Many countries of Central and South America rely heavily on hydropower for electricity generation. In Brazil, 87% of the installed capacity consists of hydropower. Hydro also accounted for 50% or more of the total installed capacity in Chile, Colombia, Paraguay, Peru and Venezuela. Thermal capacity was expanding ever more rapidly, increasing by more than 5GWe - representing a 10% growth of the thermal installed capacity. By opening up markets to independent power producers (IPPs), and by freeing utilities through privatisation, market economics have boosted the rapid deployment of gas-fired power.

Refining capacity increasing slowly with utilisation rate close to the world average...

In 1998, the **refinery capacity** (6.47 million barrels a day or a 1.3% decrease over 1997) represented 8.1% of world capacity (9.3% in 1980). Whereas about 2 million barrels day of refining capacity was closed in the first half of the 1980s, since 1985 the installed capacity has grown by about 1.0% per year on average. But the utilisation rate of the refineries (83% in 1998 from 75% in 1985) increased slower than the world average (84% in 1998 from 74% in 1985).

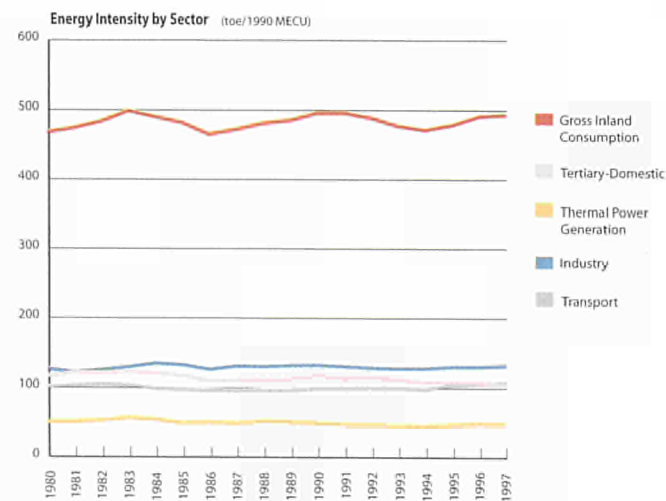
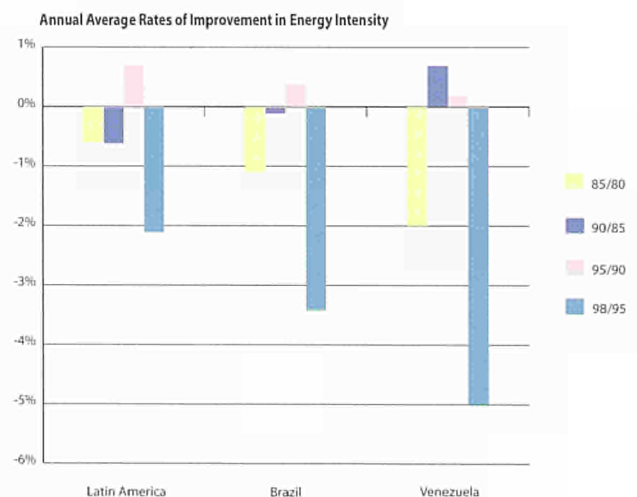
COMPETITIVENESS

Energy intensity peaked in 1997 pushed by transport...

The **energy intensity** indicator for the region evolved differently in the period 1980-1997. It increased regularly by 0.6% per year on average over the period 1980-1990, decreased by 1.3% on average between 1990 and 1994 but has rebounded since 1995, increasing successively by 1.5%, 2.6%, 0.5% and 3.1% between 1995 and 1998, to peak at 510 toe/million 1990_, a little above the world average. This reflects contrasting economic conditions in the region since 1980. The economic recession in the early 1980s, through lower utilisation of industrial capacity, induced increasing energy intensity of industry. At the same time, development of services and improving standards of living accelerated energy consumption in the tertiary-domestic sector, although GDP remained flat. Between 1986 and 1990, the upturn in economic activity resulted in a reduction of industrial energy intensity due to the acceleration of investment despite the development of highly energy-intensive industries relocated from OECD countries. At the same time, the negative impact of the tertiary-domestic sector continued, currently being reinforced by the transportation sector where motorization has accelerated. Finally, since 1990, the increasing energy intensity of the transport sector (+8.7% since 1990) compensated largely for the gains observed in

the tertiary-domestic sector (-12.0%) while energy intensity in industry remained flat overall. It must be stressed that the contribution of power generation declined slowly, from 10.8% of the total in 1980 to 9.7% in 1997. Energy intensity analysis by country reveals significant national differences within the region. Argentina and Brazil, amongst the more developed countries, were characterised by energy intensity around 370-400 toe/million 1990_, comparable with some OECD countries. In contrast Venezuela, together with many Central American countries, has an energy intensity three to five times higher, in line with levels observed in developing countries.

Energy consumption per capita, quite stable during the 1980s has increased since 1990 to jump by 4.1% in 1996, 3.6% in 1997 and 2.8% in 1998. By sector, increasing trends appeared clearly since 1990 in transport (+27% over the period 1990-1997) due to greater motorisation and in industry (+16%) as a consequence of



LATIN AMERICA : ENERGY INTENSITY

toe/1990 MEUR	1980	1985	1990	1995	1996	1997	1998(1)
Latin America	468.7	482.6	496.6	479.4	491.9	494.5	509.7
Argentina	336.2	366.8	390.1	380.2	381.3	367.7	368.5
Brazil	349.8	370.2	372.4	365.3	371.9	383.9	403.9
Colombia	843.4	873.6	845.9	775.4	774.4	729.6	759.4
Venezuela	1004.9	1110.3	1070.2	1061.5	1224.4	1219.1	1228.7

(1) estimates

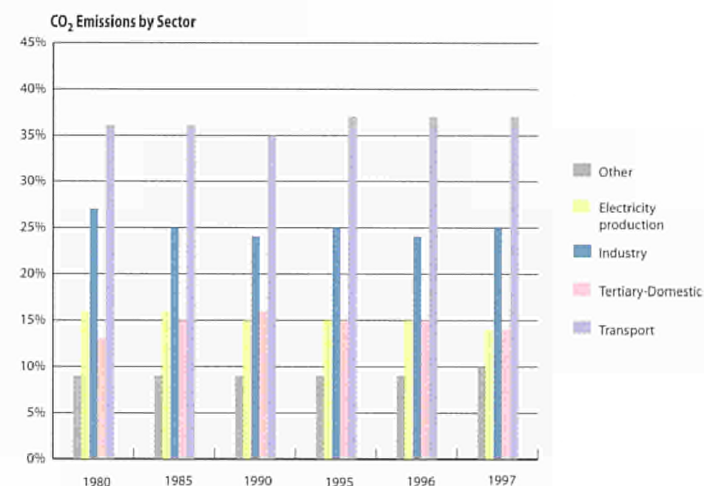
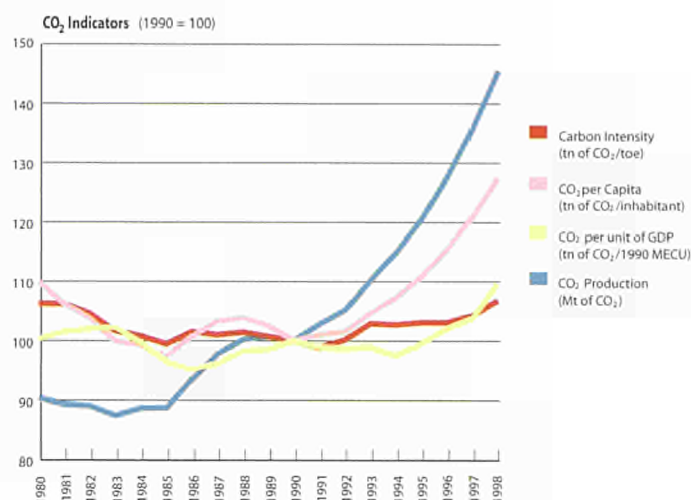
increasing industrial production. The energy intensity of the tertiary-domestic sector increased slowly and even experienced relative stability since 1995. Improving living standards and greater specific demand by commercial services were compensated by greater efficiencies induced by deregulated energy prices closer to international prices. Nevertheless, the per capita consumption in 1997 remained well below the European level with 40% for industry, 32% for transport and only 24% for the tertiary and domestic sector.

ENVIRONMENT

CO₂ emissions increased by 46% since 1990...

In broad terms, CO₂ emissions have been rising continuously since 1980 (867 million tonnes of CO₂ in 1998, compared to 596 million tonnes in 1990, 529 million tonnes in 1985 and 538 million tonnes in 1980). Major contributors were Brazil (33% of the total in 1997), Venezuela (16%) and Argentina (15%). Whereas CO₂ emissions increased annually by 1.0% on average during the 1980s, growth accelerated significantly to reach 4.8% per year on average after 1990 due to the fact that fossil fuels covered 83% of incremental energy consumption. CO₂ emissions increased dramatically in 1997 and 1998, by 6.7% and 7.0% respectively. Other indicators reinforced this evolution, quite disturbing in the post-Kyoto context. Carbon intensity started to increase since the early 1990s with the greater contribution of fossil fuels, especially gas but also oil and coal, in satisfying total energy needs of the region. CO₂ emissions per capita decreased by 1.0% per year during the 1980s but increased by 4.8% since 1990 and this growth was accelerating. CO₂ intensity per unit of GDP, quite stable during the 1980s, grew by about 1.1% per year on average since 1992.

Looking at CO₂ emissions by sector at a regional level, the largest sector by far is transport. It easily occupied first place with about 37% of total emissions in 1998 against 36% in 1980. Industry



accounted for about 25%, decreasing slowly since 1980 (27%). The tertiary-domestic sector was quite stable at about 14%, the same share as the electricity generation sector. Since 1990, about 42% of incremental CO₂ emissions have arisen from the transportation sector, 23% from industry, 14% from the energy branch (hydrocarbon production and transformation), 11% from the power sector and 9% from the tertiary-domestic sector. Excepting some switches between transport and industry, in favour of transport, the structure of emissions by sector has remained quite stable since 1985.



GLOBAL MARKETS

Net exports, mainly oil, have more than doubled since 1990...

Over the whole period, Latin America was increasingly a **net exporter of energy**. Net exports increased from 51 Mtoe in 1990 to 118 Mtoe in 1997, more than doubling. Oil accounted for 95% of total exports in 1997 (112 Mtoe from 51 Mtoe in 1990 and only 28 Mtoe in 1980), of which three quarters consisted of crude oil and one quarter refined products. Since 1980 crude exports have multiplied by four, although exports of refined products have halved. In 1998, first indicative numbers demonstrated a contraction of 7.5% in total exports, mainly concentrated on oil. In fact, as part of a co-ordinated effort by major oil producers to prop up world oil prices since early 1998, Venezuela has agreed to production cuts totalling more than 500,000 bbl/d over the year. In 1998, net oil exports of Venezuela, one of the founders of OPEC, represented more than the net total oil exports of the region, with Argentina and Colombia also increasing their contributions since the early 1990s. Oil exports are oriented towards the United States (84% of the total), Western Europe being the second market with only 8% in 1998. Bitor, a subsidiary of Petroleos de Venezuela, controlled the processing, shipping and marketing of Orimulsion (a mix of 70% natural bitumen and 30% water emulsifiers) as a boiler fuel, mainly for countries planning to switch from oil. As of late 1998, several power plants in Europe (Denmark, Italy and Lithuania), Japan, China and Canada burned Orimulsion. Bitor now operates one Orimulsion plant with a capacity of 5.2 million tonnes per year, and hopes to produce 20 million tonnes per year by 2006. All this production is intended for export. Despite the limited production of solid fuels, the region became a net exporter in 1990, due to the efforts made by Columbia to develop its reserves. But net regional exports remained limited because Brazil absorbed a large part of the coal available on the regional market.

LATIN AMERICA : NET OIL IMPORTS

Mtoe	1980	1985	1990	1995	1996	1997	1998(1)
Latin America	-27.7	-43.2	-50.8	-104.7	-102.3	-111.8	-106.3
Argentina	1.3	-3.7	-4.8	-14.4	-18.1	-20.1	-19.4
Brazil	44.6	23.7	30.9	35.9	41.2	42.6	37.3
Colombia	1.3	-0.7	-11.5	-17.0	-18.5	-19.4	-23.4
Venezuela	-98.2	-71.7	-86.2	-134.4	-135.4	-144.8	-136.1

(1) estimates









European Commission

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