INTERNATIONAL ENERGY AGENCY

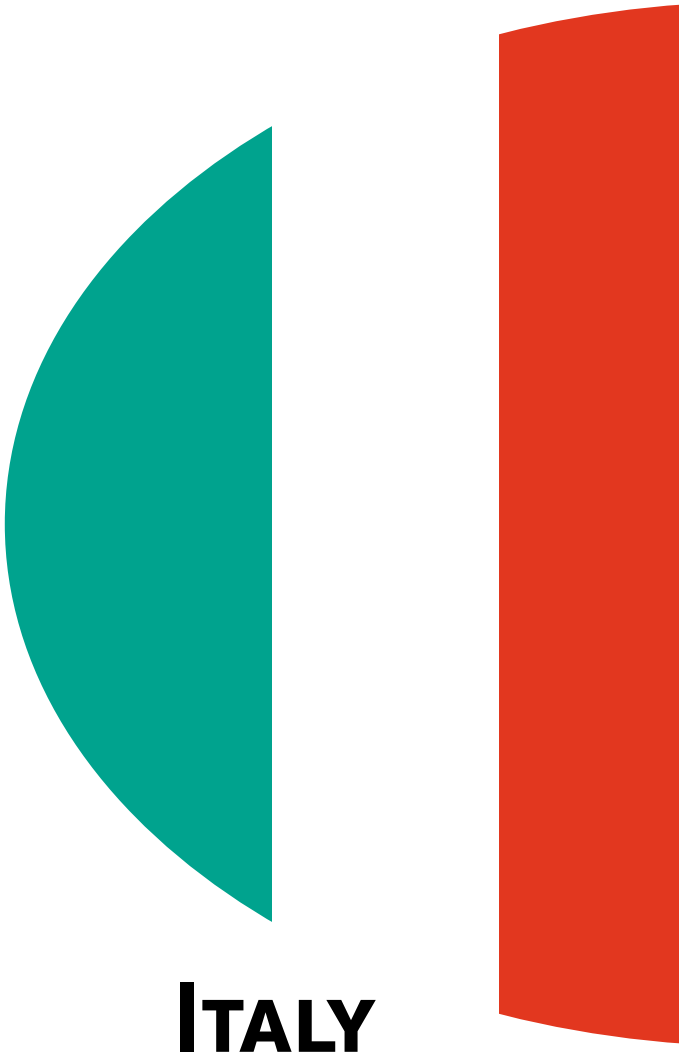
Energy Policies of IEA Countries



ITALY 1999 REVIEW

INTERNATIONAL ENERGY AGENCY

Energy Policies of IEA Countries



ITALY 1999 REVIEW

OECD
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1

INTRODUCTION

An IEA review team visited Italy in January 1999 to review the country's energy policies. This report was drafted on the basis of information received during and prior to the visit, including the Italian Government's official response to the IEA's annual policy questionnaire and views expressed by various parties during the visit.

The team greatly appreciated the co-operation and the openness demonstrated by the participants during this policy review process.

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The team held discussions with representatives of the following organisations:

- Ministry of Industry, Commerce and Crafts;
- Ministry for the Environment;
- National Agency for New Technology, Energy and Environment (ENEA);
- Antitrust Authority;
- Regulatory Authority for Electricity and Gas;
- Unione Petrolifera;
- Assocarboni;
- Representatives from the Regions of Campania, Lombardia, Marche, Piemonte, Toscana;
- ENI;
- Assomineraria;
- ENEL;
- UNAPACE;
- Federelettrica.

2

SUMMARY AND RECOMMENDATIONS

Italy has 20 regions, 103 provinces and some 8 100 municipalities[1]. The Government has recently undertaken a decentralisation policy. The Legislative Decree of 1998 on decentralisation, which still needs to be implemented, gave new responsibility for energy policy to regions and local authorities. In implementing this Decree, it is important to ensure that respective responsibilities are well defined and that energy policies are well co-ordinated across regions and with the State.

The public sector has a large role in the Italian energy industry. ENI (the oil and natural gas company) retains a dominant position as does ENEL (the public electricity company), although they do not have legal monopolies. ENI has been partially privatised, with the government's share reduced to 38% by June 1998. No decision has been taken on privatising ENEL, which in mid-1999 remained fully owned by the State.

In line with IEA Shared Goals, the Government is implementing numerous measures to liberalise and to increase the efficiency of the energy sector. The National Conference on Environment and Energy, held in November 1998, emphasised the need to increase the role of the market in the energy sector. The Government expects the decentralisation policy to lead to more efficiency in administrative procedures. The Government has moved from a previous "command and control" system, where national companies were in charge of implementing government policy, to a market-based economy and it is now necessary to continue to develop clear arm's length relations between the State and ENEL and ENI.

The Antitrust Authority, which oversees all sectors of the economy, including energy, was created in 1990. A Regulatory Authority for Electricity and Gas was formed in 1995. The well functioning of these authorities is essential for promoting effective competition, and their independence should be safeguarded.

Italy has high energy taxes in comparison with other IEA countries. In December 1998, Parliament voted a CO_2 tax. Multiple tax rates on electricity and natural gas, which are set up to incorporate fiscal, social and regional policies, distort competition between fuels and industries. The Government should devise a long-term strategy to make taxes consistent across different sectors and fuels and to better internalise the externalities associated with energy use.

High energy prices, a mild climate and Italy's small number of energy-intensive industries contribute to the low level of energy consumption and CO_2 emissions in comparison with GDP. The Government has issued a plan to meet the Kyoto target

1. Provinces and municipalities are called "local authorities".

for reducing carbon emissions. Energy efficiency can be improved in many sectors and measures should concentrate on being cost-effective. The regions' responsibilities for energy efficiency improvements should be clearly set, and the Government should ensure that these responsibilities are carried out effectively. Specific measures are needed to increase the use of public transport.

Italy produces oil and natural gas. The removal of unnecessary barriers to oil and gas exploration and production would increase domestic production and enhance security of supply. In the domestic oil sector, competition needs to be developed. The Government has taken some measures to rationalise the downstream oil sector and should continue to ensure the development of effective competition.

Natural gas consumption has increased rapidly, and import sources are being diversified. However, Italy will continue to be dependent on large foreign gas suppliers. The Government should therefore continue to monitor the evolution of the gas market to ensure security of supply. There is no legal monopoly in the Italian gas sector, and Law 9 of 1991 allows third party access in limited circumstances so that some companies have become active in this market. There is a good basis for developing competition, in spite of SNAM's dominant position in imports and transport, its important share in distribution, and ENI/AGIP's dominant position in gas storage (see box p. 57).

In May 1999, Parliament mandated the Government to implement the EU Directive on Natural Gas within one year. This reform should be based on regulated third party access and should be implemented as soon as possible to complement the reform in the electricity sector. SNAM's take-or-pay contracts are likely to account for a substantial amount of gas consumption; the Government should seek means to reduce their anti-competitive effects.

After the referendum of 1987 which phased out nuclear electricity generation, the rise in electricity demand has been met through an increase in domestic generation from other sources and an increase in imports. ENEL has retained a dominant position in electricity generation, imports, transport and distribution. In February 1999, the Government issued a Legislative Decree to implement the EU Directive on Electricity. This Decree instructs ENEL to divest itself of at least 15 GW of generation capacity and sets up a single purchase system for captive consumers. Together with the reform of prices to end-users, access to the grid and the buy-back tariffs, this reform is expected to lower prices, in particular for small and medium enterprises which play a major role in Italy's economy. The Government should ensure that the Legislative Decree, and in particular ENEL's divestiture of assets, do in fact generate competition. Payments of stranded costs to ENEL should not distort competition between companies.

Energy from renewable sources has increased significantly since 1990, mostly because of the high buy-back tariffs for electricity. The Government has set ambitious targets for energy production from renewable sources as one of its measures to reduce CO_2 emissions. The February 1999 Legislative Decree on electricity also includes provisions to increase electricity production from

renewable sources. The Government should ensure that the new system works efficiently and does not distort competition between utilities. It should also ensure that the promotion of renewable sources leads to a decrease in their generation cost to make them competitive.

Italy's public budget for energy research and development is managed by ENEA, the National Agency for New Technology, Energy and Environment. The budget is the fifth largest among IEA Members, although it has substantially decreased over the past decade. Most of this decrease is due to the rapid reduction in nuclear R&D after the 1987 moratorium. R&D in other energy areas has also decreased substantially since the late 1980s. The Government is reviewing its energy R&D policies with the aim of improving their effectiveness and is considering an increase in their funding. The review should cover the following issues: improving the assessment of energy R&D measures, co-ordinating activities among the different institutions and regions, and redefining the relationship between ENEA and the national enterprises.

RECOMMENDATIONS

The Italian Government should:

General Energy Policy

☐ Continue to increase competition in the oil, natural gas and electricity sectors.

☐ Continue to develop a clear arm's length relationship between the State on the one hand and ENI and ENEL on the other.

☐ Support efficient co-operation between the Regulatory Authority for Electricity and Gas and the Antitrust Authority.

☐ Clearly define the respective responsibilities of the central Government and the regions.

☐ Ensure that energy policies are well co-ordinated across regions and with the State and that regions have adequate staff and financial resources to carry out their tasks.

☐ Set a clear timetable for the implementation of reforms to ensure consistency in energy policy.

Energy Efficiency, Environment and Taxation Policy

- ☐ Seek the most cost-effective means of reducing CO_2 emissions.

- ☐ Clearly define the responsibilities of the regions and the local authorities for energy efficiency measures and ensure that they are carried out effectively in co-operation with ENEA. Ensure that regions focus on the most cost-effective measures.

- ☐ Increase the share of public transport and ensure that regions effectively co-operate on inter-regional transport issues.

- ☐ Continue to tighten building codes and to ensure that they are appropriately implemented at the local level, especially in the renovation of buildings.

- ☐ Implement EU Directives on Energy Labelling and Standards in a timely way and contribute positively to the development of other measures.

- ☐ Continue to develop Voluntary Agreements with industry, taking account of the experiences in other countries, and monitor their results to ensure that these Voluntary Agreements lead to energy efficiency improvements significantly beyond the business-as-usual trend.

- ☐ Set a long-term objective of clarifying the fuel tax structure in order to make it consistent across sectors and fuels and to internalise the externalities associated with energy use. In particular, in implementing the CO_2 tax, take into account the need to avoid distortion of competition between the different fuels and between the different electricity generators.

- ☐ Ensure predictability and transparency as to the time schedule and the conditions for the progressive introduction of the CO_2 tax, so that energy users and producers have a firm basis for their investment decisions.

Oil

- ☐ Clarify the regions' role in granting licences to ensure that there are no unnecessary obstacles to the production of hydrocarbons. Ensure a consistent approach between regions in granting production licences. Streamline and speed up licensing procedures at the national level.

- ☐ Implement the 1998 Decree on the rationalisation of fuel distribution and ensure that filling stations can be freely closed or opened, provided that they meet regulations on environment and safety. Ensure that the municipalities' concession procedures do not impede competition.

- ☐ Closely monitor the evolution of competition, in particular to ensure that there is no cartel activity or abuse of dominant position, including on access to pipelines and storage.

☐ Support the Regulatory Authority in setting buy-back tariffs for electricity from refinery residues in order to avoid distortion of competition at the international level.

Natural Gas

☐ Continue to monitor the evolution of the gas market to ensure security of supply.

☐ Introduce competition into the natural gas market as soon as possible.

☐ Seek means to reduce the effects of take-or-pay contracts which impede competition.

☐ Implement regulated third party access to ensure maximum transparency in transmission and distribution tariffs and to prevent any discrimination between users. These tariffs should be designed to allow for additional investment and to prevent any bottlenecks in transport.

☐ Ensure effective unbundling between supply, transmission, distribution and non-gas activities to create a level playing field for competition in gas supply. Ensure that all gas companies are effectively corporatised.

☐ Promote the largest possible degree of market opening when defining eligible consumers.

☐ Ensure the independence of the Regulator. Its role in promoting effective competition in the gas market should be well recognised and respected.

Electricity and Renewable Energy Sources

☐ Monitor the electricity market to prevent any abuse of dominant position, taking into account the development of competition in the European electricity market.

☐ Consider whether joint ventures involving ENEL will deliver effective competition in the generation sector. Ensure that there is no discrimination against independent generators.

☐ Ensure that the dominant position of ENEL in the distribution sector is reduced.

☐ Ensure effective unbundling of the different activities of electricity companies.

☐ Ensure the independence of the Regulatory Authority. Its role in promoting effective competition in the electricity market should be well recognised and respected.

☐ Take a fair view on stranded costs payments.

☐ Define clearly the relations between the Regulatory Authority, the Network Operator, the "Single Buyer" and the Market Operator.

☐ Ensure effective independence of these newly created institutions to avoid discrimination between users of the system.

☐ Ensure that directives to the "Single Buyer" place no unnecessary burden on the captive market, relative to the liberalised market.

☐ Support the Regulatory Authority in setting tariffs in a cost-reflective manner, properly allocating costs between different types of customers. Transmission and distribution tariffs should be set to provide an incentive for efficiency improvements, to allow for competition and to ensure security of supply.

☐ Continue to seek the most cost-effective ways of promoting renewable sources, make efforts to decrease the cost of their use for generation and avoid distortions of competition between utilities.

Energy Technology, Research and Development

☐ Set up a National Research Programme reflecting the conclusions of the National Conference on Environment and Energy.

☐ Ensure sufficient funding for energy R&D, consistent with energy policy goals and continue to carry out long-term energy R&D.

☐ Take appropriate measures to implement the plan for the co-ordination of energy R&D activities and their evaluation.

☐ Encourage collaboration with industry to better secure market deployment of technology.

☐ Continue to increase ENEA's expertise in R&D and energy policy issues.

3

GENERAL ENERGY POLICY

BACKGROUND

Italy has 20 Regions, 103 provinces and about 8 100 municipalities[2] (Figure 1). Five regions (Friuli-Venezia Giulia, Trentino-Alto Adige, Sardinia, Sicily and Val d'Aosta) have a higher degree of autonomy than the others.

Italy's total surface area is 301 000 km^2, and in 1997 population was 57.5 million. Population density was 190 inhabitants per km^2, one of the highest among OECD countries. Some 36 million people live in the north and centre of the country (around 15 million in the Po Basin) and more than 20 million in the south.

In 1997, GDP increased 1.3% and was US$ 1 146 billion. GDP per inhabitant was around US$ 20 000. The Government aims to reduce the budget deficit, which amounted to 2.7% in 1998. Inflation was low at 1.8% in 1998, but the unemployment rate was more than 12.5% at end 1998.

PUBLIC SECTOR ORGANISATION

State and Regional Responsibilities

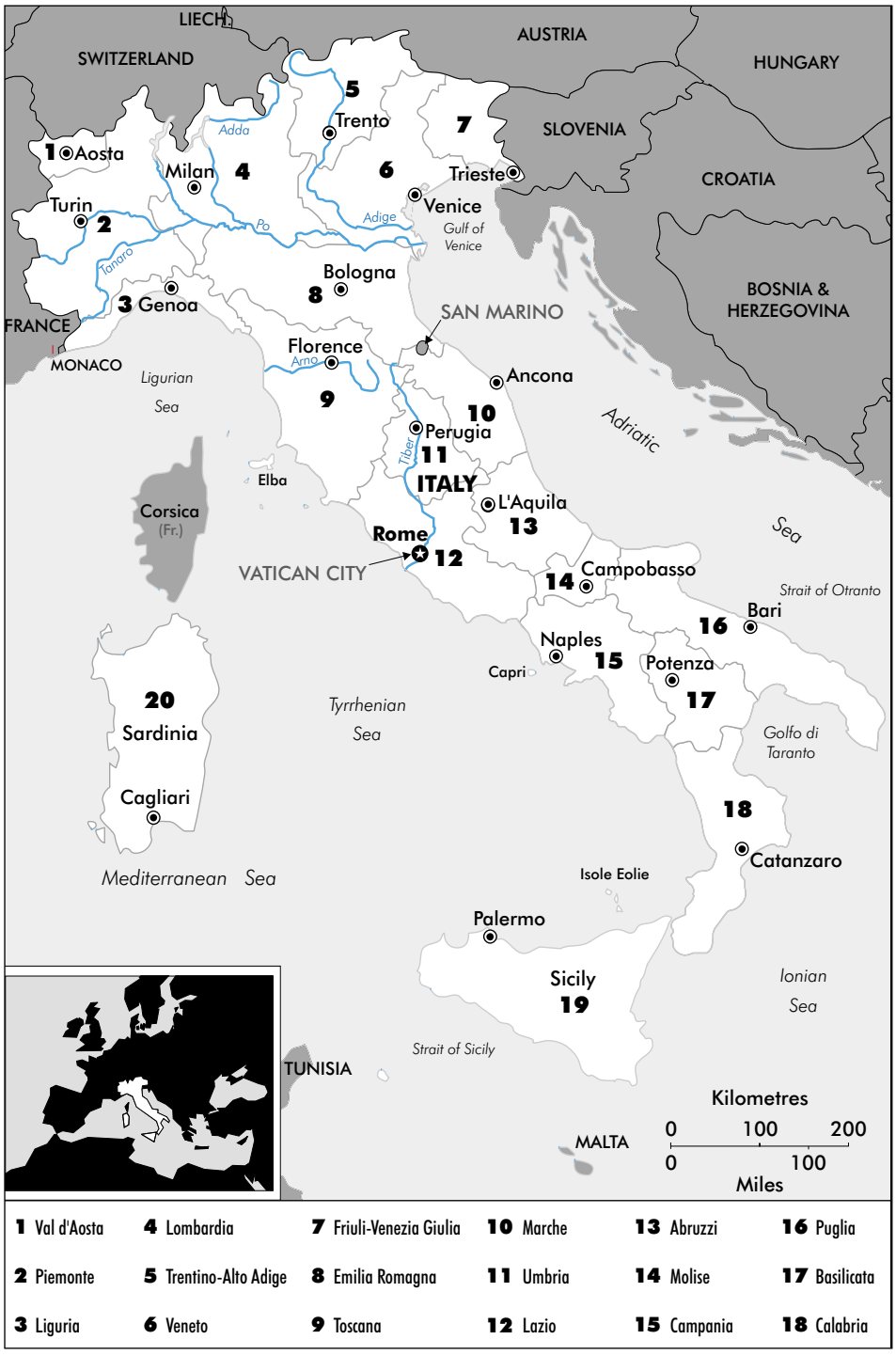
In the 1990s, the Italian Government began a process of decentralisation. Law No. 10 of 1991 (Law 10/91) gave some responsibilities to regions, in particular to make regional energy plans. The Legislative Decree of 1998 on decentralisation, which remains to be fully implemented, gave new responsibilities with regard to energy policy to regions and local authorities.

According to the 1998 Legislative Decree, the State's main administrative functions related to energy are as follows:

- General energy policy objectives and guidelines;
- Co-ordination of energy planning at the regional level;
- National objectives and programmes for renewable sources and for energy savings;
- Energy statistics;
- National mining policy including policies related to exploration, production and storage of hydrocarbons, and to fees and taxes on mining activities;

2. Provinces and municipalities are called "local authorities".

Figure 1
Map of Italy



1 Val d'Aosta	**4** Lombardia	**7** Friuli-Venezia Giulia	**10** Marche	**13** Abruzzi	**16** Puglia
2 Piemonte	**5** Trentino-Alto Adige	**8** Emilia Romagna	**11** Umbria	**14** Molise	**17** Basilicata
3 Liguria	**6** Veneto	**9** Toscana	**12** Lazio	**15** Campania	**18** Calabria

- Regulations related to import, export and storage of energy;
- Geothermal resources inventory;
- Public research and development and supervision of ENEA, the National Agency for New Technology, Energy and Environment[3];
- Standards on building techniques, technical standards for the functioning of energy plants, production, distribution and use of energy; and
- Licensing for building and management of electricity plants with a capacity over 300 MW and of transmission networks with a voltage higher than 150 kV, and the establishment of technical standards regarding the building of power lines.

The regions' main responsibilities are as follows:

- Drafting and adoption of programmes aimed at promoting renewable energy sources and energy savings;
- Funding energy savings and controlling the energy efficiency of energy plants;
- Assisting local authorities which are responsible for the control of energy savings, rational energy use and other responsibilities foreseen by regional legislation;
- Licensing for building and management of electricity plants with a capacity below 300 MW; and
- Granting licences for onshore hydrocarbons production.

Ministries and Authorities at the State Level

Responsibility for energy policy lies primarily with the Ministry of Industry, Commerce and Crafts, in co-ordination with other ministries (including the Ministry for the Environment), inter-ministerial committees, government organisations and independent agencies. The Inter-ministerial Committee for Economic Planning (CIPE) co-ordinates national energy policy with economic policy and issues reports which provide a framework for energy policy. In November 1998, the CIPE issued a report on the Kyoto emissions reduction target. The Ministry for the Environment, in collaboration with other ministries involved in energy and with regional/local authorities, is responsible for setting up limits for emission reductions and for fuel and product specifications, for giving guidelines concerning new technologies and for evaluating the environmental impact of facilities and industrial installations.

3. ENEA is described in Chapter 8.

The Antitrust Authority was set up to enforce the Competition Law of October 1990. The Authority has a staff of some 180 and its main tasks are to evaluate claims against abuse of dominant position and to review possible agreements and mergers. The Authority can investigate activities in all sectors and can make recommendations (which are not binding) to several public bodies and in particular to the Parliament and to the Government. The Authority suggests reforms for improving competition in various sectors, e.g. it analysed and suggested reform to oil products distribution in 1996. The Authority's decisions can be appealed to the regional administrative court of Lazio, then to the Council of State.

The Regulatory Authority for Electricity and Gas was created by the Law of November 1995, a general law on regulation of public utility services in the areas of gas, electricity and telecommunications. The responsibilities of the Regulatory Authority are described in detail in Chapters 6 and 7. In 1999, the Authority had 80 employees and three commissioners (one of whom is the acting president), nominated by the President of the Republic with a term of seven years which cannot be renewed. This Authority is financed through a tax on the revenue of utilities, and its decisions are subject to appeal to the Administrative Court of Lombardia, then to the Council of State. The Government sets the relevant energy policy objectives and the Regulatory Authority's task is to find the best way to meet these objectives.

State-owned Companies

Although its role has decreased recently, the public sector is still a prominent player in the Italian energy industry. Despite the fact that dominant positions have been retained by ENI, the oil and natural gas company, and ENEL, the electricity company, the companies do not have legal monopolies. ENI has been partially privatised, with the government's share reduced to 38% in 1998. No decision has been taken on privatisation of ENEL, which in mid-1999 remained fully owned by the State.

ENERGY POLICY OBJECTIVES

At the conclusion of the National Conference on Environment and Energy in November 1998, the Government set out a series of energy policy goals. The Conference was held at the initiative of the Government and was organised by ENEA. It focused on the environmental, social and economic aspects of the energy sector with the aim of achieving agreements among the Government, energy companies and unions on energy requirements, environmental protection and the achievement of national objectives. In the concluding document, the Government set the following energy policy objectives:

- To increase the role of competition and to favour voluntary actions over command and control.

- To promote sustainable development and to account for environmental concerns in energy policy.

- To extend the decentralisation process and to improve the balance between the north and south of Italy in terms of infrastructure and quality of energy services.

- To simplify legislation and procedures.

- To support the internationalisation of energy companies.

The Government plans to devote at least L 5 000 billion[4] from 1999 to 2004 to specific actions which were decided at the Conference. These main actions are:

- To ensure energy security of supply through domestic production, diversity of supply and hydrocarbon storage.

- To issue the Legislative Decree on the reorganisation of the electricity sector (which was issued in February 1999) and to introduce competition in the gas sector as soon as possible.

- To increase efficiency in final energy use, especially in the transport sector.

- To double energy production from renewables from 12.7 Mtoe in 1996 to 24 Mtoe in 2010.

- To better internalise the external cost of using energy and to promote a common approach in this respect in line with the European Union objectives.

- To start a programme to reduce greenhouse gas emissions.

- To increase energy R&D funding, in particular in the fields of development and demonstration.

CRITIQUE

Since the last review, Italy has made significant progress towards increasing competition in its energy markets. The IEA welcomes the achievement at the National Conference on Environment and Energy of a consensus on increasing the role of competition. Italy's command and control system has provided few incentives for improving the efficiency of energy industries. The Government is rightly moving from an energy policy implemented through national companies to regulations which provide for competition. As this will strenghten the efficiency of energy companies, it will benefit the Italian economy.

4. 1 € = L 1 937.27; on average in 1998, L 100 = US$ 0.058.

A clear arm's length relationship should be developed between the Government, and ENI and ENEL so that these companies compete on a level playing field with their competitors. The partial privatisation of ENI should facilitate effective competition in the oil and gas sectors.

The creation of the Regulatory Authority for Electricity and Gas was a welcome step towards effective market functioning. Co-operation between the Regulatory Authority and the Antitrust Authority is essential to ensure market competition. This co-operation is especially important in the oil and gas sectors, where companies such as ENI are involved, because the Regulatory Authority only has jurisdiction over gas issues, whereas the Antitrust Authority has jurisdiction over all energy issues, including oil. The responsibilities of both Authorities should be clear and transparent to all market participants to avoid delays in procedures.

The decentralisation of energy policy is an important objective in Italy because of the wide differences between regions in terms of economy, geography, climate, energy consumption and production. This decentralisation policy should be accompanied by less complex administrative procedures for onshore hydrocarbon production to enhance domestic production. Given Italy's dependence on imported hydrocarbons, increasing domestic production will improve security of energy supply.

The challenge for the Government is to carry out the decentralisation process in such a way as to effectively implement the Legislative Decree. The responsibilities of the regions and local authorities need to be clearly stated. The Legislative Decree should be quickly implemented; this is necessary to avoid long periods of uncertainties about the respective responsibilities of public authorities and also to avoid delaying administrative decisions. In addition, regions and local authorities should have the proper resources, especially expertise on energy issues, to carry out their tasks. ENEA has been making contributions to this end, and its support should be strengthened. In addition, co-ordination between regions as well as between regions and the central Government needs to be well organised.

The Italian Government is committed to making a large number of reforms to its energy sector. It should set a timetable for the implementation of these reforms to ensure that commercial decisions can be made in a clear regulatory framework and to ensure consistency in energy policy.

RECOMMENDATIONS

The Italian Government should:

- ☐ Continue to increase competition in the oil, natural gas and electricity sectors.
- ☐ Continue to develop a clear arm's length relationship between the State on the one hand and ENI and ENEL on the other.

- ☐ Support efficient co-operation between the Regulatory Authority for Electricity and Gas and the Antitrust Authority.
- ☐ Clearly define the respective responsibilities of the central Government and the regions.
- ☐ Ensure that energy policies are well co-ordinated across regions and with the State and that regions have adequate staff and financial resources to carry out their tasks.
- ☐ Set a clear timetable for the implementation of reforms to ensure consistency in energy policy.

4

ENERGY EFFICIENCY, ENVIRONMENT AND TAXATION POLICY

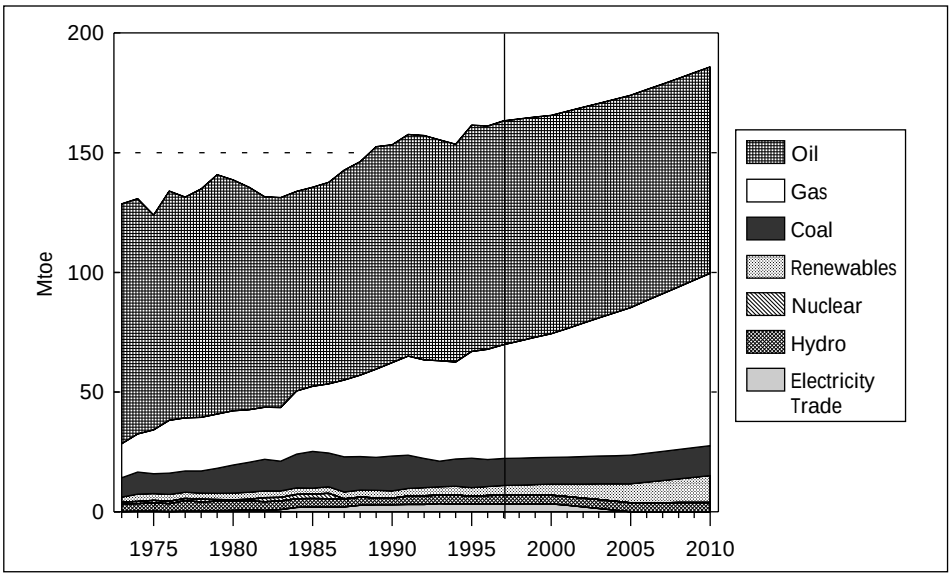
MARKET TRENDS

Supply and Demand

In 1997, total primary energy supply (TPES) was 163.3 Mtoe (Figure 2), a 6.5% increase over its 1990 level. In spite of a decrease in oil supply over the past two decades, oil still remains the most important fuel. Its share in energy supply was 57.3% in 1997, well above the IEA average, due primarily to the use of heavy fuel oil for electricity generation. Natural gas accounted for the second highest share of consumption, with 29.1% in 1997. Natural gas supply has increased at an annual average rate of more than 4% over the past two decades, replacing oil and coal in final consumption. Italy's dependence on fossil fuels is the fourth highest among IEA countries (Figure 3).

In 1997, total final consumption was 125.5 Mtoe (Figure 4)[5], a 6.7% increase over its 1990 level. Natural gas consumption increased at the fastest pace to 35.4 Mtoe in

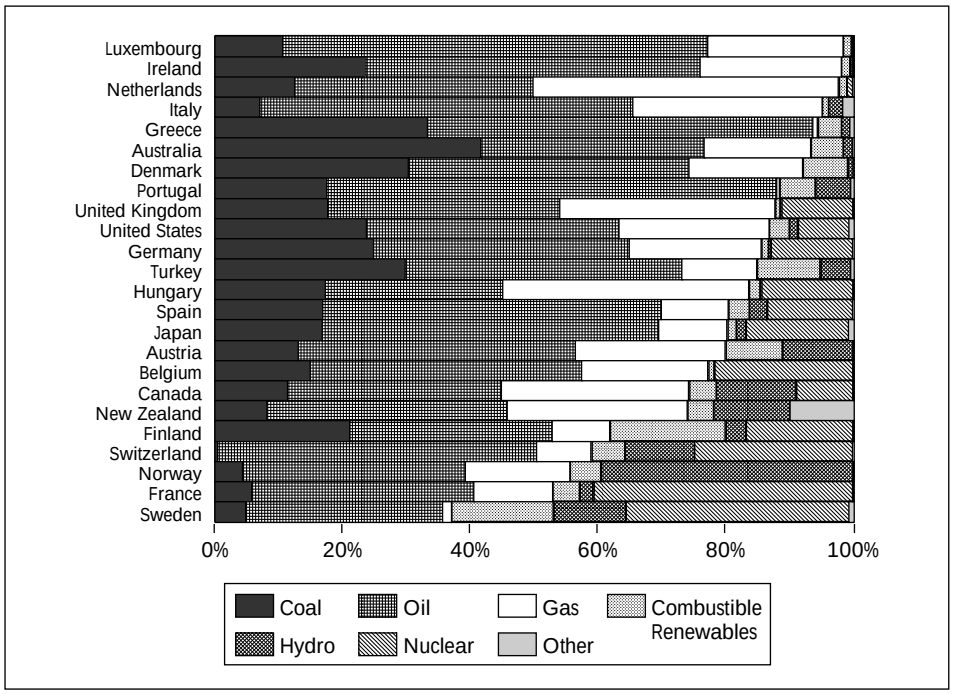
Figure 2
Energy Supply by Fuel, 1973-2010



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

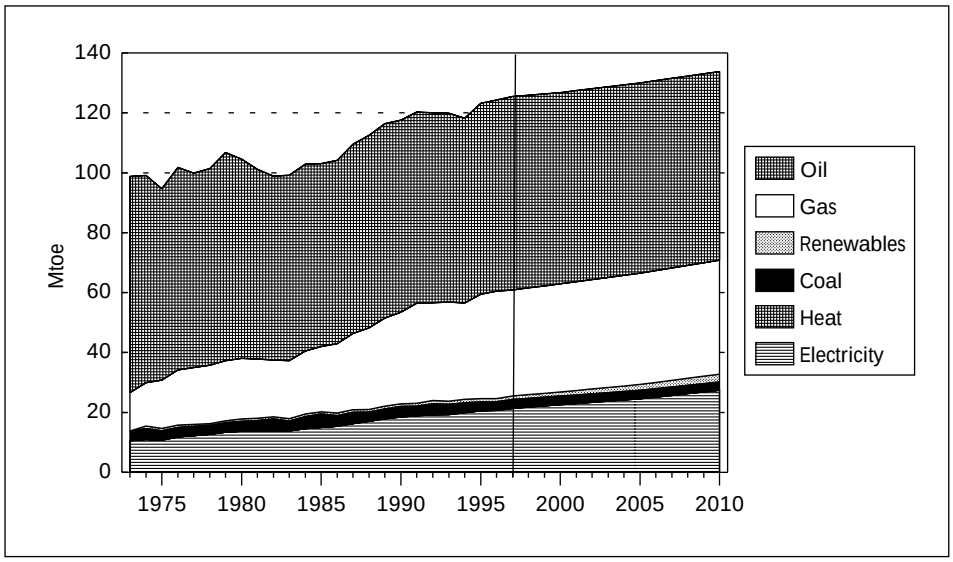
5. IEA data are based on Italian national statistics but may differ because of different conversion factors and methodology.

Figure 3
TPES by Fuel in IEA Countries, 1997



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

Figure 4
Total Final Consumption by Fuel, 1973-2010

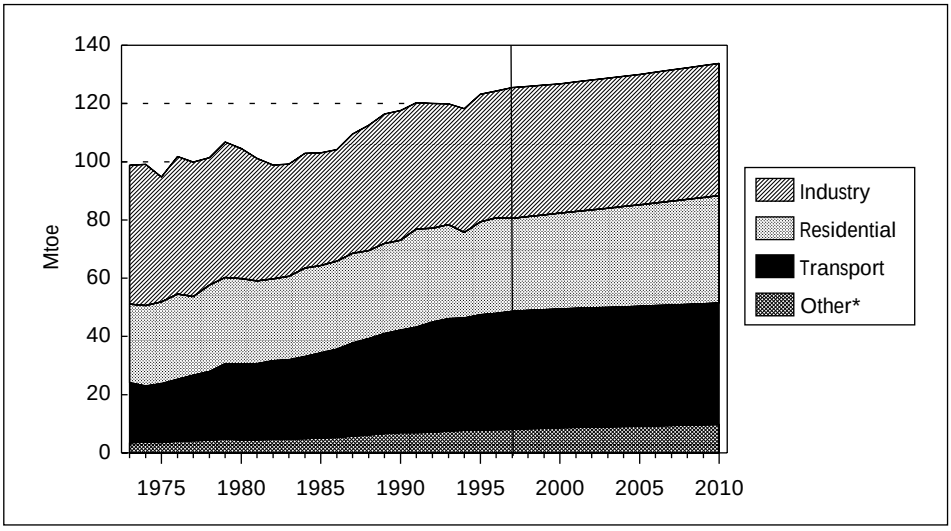


Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 1998, and country submission.

1997, followed by growth in electricity demand. Oil, however, remained the most important fuel with 64.6 Mtoe, i.e. a share of 51.5%.

Industrial energy consumption, after a slight dip at the beginning of the 1990s, has increased since 1993, reaching 44.9 Mtoe in 1997 (Figures 5 and 6). In 1997, the industry sector accounted for the largest share of final energy consumption (35.8%). Energy consumption in the transport sector was 40.6 Mtoe in 1997 and has increased at the fastest pace, due to growth in road and air transport. In 1997, energy consumption in the residential/commercial sector[6] was 40 Mtoe, a 5.8% increase from its 1990 level. Natural gas consumption has increased rapidly in this sector and, in 1997, accounted for the largest share of total consumption at 47.8%. The share of electricity increased to 25.1%, while the share of oil decreased to 23.8%.

Figure 5
Total Final Consumption by Sector, 1973-2010

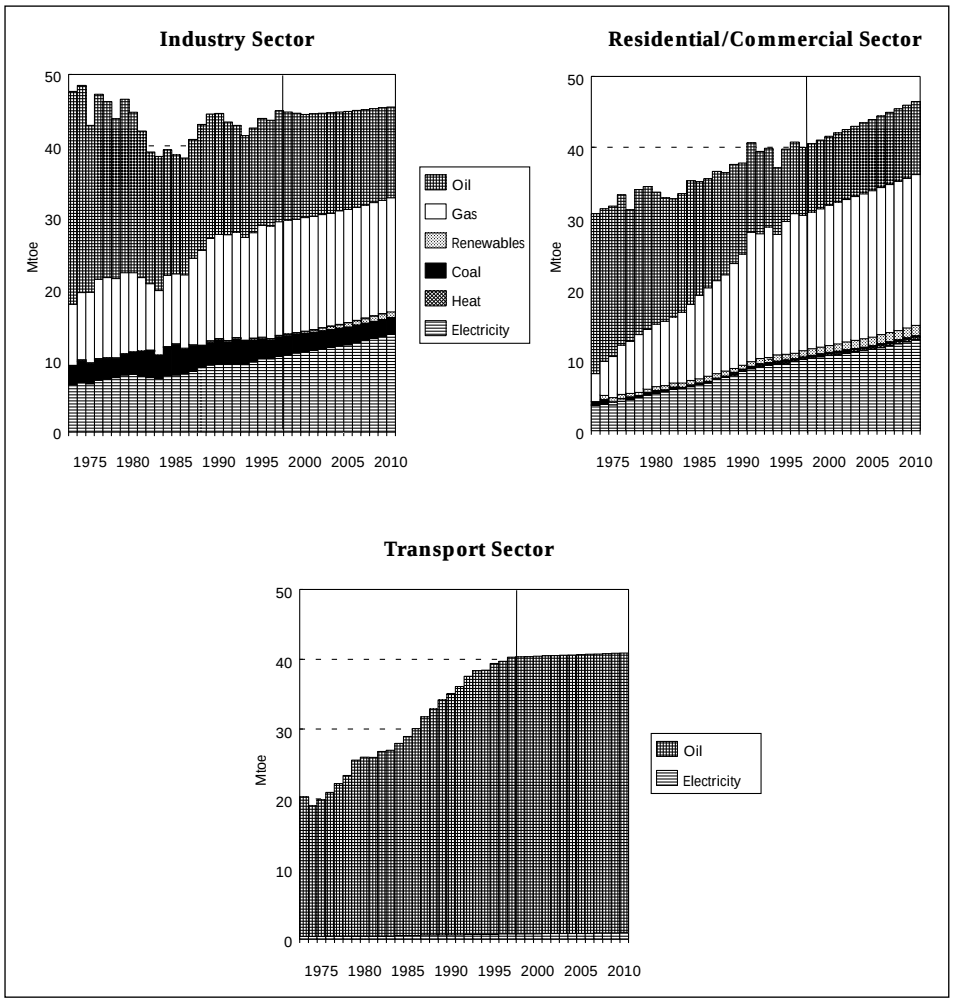


* Includes commercial, public service and agricultural sectors.
Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 1998, and country submission.

According to a 1996 ENEA report[7], there were vast disparities in 1995 in energy consumption among the regions: total energy consumption, per capita consumption and per area consumption were higher in the north of the country in comparison with the centre and south, due to higher GDP and population levels.

6. In the text, the residential/commercial sector includes residential, commercial, public services and agricultural sectors. In the figures, the residential sector is separated from the other sectors (commercial, public services and agricultural).
7. *Dati e Indicatori Energetici*, ENEA, 1996.

Figure 6
Total Final Consumption by Sector and by Fuel, 1973-2010

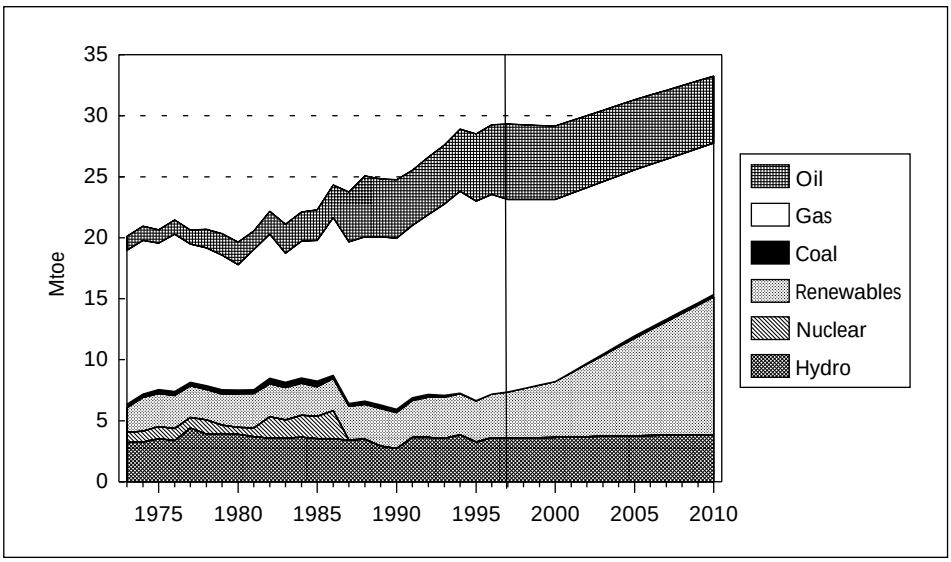


Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 1998, and country submission.

Production and Trade

Energy production in Italy increased over the past two decades (Figure 7) but remained low compared with energy consumption. In 1997, production was 29.3 Mtoe, i.e. 18% of TPES. Natural gas production was 15.8 Mtoe (54% of energy production and 33.3% of natural gas supply), and oil production was 6.2 Mtoe. Energy from hydro sources was 3.6 Mtoe (2.2% of TPES), and from non-hydro renewable sources was 3.8 Mtoe, mostly geothermal (2.5 Mtoe). Coal production is now negligible, but there are plans to reopen the Sulcis coal mine (see box). Nuclear electricity generation ceased with the 1987 referendum which set a five-year moratorium on electricity production from nuclear.

Figure 7
Energy Production by Fuel, 1973-2010



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

Coal Production in Italy

A small and declining amount of brown coal (less than 0.1 Mtoe in 1997) is produced by ENEL.

ENI, the national oil and gas company, operated a coal mine in Sulcis in Sardinia which was closed in 1971. In October 1996, an agreement was signed in Sardinia between the Co-ordinating Committee for the Development of Sulcis Inglesiente and a private consortium including Italian, German and American coal companies to reopen the Sardinian coal mine. Coal is expected to supply the Portovesme power plant at a price of L 82 950 per tonne (for a calorific value of 5 000 kcal/kg), a price above the international level. A gasification plant is expected to be built to feed an electricity power plant. ENEL will purchase the electricity generated (3.5 TWh in 2003) at a price which was set by special decree at L 160 per kWh in 1994. This price is expected to change. Total investment is expected to amount to L 2 000 billion, part of which will be funded by the European Union.

In 1997, net energy imports were 133 Mtoe. Dependence on energy imports (net imports/TPES) was 81%, a high level in comparison with the average for IEA Europe. Net oil imports were 86.6 Mtoe, followed by natural gas imports of 32 Mtoe, coal imports of 21.5 Mtoe and electricity imports of 38.8 TWh. Over the past decade, dependence has ranged between 80 and 85%.

Forecasts

Forecasts by the Ministry of Industry at end 1998 indicate the following trends:

- Total energy supply will continue to increase to 165.6 Mtoe in 2000 and 185.8 Mtoe in 2010. Oil supply will decrease, while natural gas supply and energy from renewable sources will continue to increase rapidly.
- Final energy consumption will increase faster in the residential/commercial sector than in the industry and transport sectors.
- Energy production from non-hydro renewable sources will increase from 3.8 Mtoe in 1997 to 11.4 Mtoe in 2010.
- Growth in electricity generation will outpace growth in electricity consumption.
- Energy intensity will decline more rapidly than it did over the past decade, particularly in the transport sector.

TRENDS IN ENERGY INTENSITY

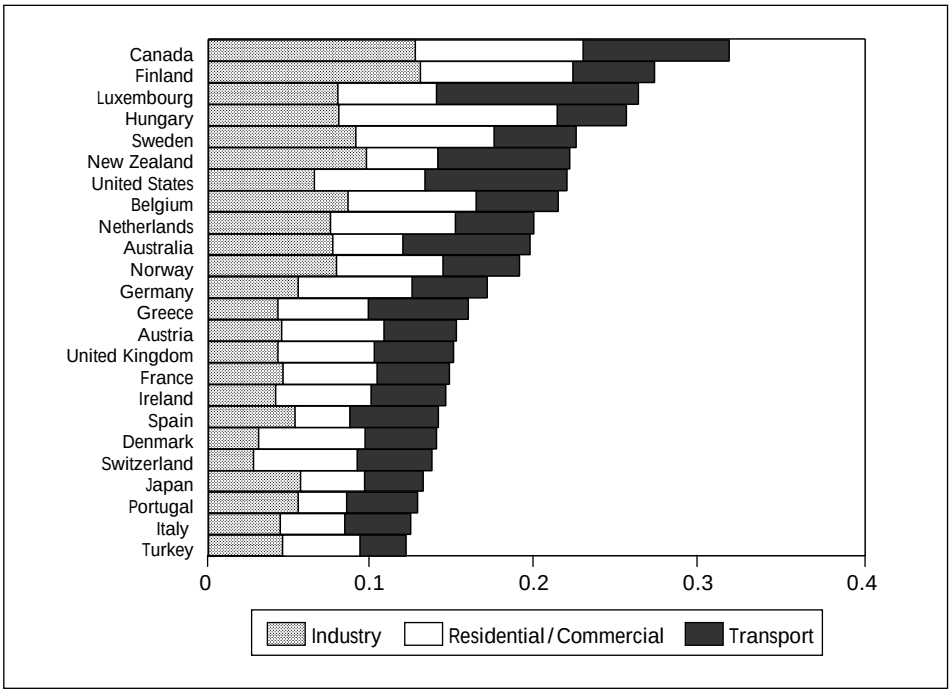
Italy has the second lowest energy intensity of IEA countries when calculated with GDP at purchasing power parity (Figure 8). As compared with previous periods of decline, i.e. during the periods of the two oil shocks, the rate of decline in energy intensity has slowed since 1982 (Figure 9).

Energy intensity in the industrial and residential/commercial sectors fell substantially in the period to 1982 but has since levelled off (Figure 10). A 1998 ENEA study[8] showed that the low rate of industrial energy intensity was mainly due to the industrial structure in Italy. Italy has many small industries with low energy intensity, and many energy-intensive goods are imported. The decline in energy intensity in industry over the past two decades is due to increased energy efficiency in some industrial branches, especially in the steel and glass industries, and to structural changes. Energy-intensive industrial production has decreased, while production of industries which have low energy intensity, e.g. equipment, has increased. Changes in product composition within the same industry have also contributed to lower energy consumption levels. For example, the chemical industry has moved away from producing base chemicals towards producing less energy-intensive light chemicals.

Energy intensity in the residential/commercial sector is low in comparison with the IEA European average. Intensity in this sector has fallen despite the fact that energy consumption has risen in recent years (Figure 6). The 1998 ENEA study found that the increase in the energy efficiency of buildings was partly offset by an increase in the size of dwellings. Energy use for space heating has not changed significantly

8. *Energy Efficiency in Italy (1970-1995)*, ENEA 1998.

Figure 8
Energy Intensity in IEA Countries by Sector, 1997
(Toe per thousand US$ at 1990 prices and purchasing power parities)



Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 1998, and *National Accounts of OECD Countries*, OECD Paris, 1998.

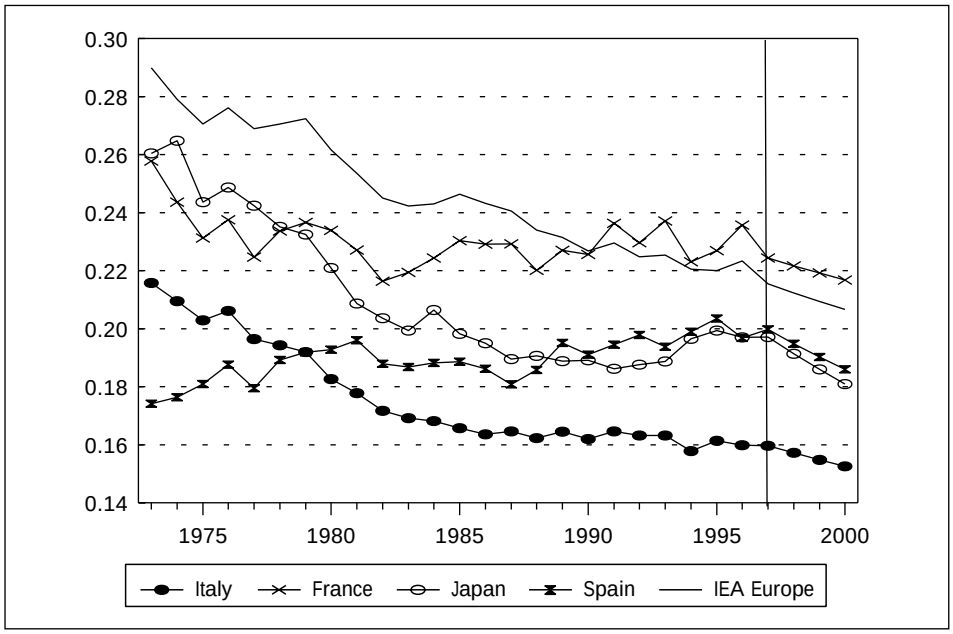
since the end of the 1970s, but energy use for hot water, cooking and, in particular, for electricity appliances and lighting has increased.

Energy intensity in the transport sector rose until 1993, then stabilised. Energy intensity in this sector in Italy has increased at a faster pace than the average intensity for IEA Europe. Italy's car ownership rate (i.e. cars per total population) is the second highest in the OECD area, after the United States, and in the past two decades road transport increased more rapidly than rail transport. Forecasts from the association of oil industries (Unione Petrolifera) suggest that this trend could reverse after 2000 (Table 1). According to the Ministry of Industry forecasts, the rate of increase in transport sector energy consumption will slow down substantially.

Electricity intensity is low in Italy compared with other IEA countries (Figure 11), but it has been increasing since the mid-1980s. Electricity consumption per GDP is much lower in the south than in the north.

Figures 12 to 14 illustrate the evolution in energy consumption of energy-related service sectors (i.e. electricity, transport excluding electricity, and stationary fossil

Figure 9
Energy Intensity in Italy and in Other Selected IEA Countries, 1973-2000
(Toe per thousand US$ at 1990 prices and purchasing power parities)



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

fuel uses) and GDP calculated using purchasing power parity. Figures 12 and 13 indicate an almost linear correlation between the growth in electricity consumption and in transport and GDP. Electricity consumption in comparison with GDP increased at a slower rate than in the IEA area but consumption in the transport sector increased at a much higher rate. Stationary fossil fuel use increased with GDP after 1982, at a slightly slower rate than the IEA average (Figure 13).

Table 1
Trends in Public and Private Transport, 1980-2010

	1980	*1990*	*1995*	*2000*	*2010*
Transport of Passengers (billion passenger-kms)	461	729	828	953	1 244
Cars and Motorcycles	351	583	675	762	920
Train	110	146	153	191	324
Fuel Consumption by Cars and Motorcycles (Mt)	12.2	17.5	21.3	22.1	19.6
Freight Transport (billion tonne-kms)	182	247	268	300	370
Road	120	178	195	220	252
Other Means	62	69	73	80	118

Source: Unione Petrolifera.

Figure 10

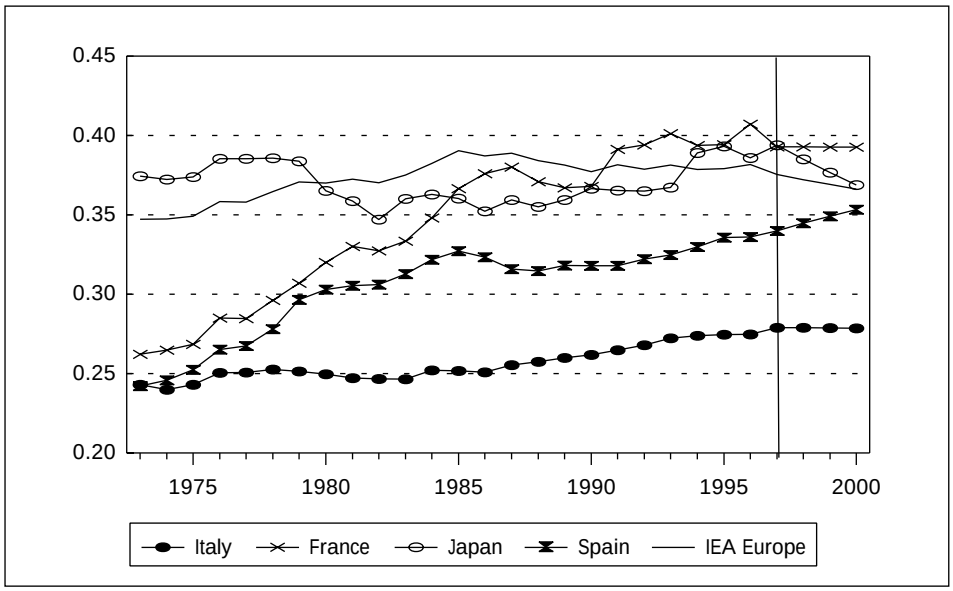
Energy Intensity by Sector in Italy and in Other Selected IEA Countries, 1973-2000

(Toe per thousand US$ at 1990 prices and purchasing power parities)



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

Figure 11
Electricity Intensity* in Italy and in Other Selected IEA Countries, 1973-2000



* Calculated as production plus net imports divided by GDP (PPP) and measured in kWh per dollar of GDP at 1990 prices and purchasing power parities.
Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 1998; *National Accounts of OECD Countries*, OECD Paris, 1998; and country submissions.

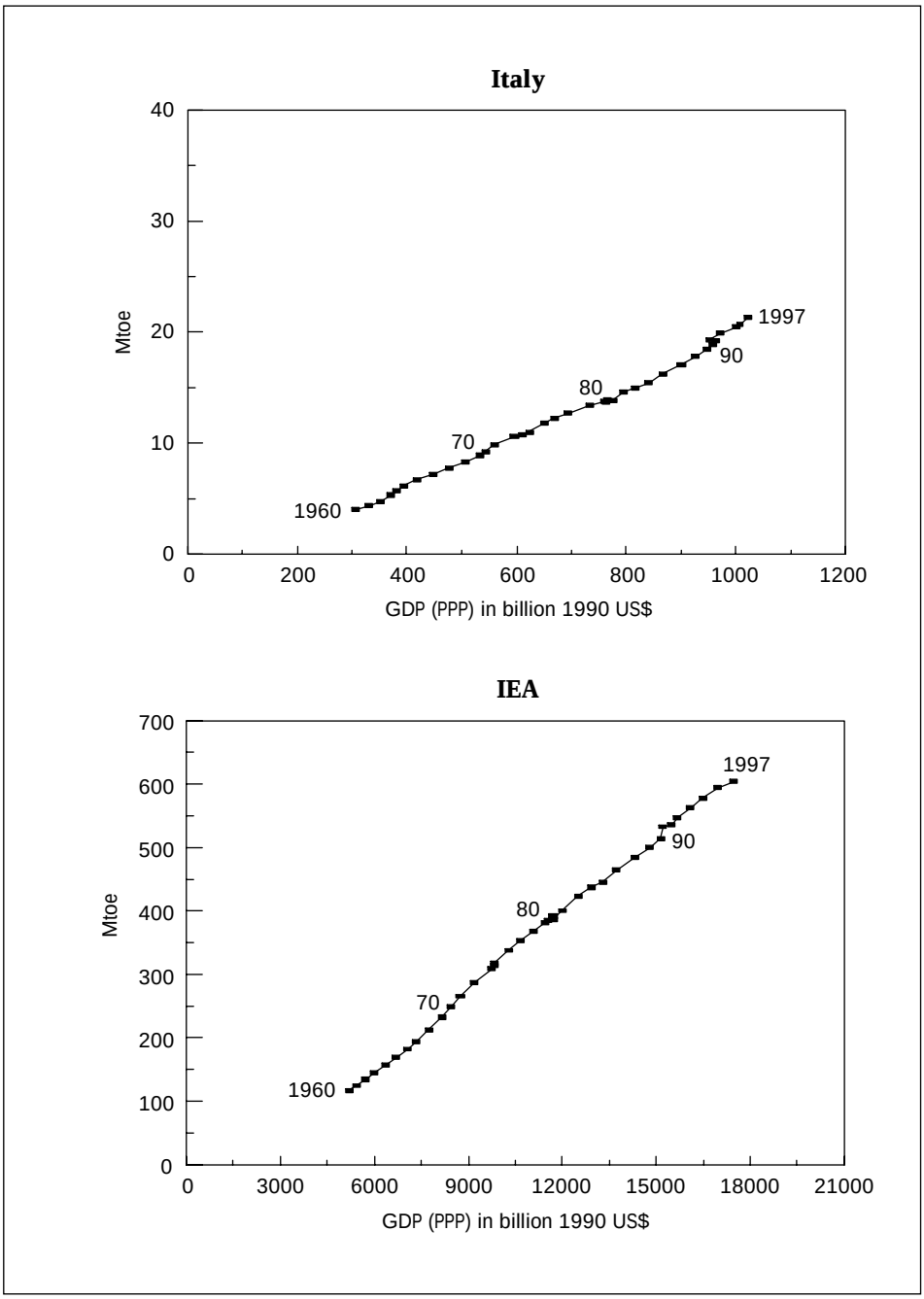
CO_2 EMISSIONS

According to ENEA calculations, energy-related CO_2 emissions were 406.9 million tonnes (Mt) in 1996, a 1.3% increase over the 1990 level (401.5 Mt). These emissions amounted to some 92% of total gross CO_2 emissions. According to IEA calculations, energy-related CO_2 emissions were 424.3 Mt in 1997, a 4% increase over the 1990 level (408.2 Mt). Most of these energy-related CO_2 emissions came from oil combustion. Emissions from gas use have been increasing rapidly while those from coal use have declined. Energy use for transport is the fastest growing source of CO_2 emissions, followed by energy use for electricity (Figure 15). According to IEA calculations based on energy supply as forecast by the Ministry of Industry, energy-related CO_2 emissions are expected to increase to 464 Mt in 2010. The energy consumption figures used to calculate the expected emissions level do not include the effects of a CO_2 tax.

The decrease in energy-related CO_2 emissions per TPES has slowed down slightly since the beginning of the 1980s (Figure 16). Italy's emissions level per TPES was below the IEA European average in the 1970s but has been higher since 1981.

Energy-related CO_2 emissions per GDP (PPP) in Italy are low compared with the average emission level for IEA Europe. Emissions in Italy have not fallen

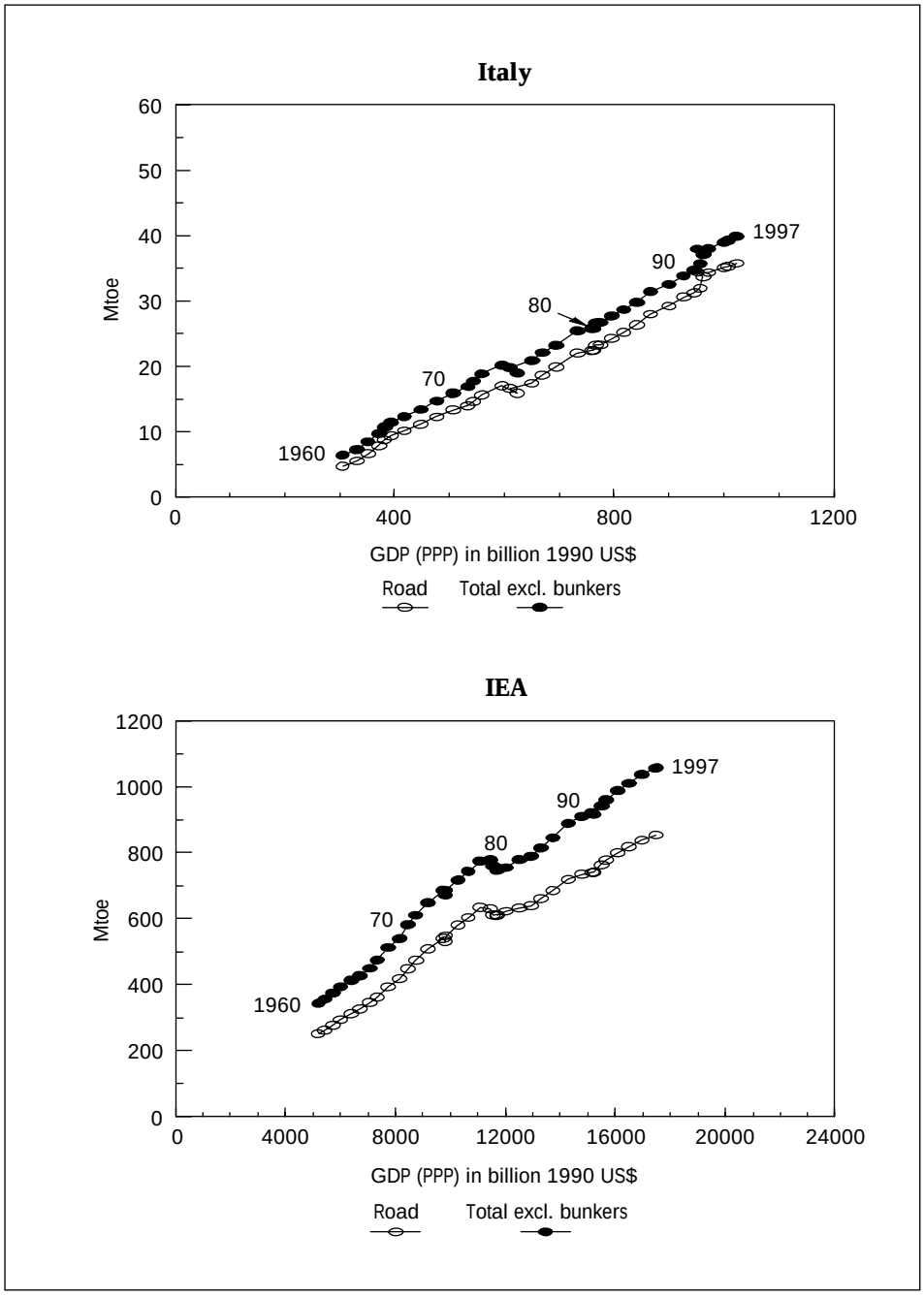
Figure 12
Electricity Consumption vs GDP (PPP) in Italy and in IEA Countries, 1960-1997



Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 1998, and *National Accounts of OECD Countries*, OECD Paris, 1998.

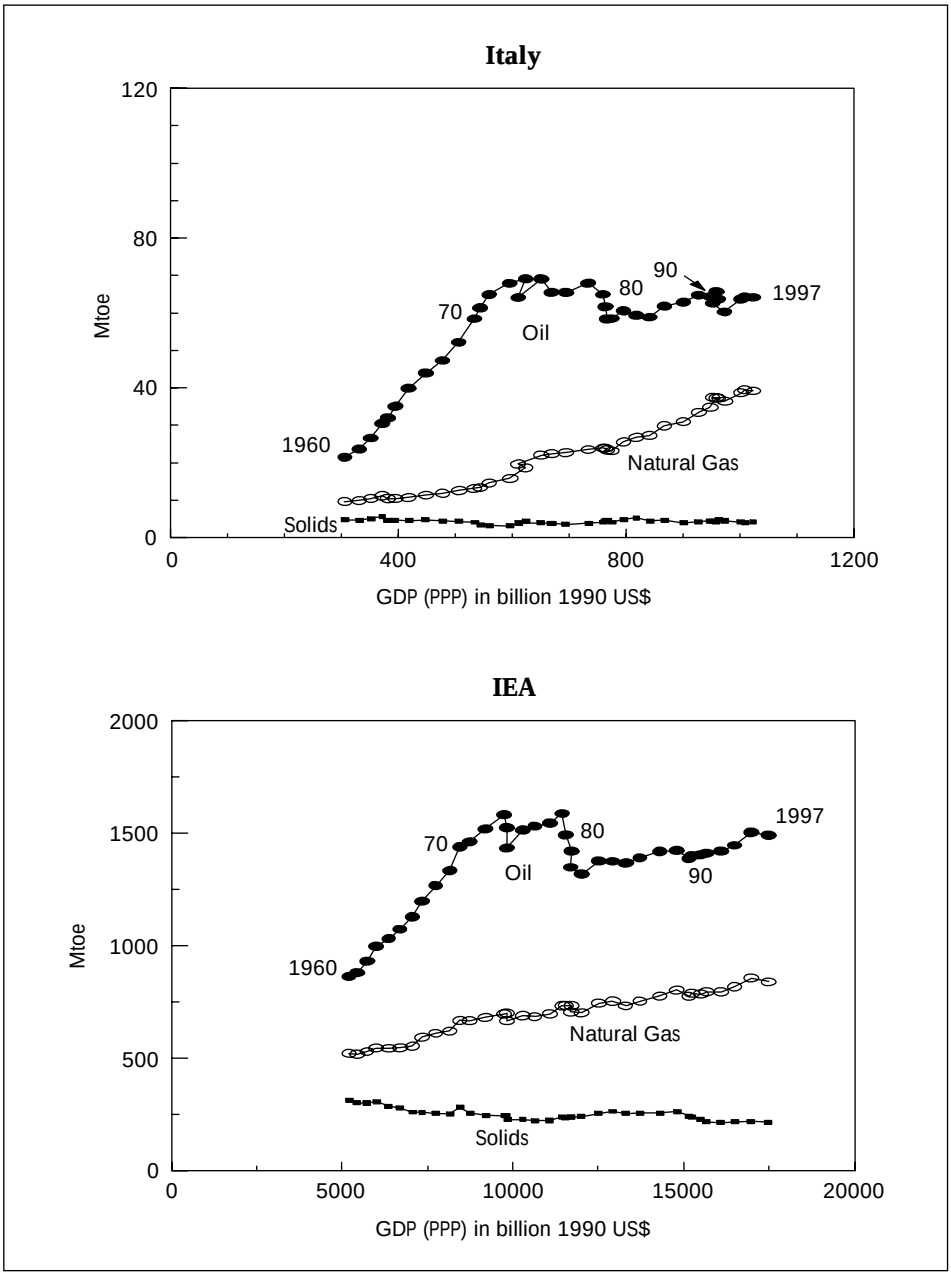
Figure 13

Energy Consumption in the Transport Sector, Excluding Electricity, vs GDP (PPP) in Italy and in IEA Countries, 1960-1997



Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 1998, and *National Accounts of OECD Countries*, OECD Paris, 1998.

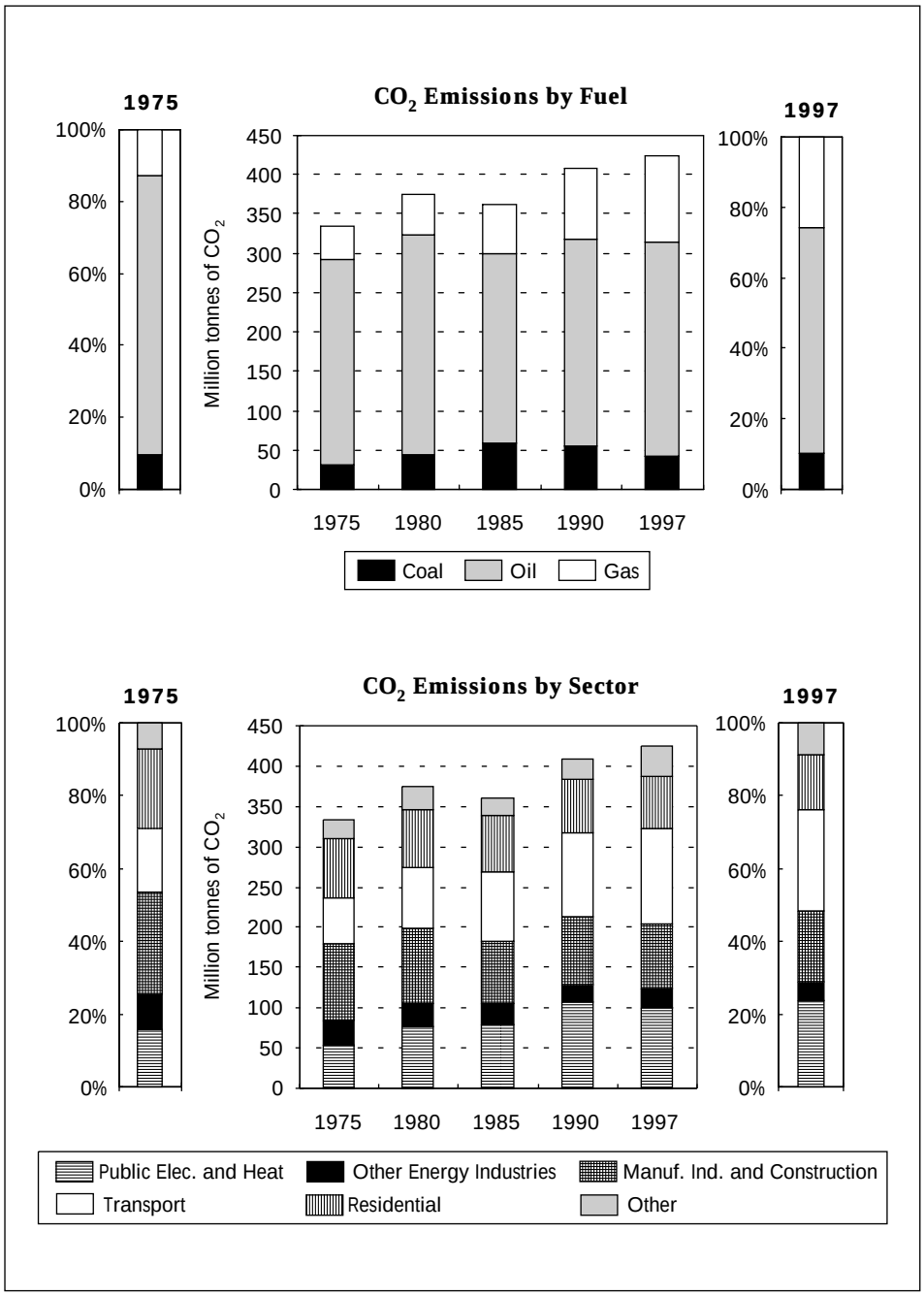
Figure 14
Stationary Fossil Fuel vs GDP (PPP) in Italy and in IEA Countries, 1960-1997



Note: data for the production of electricity and heat by autoproducers in the USA are estimated prior to 1989.
Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 1998, and *National Accounts of OECD Countries*, OECD Paris, 1998.

Figure 15

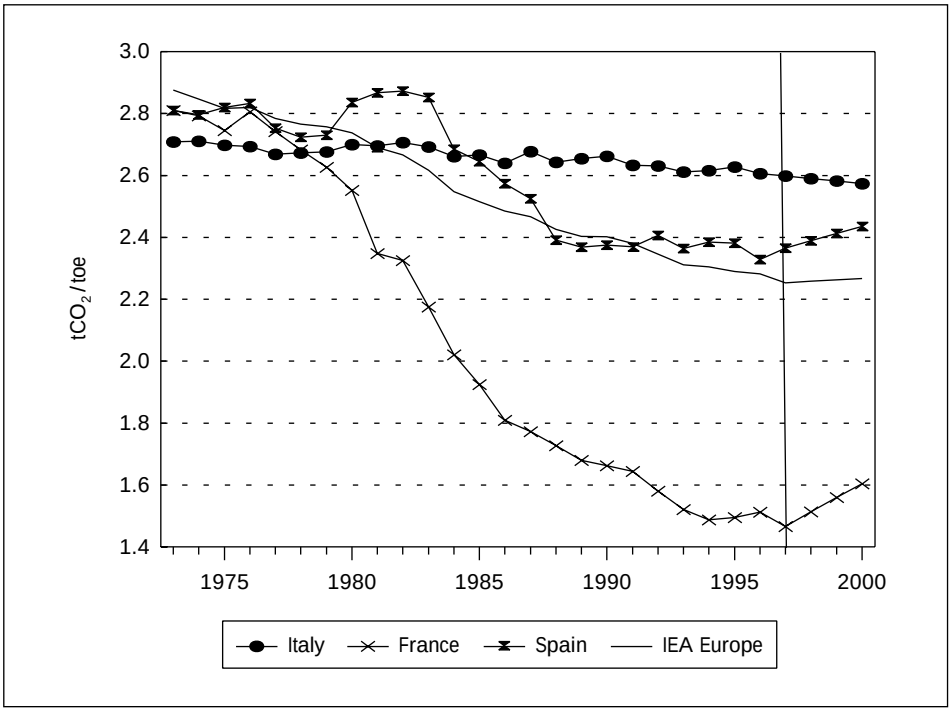
Energy-Related CO_2 Emissions by Fuel and by Sector, 1975-1997



For presentational purposes, the statistical difference and the differences due to losses and/or transformation have been allocated between the sectors.

Source: *CO_2 Emissions from Fuel Combustion*, IEA/OECD Paris, 1998.

Figure 16
Energy-Related CO_2 Emissions per TPES in Italy and in Other Selected IEA Countries, 1973-2000



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

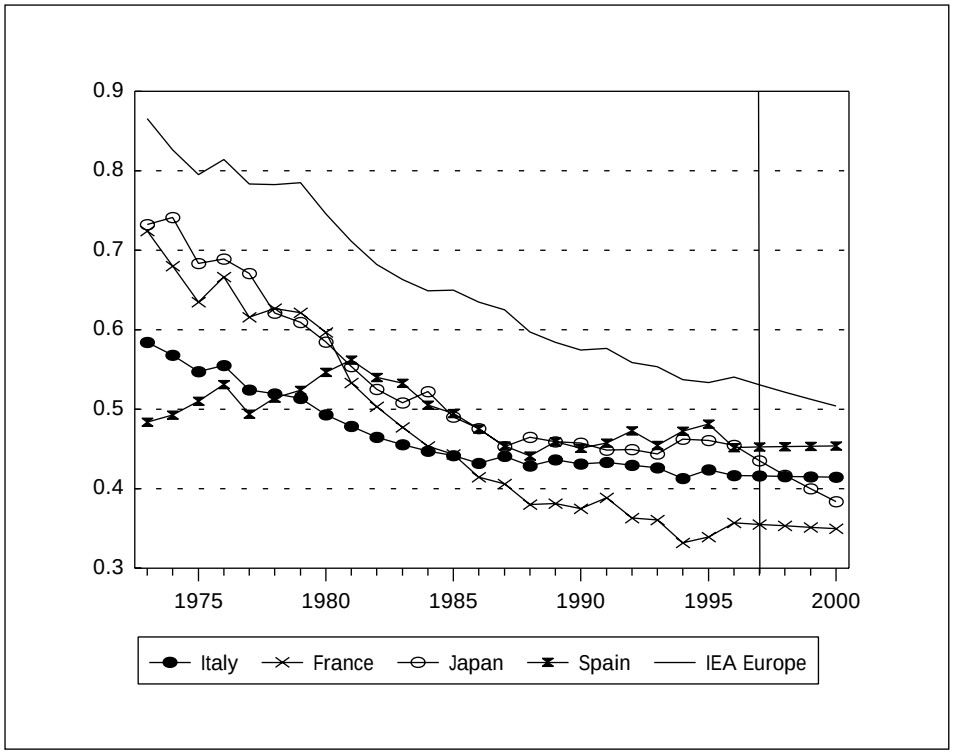
significantly since the mid-1980s, while the average emissions level for IEA Europe has declined (Figure 17).

CO_2 EMISSIONS TARGETS

In February 1994, the Inter-ministerial Committee for Economic Planning (CIPE) approved a programme which set a national target of containing net CO_2 emissions, including removal of CO_2 by sinks, at 1990 levels by 2000. The programme noted that a slight increase in total CO_2 emissions was possible. To meet the target, the programme recommended the following measures:

- Improvements in the efficiency of electricity plants.
- Large-scale diffusion of more efficient electrical appliances.
- Reduction of losses in electricity transmission and distribution and in the gas grids.
- Increased use of gas in industry and the residential/commercial sectors.

Figure 17
Energy-Related CO_2 Emissions per GDP (PPP) in Italy and in Other Selected IEA Countries, 1973-2000
(kilogrammes CO_2 /US$ using 1990 prices and purchasing power parities)



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

- Reducing traffic congestion and increasing urban mobility.
- Promotion of renewable sources.
- Increased energy efficiency in residential buildings.
- Monitoring efficiency standards for space heating equipment.

A report prepared by the CIPE for the Second Communication to the Framework Convention on Climate Change (FCCC) was released in December 1997. The report envisaged several measures, i.e. regulatory measures, economic instruments, promotion of renewable sources and Voluntary Agreements with industry.

Under the agreement reached in Kyoto to reduce CO_2 emissions and five other gases and the subsequent burden-sharing agreement among EU Members, Italy has

committed to reducing its emissions by 6.5% between 1990 and 2008-2012. An inter-ministerial group was created, comprised of the Ministries of Industry, Transport, Research, Public Works, Finance and Agriculture and chaired by the Ministry for the Environment. According to the report released in November 1998, in a business-as-usual scenario, greenhouse gas (GHG) emissions would increase 12% to 622 Mt in 2010 (Table 2). The report lists more detailed measures than those in the 1997 plan in order to decrease GHG emissions by about 100 Mt from business-as-usual growth and to meet the Kyoto target. The emissions reduction objectives by sector are shown in Table 3.

Table 2
GHG Emissions, 1990-2010
(Mt CO_2 equivalent)

	1990	*2010 (Business-as-Usual)*	*2010 (Kyoto Measures)*
CO_2	442.2	512	445
CH_4	52	48	36
N_2O	53.9	51	40
SF_6+HFC+PFC	7	11	10
Total	**555**	**622**	**531**

Source: ENEA.

Table 3
Emissions Reduction Objectives by Sector
(CIPE, November 1998)
(Mt CO_2 equivalent)

	1990 Net Emissions	*Reduction in 2002*	*Reduction in 2006*	*Reduction in 2008-2012*
Electricity Generation	163	4/5	10/12	20/23
Transportation	100	4/6	9/11	18/21
Renewables*		4/5	7/9	18/20
Energy: Industry/ Resid/Commercial	207	6/7	12/14	24/29
Non-Energy	85	2	7/9	15/19
Forest Sinks	–36			1
Total	**519**	**20/25**	**45/55**	**95/113**

* The increase in energy generation from renewable sources is lower than that planned in the Green Paper on Renewable Energy. Calculations have been made by different administrations (see Chapter 7).
Source: ENEA.

Targets have been set with a specific deadline for the different ministries. Each ministry will be given a special fund to implement the targets. The following main measures are planned:

- Substitution of oil and coal by natural gas, in particular in the electricity sector.
- Voluntary Agreements with industry.
- A CO_2 tax, implemented as of 1999.
- Flexibility mechanisms as specified in the Kyoto Protocol (Joint Implementation and Clean Development Mechanism)[9].

According to ENEA's calculations, measures to reduce GHG emissions by 6.5% between 1990 and 2010 are expected to cost L 25 000 billion over 14 years. The marginal cost of emissions reduction increases rapidly as the reduction proceeds. According to the agency, the cost of reduction per unit of CO_2 in Italy is much higher than in most IEA countries, mainly because of Italy's relatively low level of energy intensity.

GENERAL ENERGY EFFICIENCY POLICIES

The basis of energy efficiency policy in Italy was the Law No. 10 of 1991 (Law 10/91) which earmarked L 2 500 billion between 1991 and 1993 to be spent by the Ministry of Industry (directly or through an agreement with ENEA) or to be given to regions to subsidise investments in energy efficiency, co-generation and district heating (and also subsidies to renewable sources). The Law stated that grants given to end-use sectors could cover 25 to 75% of the project cost. Around L 764 billion was spent in 1991 and 1992, and funding was substantially reduced after 1992 (Table 4).

Table 4
Public Funding on Energy Efficiency and Renewables, 1991-1997
(L billion)

	1991	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*
ENEA	42.7	33.7	1	2.5	35	54.7	81.5
Regions*	116.8	61.7	0	0	41	0.4	0
Other	267.5	241.8	9	6	4	82.4	66.7
Ministry of Industry**	220	180	5	0	0	0	0
Demonstration Projects	33	25	2	4	2	70	48.8
Hydro	14.5	36.8	2	2	2	12.4	17.9
Total	**427**	**337.2**	**10**	**8.5**	**80**	**137.5**	**148.2**

* Funds transferred to the regions.

** There was no funding after 1993.

Source: Ministry of Industry.

9. The Italian Government would like the reduction of natural gas leaks in pipelines in Russia to be included in Activities Implemented Jointly and Joint Implementation. The Government expects a 16 Mt reduction from the use of flexible mechanisms which is included in the reduction indicated in Table 3.

The regions have been increasingly involved in energy efficiency policy and have been active in promoting renewable sources through energy planning and grants (see Chapters 3 and 7). Measures involve increased energy efficiency in public buildings, the promotion of pilot projects, information dissemination and R&D grants. The Legislative Decree of 1998 on decentralisation has transferred further competences in energy savings to the regions, as follows:

- Regions have to produce a regional energy savings plan.
- Regions control the efficiency of thermal power plants.
- Public funding to energy efficiency projects is granted only by the regions[10].
- Monitoring and assessment of measures and grant programmes which were under ENEA's responsibility are transferred to the local authorities and the regions.

A Programme Agreement between the regions and ENEA was designed to provide a framework for co-operation. ENEA provides expertise upon request, and regions pay for the service. A Regional Co-ordination Group for Energy was created in which ENEA undertakes the function of secretariat to deal with issues under the regions' jurisdiction. However, the 1998 Legislative Decree still needs to be fully implemented, in particular with regard to the assessment of energy efficiency measures.

SECTORAL MEASURES

Buildings

Codes for new buildings were reinforced in 1975, 1982 and 1989. In 1993, new standards were set for new buildings and for renovation works. These standards are enforced by local authorities, with fines for non-compliance. Post-1993 buildings use 11% less energy than pre-1978 buildings and 5% less than buildings constructed between 1978 and 1989. ENEA is preparing additional non-mandatory building codes. CO_2 emissions are expected to fall by 10% by 2001 in the new-built residential sector.

The Ministerial Decrees of October 1991 and August 1994 revised the mandatory minimum energy efficiency standards for newly constructed building shells, residential and non-residential, and introduced methods to determine the seasonal energy consumption of buildings.

Two new decrees, prepared by the Ministry of Public Works, will set criteria for design and maintenance of buildings and will reduce the limit values of specific power lost through transmission.

10. However, the Government may decide to fund projects subject to budget availability.

Since 1991, energy audits of buildings have been implemented by ENEA through Voluntary Agreements concluded between ENEA and the Ministry of Public Works. In four pilot towns, energy audits were performed in 10 000 apartments.

The Ministry of Industry and ENEA established a budget of € 150 000 per year to disseminate energy efficiency information to the residential/commercial sector.

Appliances

The Presidential Decree of 1993, implementing Law 10/91, set energy efficiency standards for hot-water boilers. The 1991 Law requires hot water boilers to be inspected for both efficiency and safety every one to two years, depending on the boiler size. This inspection programme started in 1994. Sanctions for non-compliance are foreseen but not in place. ENEA supports the programme by providing training and information to the municipalities that are responsible for the inspection.

Italy has transposed the EU Directive on Energy Performance Standards for refrigerators and freezers and, in November 1998, the EU Directive on Energy Labelling for refrigerators and freezers. The Ministry of Industry envisages an incentive scheme for households which are willing to replace old appliances with more energy-efficient ones.

Industry

ENEA undertakes energy audits and training programmes, in particular for small and medium enterprises. Energy managers are compulsory in all industrial, commercial, public and transport sector companies and organisations consuming more than 10 000 toe per year for industry and 1 000 toe per year for the others. 750 companies have appointed energy managers. Companies that fail to comply with this regulation are ineligible for grants for energy efficiency investments and are liable to be fined. Through an agreement between the Ministry of Industry, ENEA and FIRE (the Italian Federation for the Rational Use of Energy), a budget of € 400 000 per year is available to support this network of energy managers.

Under the Law of 1991, grants can be provided to industry, subject to budget availability[11]:

- 20 to 40% of the investment for initiatives in industrial buildings (increasing to 80% for the use of photovoltaic power).

- Up to 30% of the invested capital for the realisation or modification of production plants using more than 10 MW_{th} or 3 MW_e of energy to achieve energy savings through the use of renewable sources of energy, through improvements in equipment efficiency or through replacement of hydrocarbons by other fuels.

11. The grants were stopped in 1994 at the central level but some subsidies continue at the regional level.

- Up to 50% for experimental projects in industrial plants that increase the use of renewable energy sources and/or non-conventional fuels, that lower specific energy consumption or that improve technologies for coal combustion, gasification, liquefaction and ash disposal.

In the framework of the new measures to meet the Kyoto target, emphasis has been put on Voluntary Agreements with industry. At the beginning of 1999, nine Voluntary Agreements were under discussion between industry and the Ministry of Industry. The Government plans to impose standards on those industrial sectors that fail to meet the targets they have negotiated with the administration.

The glass industry has concluded a Voluntary Agreement with the Government establishing a programme to reduce greenhouse gas emissions by about 10% by 2005. This agreement includes monitoring mechanisms. If the manufacturer fails to comply with the agreement, the Government plans to impose standards at the national level.

Demand Side Management

Under an agreement between the Ministry of Industry and ENEL, the public electricity company, ENEL promotes savings in electrical end-uses through technical assistance, advice and dissemination of information. Recent programmes have focused on efficient heat pumps for water heating and air conditioning; compact fluorescent light bulbs; solar panels in the residential and commercial sectors; capacitors to improve power factors on customer premises; and co-generation in small and medium-sized enterprises.

Transport

In 1993, the CIPE issued a report called “Guidelines to be adopted for Italian initiatives in the community with regard to transport problems”. Its main recommendations were as follows:

- To ensure the coherence of current Community policies on Trans-European railways for high-speed and combined rail-road transport.

- To implement intermodular road-railway schemes, especially for freight, and to develop transport systems with low energy and environment impacts.

- To improve the technology of the regional lines providing access to the Trans-European Networks and additional motorway and road links.

- To give priority to new Alpine rail crossings and to expand current road crossings through the Alps.

Official reports have underlined the need to better adapt the railway network to reflect the regional shift of population and the increased urbanisation. Several measures have been decided:

- The 1998 Legislative Decree on decentralisation gave the responsibility for transport to regions and local authorities. Regions would set their own targets for efficiency improvements in the transport sector and would choose their preferred split between road and rail.

- In March 1998, the Government finalised a plan to reorganise the railway grid, including the privatisation of freight and medium- to long-distance inter-city travel. The other railway activities will remain publicly-owned.

- An investment plan which would amount to L 88 000 billion by 2000 is being implemented; at end 1998, approximately L 39 000 billion was spent. The plan aims to build 1 000 km of new high-speed lines and local railways. It includes L 15 000 billion for the building of lines for trams, subway[12] and local trains as well as restoring old lines.

- Public fleets have been obliged to replace a certain amount of older vehicles with new cleaner vehicles (such as electric cars). The Ministry for the Environment pays the extra cost for their replacement.

Since 1998, the Government has developed a joint voluntary programme with Fiat, the major Italian car manufacturer. Fiat is committed to the following goals: to produce by 2000 a general public model with a consumption of 4.5 litres per 100 km, to produce by 2005 a model with a consumption of 3 litres per 100 km and by 2010 to produce an average vehicle which would consume less than 5.5 litres per 100 km. Furthermore, Fiat should build a platform for used car recycling. In another agreement with the Government, in July 1996, Fiat was committed to producing low impact gas, electric and hybrid fuelled vehicles.

In 1998, energy performance monitoring in vehicle certification was set up and is being progressively implemented. From July 1997 to January 1998, the State contributed L 1.5 million for the replacement of any car more than 10 years old up to 1 300 cc. L 2 million was contributed for older cars over 1 300 cc (with the same amount of money given by the seller). From January 1998 to July 1998, the Government provided L 1.5 million for cars consuming less than 7 litres per kilometre (l/km), L 1.25 million for cars consuming between 7 and 9 l/km, L 4 million for electric cars and L 2 million for cars using natural gas.

ENERGY TAXATION

State and Regional Excise Taxes

Taxation policy is under the responsibility of the Ministry of Finance. Energy taxes in Italy are on average very high in comparison with most other IEA countries, in particular for household energy consumption (Table 5 and Figures 18, 19 and 20). As a consequence, energy prices are high in comparison with other IEA countries.

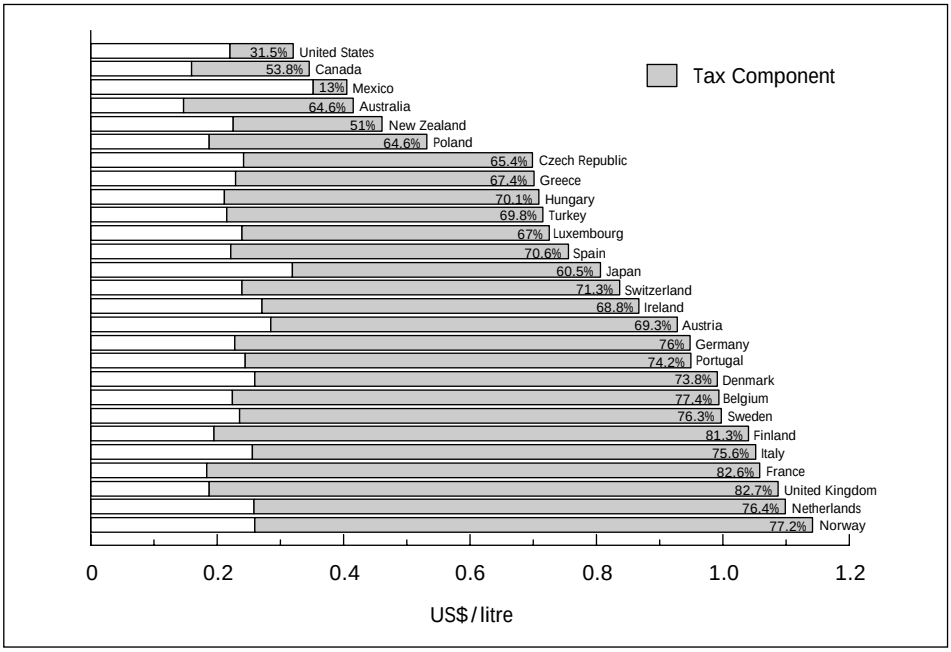
12. Underground networks are still small (a total of 105 km at the end of 1995). These networks exist in Rome, Milan, Genoa and Naples.

Table 5
Taxes in Average Energy Prices, 1997
(US$/toe)

	*Gasoline**	*Auto. Diesel***	*Light Fuel Oil*	*Nat. Gas*	*Electricity*	*Heavy Fuel Oil****	*Nat. Gas*
			Households			*Industry*	
France	993.3	637.8	183.3	80.9	437.8	20.9	0
Germany	856	518.9	96	87.2	257.5	17.7	26.8
Italy	976.7	726.8	674.9	335.9	491.6	27.5	18.6
Spain	618.3	458.7	148.9	91.9	261.6	15.6	0

* Premium (95 RON) unleaded.
** Non-commercial.
*** Low sulphur.
Source: *Energy Prices and Taxes*, IEA/OECD Paris, 1999.

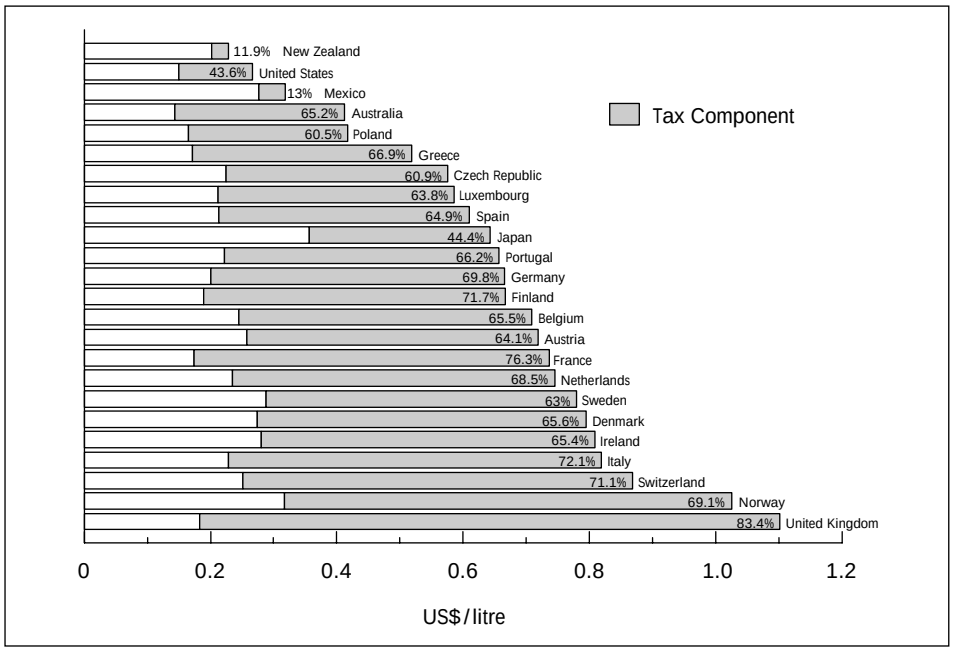
Figure 18
OECD Unleaded Gasoline Prices and Taxes, 4th Quarter 1998



Note: data not available for Korea.
Source: *Energy Prices and Taxes*, IEA/OECD Paris, 1999.

The excise tax on automotive diesel (L 747 per litre in 1998) is lower than the tax on unleaded gasoline (L 1 022 per litre in 1998). There is a rebate on the gasoline excise for agricultural use. Since 1990, the tax rate for automotive diesel has risen at the fastest pace, followed by the tax rate on leaded gasoline and on unleaded gasoline. The same excise tax and VAT of 18% applies to automotive diesel and to light fuel oil for households and for industry (but in the latter case, it is refundable for commercial

Figure 19
OECD Automotive Diesel Prices and Taxes, 4th Quarter 1998



Note: data not available for Canada, Hungary, Korea and Turkey.
Source: *Energy Prices and Taxes*, IEA/OECD Paris, 1999.

purposes). The excise tax on low sulphur fuel oil for industry is half that on high sulphur fuel oil. There is no excise tax on coal, and its use faces a reduced VAT of 9%.

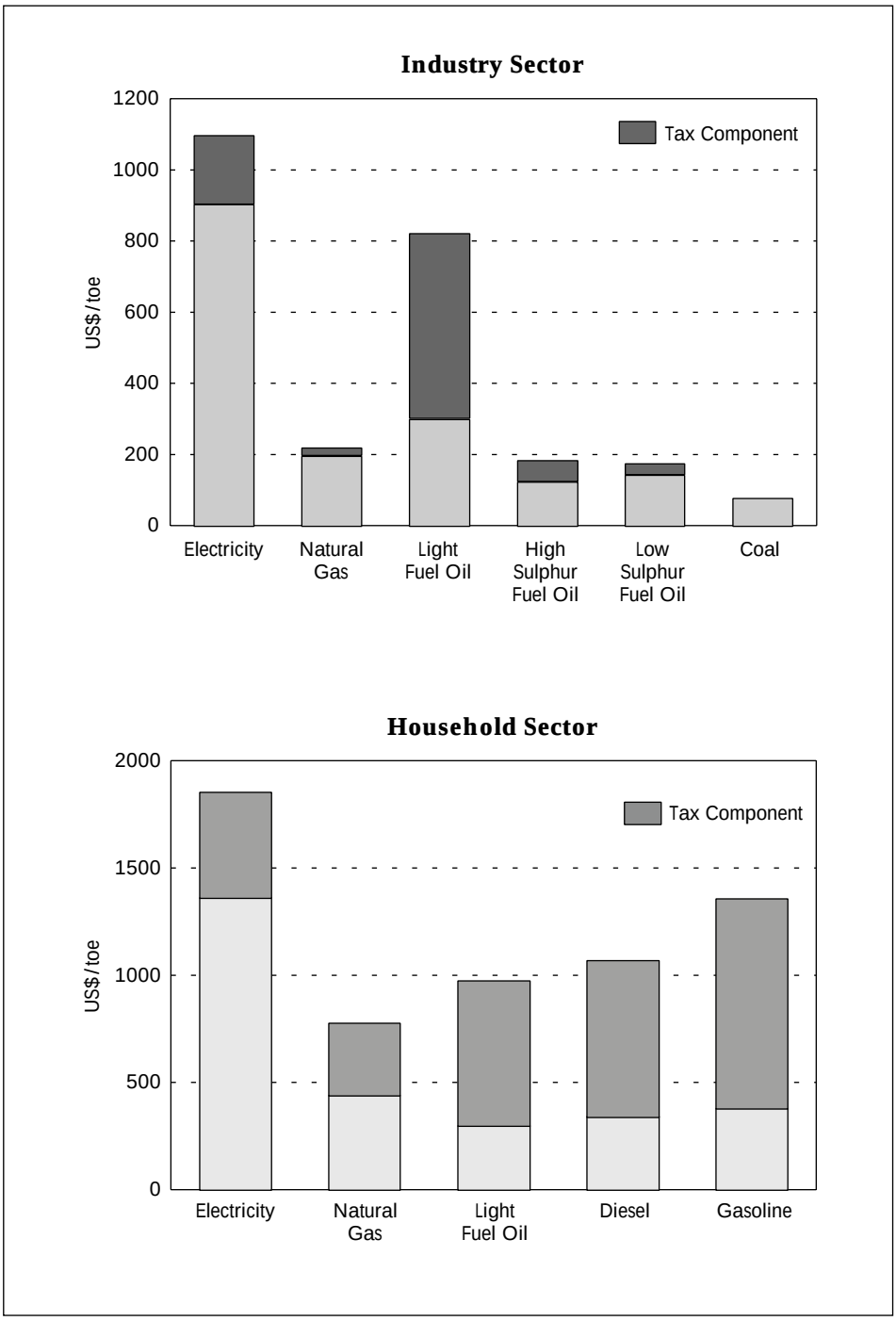
The excise tax for natural gas differs by sector. In the residential sector, the tax on gas is also different for each use; it is lower for cooking and water heating and higher for heating. Since 1994, taxes on gas consumption by households are also differentiated between the south and north. The box below indicates the different excise taxes. As of January 1991, an additional tax has been applied in most Italian regions which varies between L 10 and L 60 per cubic metre. This additional tax cannot exceed 50% of the value of the national excise tax. A general VAT of 20% is also applied, except for industrial energy use, cooking and water heating (for these uses the VAT is 10% and is refundable for commercial purposes in industry).

Taxes on electricity depend on the amount consumed. Local and regional taxes are applied. The tax regime is as follows:

- VAT on electricity is 10%.

- An excise tax of L 9.1 per kWh applies to household consumption, but there is no tax for the first 150 kWh per month for residential consumers up to 3 kW. In addition, there are local and state taxes (except for the first 150 kWh per month for residential consumers up to 3 kW). Local taxes amount to L 28 per kWh and

Figure 20
Fuel Prices and Taxes, 1997



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

Gas Excise Taxes in 1998

Industrial uses: L 20 per cubic metre.

Cooking and water heating in the south: L 74 per cubic metre.

Cooking and water heating in the north and the centre: L 86 per cubic metre

Other uses in the south: L 74 per cubic metre for consumption up to 250 cubic metres per year and L 238 per cubic metre for consumption above 250 cubic metres per year.

Other uses in the north and the centre: L 151 per cubic metre for consumption up to 250 cubic metres per year and L 332 per cubic metre for consumption above 250 cubic metres per year.

Gas used in power generation, in refining processes and as a raw material in chemical plants is exempted from the excise tax.

state taxes to L 8 per kWh. There is another state tax of L 11.5 per kWh on a second home. There is no distinction between the north and south of the country as is the case for taxes on natural gas.

- The excise tax on electricity used in industry is L 4.1 per kWh for the first 200 MWh per month and L 2.45 per kWh for all additional consumption. State taxes are L 7 per kWh for demand up to 30 kW, L 10.5 per kWh for demand over 30 up to 3 000 kW and L 4 per kWh for demand over 3 000 kW. There is a local tax (maximum of L 6.5 per kWh) and a regional tax (maximum of L 11.5 per kWh), both limited to consumption up to 200 MWh per month.

- The excise tax on autoproducer electricity use and production is L 1.1 per kWh. The Parliament is considering a budget proposal to suppress this tax advantage and to apply a tax of L 4.5 per kWh on autoproducers.

The CO_2 Tax

In addition to excise taxes, Law No. 448 of December 1998 sets a CO_2 tax which would be progressively introduced by 2005. Table 6 shows excise and CO_2 taxes at the national level in 1998 and in 2005 after the implementation of the CO_2 tax. On 1 January 1999, an excise tax of L 1 000 per metric tonne of coal, petroleum coke and "orimulsion" used in combustion plants was introduced. Tax increases will be decided each year by the Government between 1999 and 2004. According to the 1998 Law the modification of the tax rates will be consistent with the EU's progress towards fiscal harmonisation for energy taxation.

Table 6
National Excise Taxes on Energy in 1998 and 2005

Fuels	*Total Excises 1998*	*1 000 L/tonne of carbon* in 1998*	*Total Excises 2005*	*1 000 L/tonne of carbon* in 2005*
Gasoline (L/litre)	Leaded (1 111.5) Unleaded (1 003.5)	Leaded (1 774) Unleaded (1 602)	1 150.2	1 836
Kerosene (L/litre)	Fuel (625.6) Heat (416)	Fuel (899) Heat (597)	758.2	1 089
Gasoil (L/litre)	747.5	1 043	905.9	1 264
High Sulphur Heavy Fuel Oil for Heat (L/kg)	90	106	844	995
Low Sulphur Heavy Fuel Oil for Heat (L/kg)	45	52	423	489
High Sulphur Heavy Fuel Oil for Industry (L/kg)	90	106	249.3	294
Low Sulphur Heavy Fuel Oil for Industry (L/kg)	45	52	120.1	139
LPG (L/kg)	Fuel (591.6) Heat (359.2)	Fuel (728) Heat (442)	400	492
Natural Gas for Vehicles (L/m^3)	0	0	100	190
Natural Gas for Industry (L/m^3)	20	38	40	76
Natural Gas for Cooking and Water Heating (L/m^3)	86	164	90	172
Natural Gas for Cooking and Water Heating in the South (L/m^3)	74	141	78	149
Natural Gas for Other Purposes (L/m^3)	151-332**	289-634**	159-349**	303-665**
Natural Gas for Other Purposes in the South (L/m^3)	74-238**	141-454**	78-250**	149-477**
Power Plants				
Coal (L/kg) ***	0	0	41.8	61
Petroleum Coke (L/kg) ***	0	0	59.2	70
Orimulsion (L/kg) ***	0	0	30.8	52
Natural Gas (L/m^3)	0	0	8.7	16
LPG (L/kg)	0	0	13.2	16
Gasoil (L/litre)	23.8	33	32.2	45
Heavy Fuel Oil (L/kg)	28.4	34	41.3	49

* IEA calculations. The taxes per tonne of carbon have been calculated using the IPCC default carbon emission factors, and both country-specific and default energy conversion factors.

** Depending on consumption.

*** Power plants over 50 MW.

Sources: Ministry of Industry and IEA.

Tax rates on oil products will increase gradually and will be redetermined from 1 January 2005. Until that date, the excise taxes on oil products will be set by decree of the President of the Ministers Cabinet. The annual tax increases will be related to the difference between current and target levels, but in any given year the increase cannot be greater than 30% of this difference.

The tax rates in 2005 will not reflect the carbon content of each fuel. For fuels used in power generation, the tax rate per unit of carbon is much higher for coal than for oil products and natural gas. The tax on heating fuel is lower for industrial users than for households. The natural gas tax for households is lower in some areas of southern Italy, to promote economic development. For industrial autoproducers or co-generation, the tax rate on fossil fuels is 30% of the rate applied to electricity production by utilities. Fuels used in electricity production from tar gasification are exempt from this tax. Imported electricity is not taxed.

The revenues from the CO_2 tax will be used for the following main purposes:

- To reduce social security payments for labour.
- To decrease other excise taxes previously charged on diesel oil for transport.
- To compensate households not supplied by the natural gas distribution grid for the increase in heating costs.
- To subsidise equipment expenditure to reduce CO_2 emissions and to increase energy efficiency.
- To fund tax breaks for energy efficiency and renewable sources.

POLICY ON CONVENTIONAL POLLUTION

Municipalities are allowed to take measures to combat growth in urban air pollution, e.g. reducing road transport. Some cities have taken measures to improve traffic flows, to promote public transport and to reduce air pollution. In 1998, a Law was passed to oblige cities to reduce the content of benzene in the air from the previous 15 to 20 mg per cubic metre to 10 mg per cubic metre.

National targets require a 30% reduction in SO_2 emissions from the 1980 level by 1993 and a 63% reduction by 2003. NO_x emissions must be reduced by 30% between 1980 and 1998. Limits on SO_2, NO_x and ash emissions have been set for new power plants above 50 MW. Existing plants have to comply with these regulations by January 2001.

Laws No. 615 of 1996 and No. 203 of 1998 set a maximum sulphur content of 3% for heavy fuel oil and 1% for coal. The maximum content of benzene in gasoline was set at 1%. Currently, a tax differential between automotive fuels favours automotive gasoil over unleaded gasoline.

The Law No. 449 of December 1997 set taxes for SO_2 and NO_x emissions in electricity power plants with capacity larger than 50 MW at the following levels:

- L 103 000 per tonne of SO_2.
- L 203 000 per tonne of NO_x.

CRITIQUE

Energy consumption in Italy is low relative to GDP, largely because of high general energy prices (mainly due to high taxes)[13], its industrial structure, a mild climate and the living standards of its inhabitants. Despite its low energy intensity, energy efficiency can still be improved in many areas. Energy-related CO_2 emissions are rising, and efforts to improve energy efficiency are important for Italy to meet its Kyoto target. According to the Government, the cost of reducing CO_2 emissions is substantial, which makes it particularly important to seek the most cost-effective means of meeting the reduction target.

The IEA supports the programme of November 1998 which aims at reducing CO_2 emissions, since it sets a framework for reducing CO_2 emissions by setting global targets for each ministry involved. Thus the programme must be implemented with concrete measures.

In order to carry out energy efficiency measures and to promote renewable sources cost-effectively, the role of the regions in the decentralisation process must be clearly defined. This role should be defined as soon as possible to avoid periods of uncertainties which may be reflected in energy policy.

ENEA's role in assisting the regions in their tasks should also be clarified, and regions should be fully informed about how to benefit from ENEA's expertise. Based on the agreement between the regions and ENEA, relations should continue to strengthen. An efficient assessment of energy efficiency measures would allow regions to redirect measures towards the most cost-effective ones. A comparison of the cost-effectiveness of energy efficiency measures to reduce CO_2 emissions along with the promotion of renewable sources is also necessary.

Co-operation among the regions and between the regions and the central Government is necessary to ensure consistent decision-making. This co-operation is particularly important for the transport sector where demand is growing rapidly, since decentralisation has given the regions responsibility over transport issues. For inter-regional transport issues, i.e. motorways, long-distance railways and international interconnections, co-operation is necessary to avoid inconsistent policies. The

13. Prices of oil products are higher in Italy than in most IEA countries due to high taxes. Electricity and gas prices are low for small domestic consumers but are on average higher and more taxed than in most other IEA countries.

Government should set the policy framework and monitor developments. Co-ordination groups with well-defined responsibilities could be useful.

Raising the share of public transport will require a substantial investment inflow in Italy, as the population has increasingly moved from the countryside to the urban areas and has also moved regionally; railways have not taken this shift in demand into account due to insufficient investments. Low passenger travel fares[14] may have helped to maintain the competitiveness of railway transport, but in the long term low fares have brought losses to the public railway company and reduced its investment capacity. An increase in fares, together with a more diverse tariff structure to better take into account the diversity of demand, should improve public transport services. The regulatory reform of public railways is expected to promote better management, to reduce costs and to increase competitiveness.

The Government has regularly improved building codes, and should continue to do so as technical improvements become available. The Government should ensure that these codes are appropriately implemented at the local level. Given the importance of renovation works in Italy, more emphasis should be put on increasing energy efficiency during the retrofitting of buildings.

Since Italian companies provide around 40 to 50% of household electric appliances sold in Europe, the Italian Government has an important responsibility to improve the energy efficiency of such appliances. As a first step, EU Directives on Energy Labelling for washing machines, tumble driers, washer-driers, dishwashers, light sources[15] should be incorporated without delay into domestic legislation, as information dissemination appears to encourage the use of energy-efficient appliances. The Italian Government should take more proactive steps within the EU to set new energy efficiency standards and add labelling to other appliances such as air conditioning.

The Ministry of Industry and specific industries have discussed the use of Voluntary Agreements to improve energy efficiency. The effectiveness of these agreements will depend on the monitoring of the results. Industries' efforts to improve energy efficiency or to reduce CO_2 emissions should lead to results that go beyond the business-as-usual trend. To achieve this, the Government could usefully draw on the experience of other countries. Energy efficiency efforts could focus on small and medium enterprises, given their number and importance in the Italian economy. For instance, more information dissemination could be undertaken by regions and/or municipalities.

High energy taxes in comparison with the other IEA countries have contributed to high energy prices and to maintaining energy consumption at a low level. However, the multiple tax rates and exceptions which attempt to incorporate fiscal, social and

14. In 1998, passenger travel fares were 50% lower in Italy than in the rest of Europe in spite of a large increase in the beginning of the 1990s.
15. Labelling for light sources must be implemented before 2000.

regional policy goals, create distortions to interfuel competition. Other measures may be more effective than the tax system in achieving some targets, e.g. social policy objectives may be better served by direct subsidies to households rather than by energy taxation. Thus, energy taxation should be more focused on the internalisation of external costs.

Although, in theory, the CO_2 tax could be used to reduce distortions, in practice, it keeps most of the existing tax structure and maintains distortions in interfuel competition. In addition, the taxes on fuel use in power generation do not reflect their carbon content. Tax rate differentials between coal and other fuels such as oil and gas are much larger than the differentials in the carbon content of these fuels would justify. Also, lower taxes on fuels for electricity autoproducers than for utilities distort competition between electricity generators.

Eventually, tax rate changes could modify the competitiveness of fuels and investment decisions, in particular for projects where fuel costs are significant, such as electricity generation. Thus the Government needs to ensure transparency, continuity and predictability in tax policy in order to reduce risks in investment decisions.

The Government has introduced economic instruments to reduce SO_2 and NO_x emissions in large power plants, and this should be encouraged. The Government plans to prohibit the sales of leaded gasoline as of 2003. In 1998, the share of unleaded gasoline in total gasoline consumption was 59%, one of the lowest of IEA countries.

RECOMMENDATIONS

The Italian Government should:

- ☐ Seek the most cost-effective means of reducing CO_2 emissions.
- ☐ Clearly define the responsibilities of the regions and the local authorities for energy efficiency measures and ensure that they are carried out effectively in co-operation with ENEA. Ensure that regions focus on the most cost-effective measures.
- ☐ Increase the share of public transport and ensure that regions effectively co-operate on inter-regional transport issues.
- ☐ Continue to tighten building codes and to ensure that they are appropriately implemented at the local level, especially in the renovation of buildings.
- ☐ Implement EU Directives on Energy Labelling and Standards in a timely way and contribute positively to the development of other measures.

- ☐ Continue to develop Voluntary Agreements with industry, taking account of the experiences in other countries, and monitor their results to ensure that these Voluntary Agreements lead to energy efficiency improvements significantly beyond the business-as-usual trend.

- ☐ Set a long-term objective of clarifying the fuel tax structure in order to make it consistent across sectors and fuels and to internalise the externalities associated with energy use. In particular, in implementing the CO_2 tax, take into account the need to avoid distortion of competition between the different fuels and between the different electricity generators.

- ☐ Ensure predictability and transparency as to the time schedule and the conditions for the progressive introduction of the CO_2 tax, so that energy users and producers have a firm basis for their investment decisions.

5

OIL

SUPPLY AND PRODUCTION

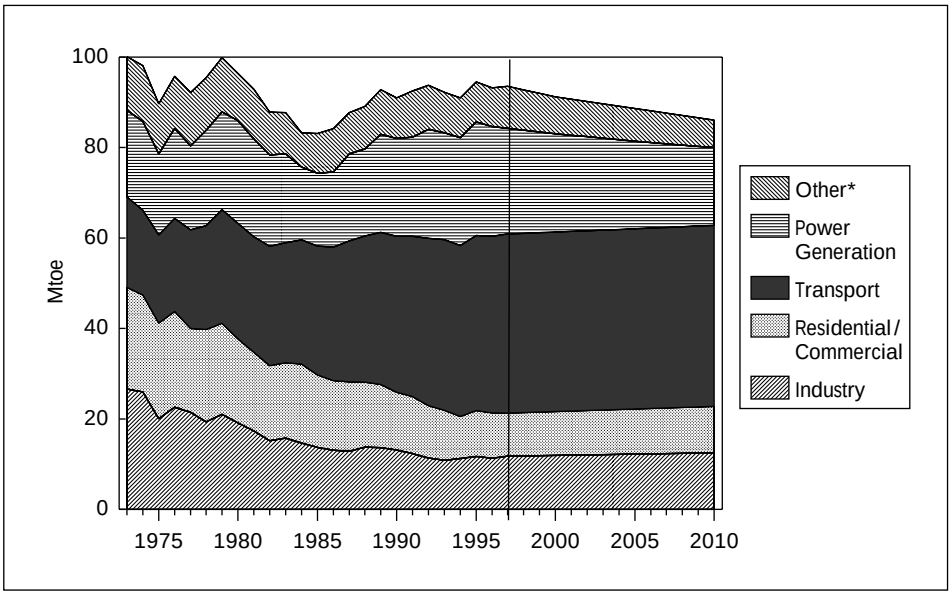
Market Trends

Oil supply increased slightly since 1986, reaching 93.5 Mtoe in 1997 (Figure 21). Total oil supply in 1997 amounted to 57.3% of total primary energy supply (TPES), a much higher percentage than in most IEA countries, because of the large use of oil in electricity generation. Oil use for generation increased until 1995, but then levelled off reaching 21.5 Mtoe in 1997 or 46% of electricity output. Oil's share in total final consumption (51.5% in 1997) was comparable to the average for IEA countries.

Natural gas has increasingly substituted for oil in the industrial and residential/commercial sectors. Oil consumption has been increasing rapidly in the transport sector (2% per annum since 1990), and in 1997 amounted to 61.3% of total final oil consumption.

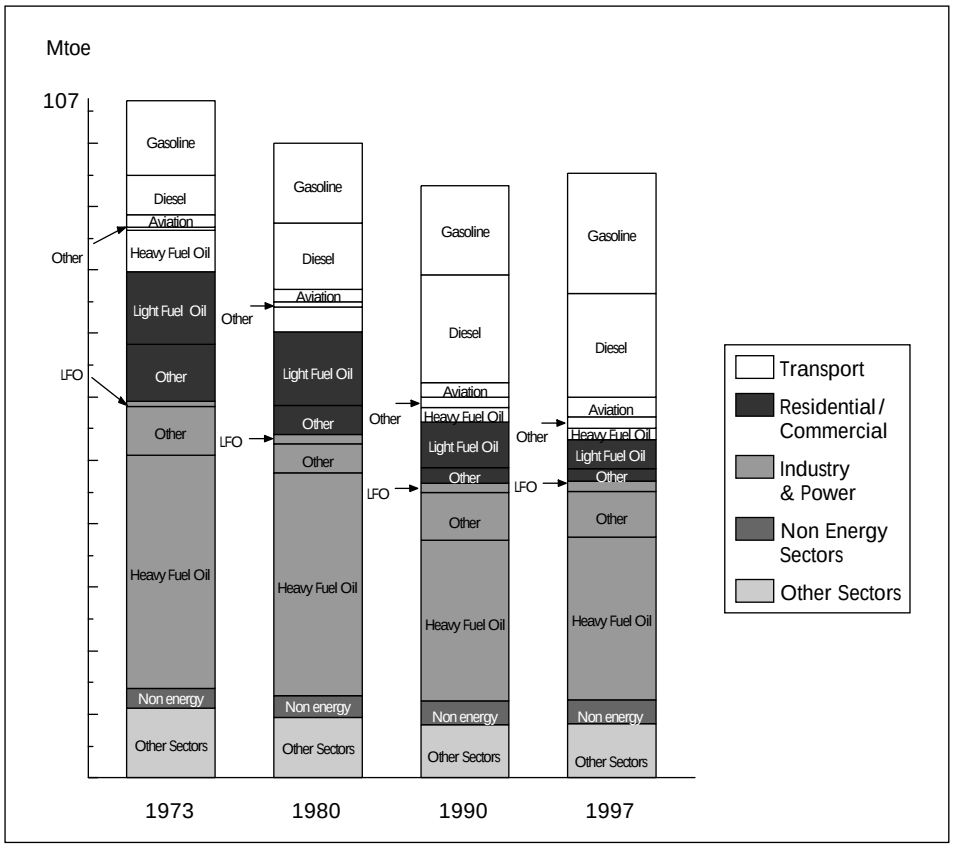
In 1997, consumption of unleaded gasoline increased 11.2%, reaching 51% of total gasoline consumption, much lower than the EU average. In 1998, the share of unleaded gasoline increased to 59%. In January 1998, the number of cars equipped with catalytic converters was estimated to be 41% of the car fleet. Since 1990, gasoline consumption has increased about 35% while that of automotive diesel has decreased 3%

Figure 21
Oil Supply by Sector, 1973-2010



* Includes own use in the transformation sector and distribution losses.
Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 1998; and country submission.

Figure 22
Oil Products Consumption, 1973-1997



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

(Figure 22)[16]. This is mainly due to a higher tax increase on automotive diesel than on gasoline (see Chapter 4). In 1997, natural gas use in transport amounted to 0.3 Mtoe and LPG use to 1.7 Mtoe; both accounted for 4.9% of energy use in the transport sector.

Forecasts

According to forecasts from the Ministry of Industry, oil supply is expected to decrease to 91.2 Mtoe in 2000 and to 86.1 Mtoe in 2010, mainly as a result of the decrease in use for electricity generation. Oil final consumption is expected to slightly decrease to 63 Mtoe in 2010. Forecasts from Unione Petrolifera, the association of oil

16. As of 1996, automotive diesel and light fuel oil have been differentiated by two colours. An estimated 360 000 tonnes of gasoil was sold to wholesalers as automotive diesel but was used for heating purposes before 1996. Taking this into account, in 1997 consumption of automotive diesel increased 2.2%.

industries, indicate a decrease in oil supply to 88 Mtoe in 2010. Increases in oil use for transport will be more than offset by a decrease in heating oil demand in the residential/commercial sector and in heavy fuel oil use in power generation which is expected to favour natural gas. Neither forecast includes the effects of the CO_2 tax which is expected to further promote gas at the expense of oil.

COMPANIES

ENI has a dominant position in the oil and gas sector in Italy (see box). In 1992, ENI was corporatised and transformed from a state enterprise into a joint stockholding company, and a privatisation programme was launched to ameliorate a large national budget deficit. In July 1997, the State's share in ENI decreased to 51%. The sale of the fourth tranche of shares in June 1998 further reduced the State's share to some 38%.

ENI

After diversifying its activities in the 1980s, ENI concentrated on its core activities: oil, natural gas, chemicals and engineering. Snamprogetti and Saipem are engineering companies. Enichem is a chemical company. ENI is comprised of three companies in the oil and gas sector, each one having a dominant position in Italy:

- ENI/AGIP is responsible for oil and gas exploration and production and for natural gas storage. AGIP was integrated into ENI in 1997. It is the largest oil and gas producer in Italy. The company's traditional areas of activity outside Italy are in North and West Africa and in the North Sea. Its expansion focuses on Central Asia, the Middle East and Latin America as well as on Eastern Europe, the ex-USSR and the Far East (China). In 1997, an important production-sharing agreement was signed in Kazakhstan. In 1998, ENI signed an agreement with Gasprom for the joint development of oil and natural gas reserves (in the Astrakhan region); the agreement also involves ENI's acquisition of a stake in Gasprom.
- Agip Petroli is the largest oil refiner and distributor in Italy. According to the company, it was the fourth largest European refiner and distributor in 1997. Erg Petroli became a fully-owned subsidiary of Erg Holding in 1997 after Agip Petroli gave up its 20% shares in Erg Petroli. In compensation Agip Petroli received 10% of Erg Holding capital. In 1998, Agip Petroli transferred 104 service stations to Erg Petroli. At the end of 1998, a merger between Agip Petroli and its subsidiary (called IP) was decided.
- SNAM has a dominant position in gas imports and transport in Italy. According to the company, it was the fourth largest gas company in Europe in 1997.

ENI's turnover increased 5.2% in 1997 to US$ 34.6 billion and its net income increased 14.6% to US$ 2.9 billion.

Private Italian and foreign companies, all of which are members of the oil industry association, Unione Petrolifera, account for the remainder of the oil market. Erg is the largest independent refiner and distributor of petroleum products in Italy. In 1998, Erg owned 7.8% of the filling stations in Italy. It also owned a 12 million tonnes per year refinery (ISAB) in Priolo near Syracuse, Sicily (the refinery is also called Melilli) and a logistics system for the distribution of petroleum products, including the depots and pipelines for the storage and transportation of petroleum products between Genoa and Arquata (situated in northern Italy).

PRODUCTION

Production Trends

In 1997, domestic crude oil production amounted to 6.2 Mtoe, a 8.8% increase over 1996. Oil production amounted to 6.6% of total oil supply. Crude oil is produced mainly in the Po Valley, the Adriatic and Ionian Seas, the Central Southern Appenines and Sicily. The Villafortuna field in the Po Valley accounts for nearly 46% of Italian oil production. Prospects are good for production in the area of the Val d'Agri in the Basilicata Region, where the largest oil reservoir in Western Continental Europe is situated. The increase in production in the Val d'Agri as well as in other smaller fields is expected to compensate for the decline in production from existing fields.

Regulation and Royalties on Production

A 1996 Legislative Decree repealed in December 1998 the law which gave ENI a monopoly on exploration, production, transport and storage of hydrocarbons in the Po Valley, the Venetian Plains, the northern Appennino foothills and offshore the Po Valley. ENI kept about one-third of the surface area, and the remaining was opened to public tender.

The 1998 Legislative Decree on decentralisation made the regions responsible for hydrocarbons onshore production, in particular in granting licences. Environmental protection is also under the regions' jurisdiction. The State is responsible for granting concessions for onshore exploration and for offshore exploration and production.

There are five regions in Italy which are allowed to make their own laws (Friuli, Trentino-Alto Adige, Sardinia, Sicily and Val d'Aoste), but only Sicily has made its own laws for hydrocarbons exploration and production. The Sicilian Mining Agency can exercise the right to take a stake in exploitation areas, and domestic and foreign oil companies must form joint ventures with locally-based companies to explore and to produce oil and gas in the region.

The normal royalty rate on onshore hydrocarbons production and offshore gas is 7%, although there are exemptions for small quantities. Royalties on offshore net oil production are 4%. Since January 1997, ENI has paid royalties in the areas where it

has a monopoly. 55% of the royalties on onshore or offshore production in territorial waters must be paid to the region and 15% of the royalty on onshore production must be paid to the municipalities where the facilities are situated. The residual share is paid to the State.

TRADE

In 1997, Libya was Italy's largest crude oil supplier with a share of 31.8% followed by Saudi Arabia and Iran (Table 7). Italy is a net importer of oil products. In 1997, imports of oil products amounted to around 23% of consumption. Italy imports mostly residual fuel oil from the United Kingdom and Libya and exports middle distillates mostly to Spain and France.

Table 7
Crude Oil Imports, 1985-1997
(million tonnes)

	1985	*1990*	*1995*	*1996*	*1997**
Africa	31.3	40.5	33.9	36.2	34.8
Libya	*13.5*	*24.5*	*23.6*	*24.3*	*25.1*
Other Africa	*17.8*	*16*	*10.2*	*11.8*	*9.7*
Middle East	19.6	26.8	25.7	27	31.9
Saudi Arabia	*4.8*	*8.1*	*10.9*	*9.9*	*13.3*
Iran	*7.3*	*9.5*	*11.4*	*13.3*	*12.9*
Other Middle East	*7.5*	*9.2*	*3.4*	*3.8*	*5.7*
Other	12.7	7.5	13.9	10.9	12.2
Total	**63.6**	**74.7**	**73.5**	**74.1**	**78.9**

* Provisional.

Source: IEA database.

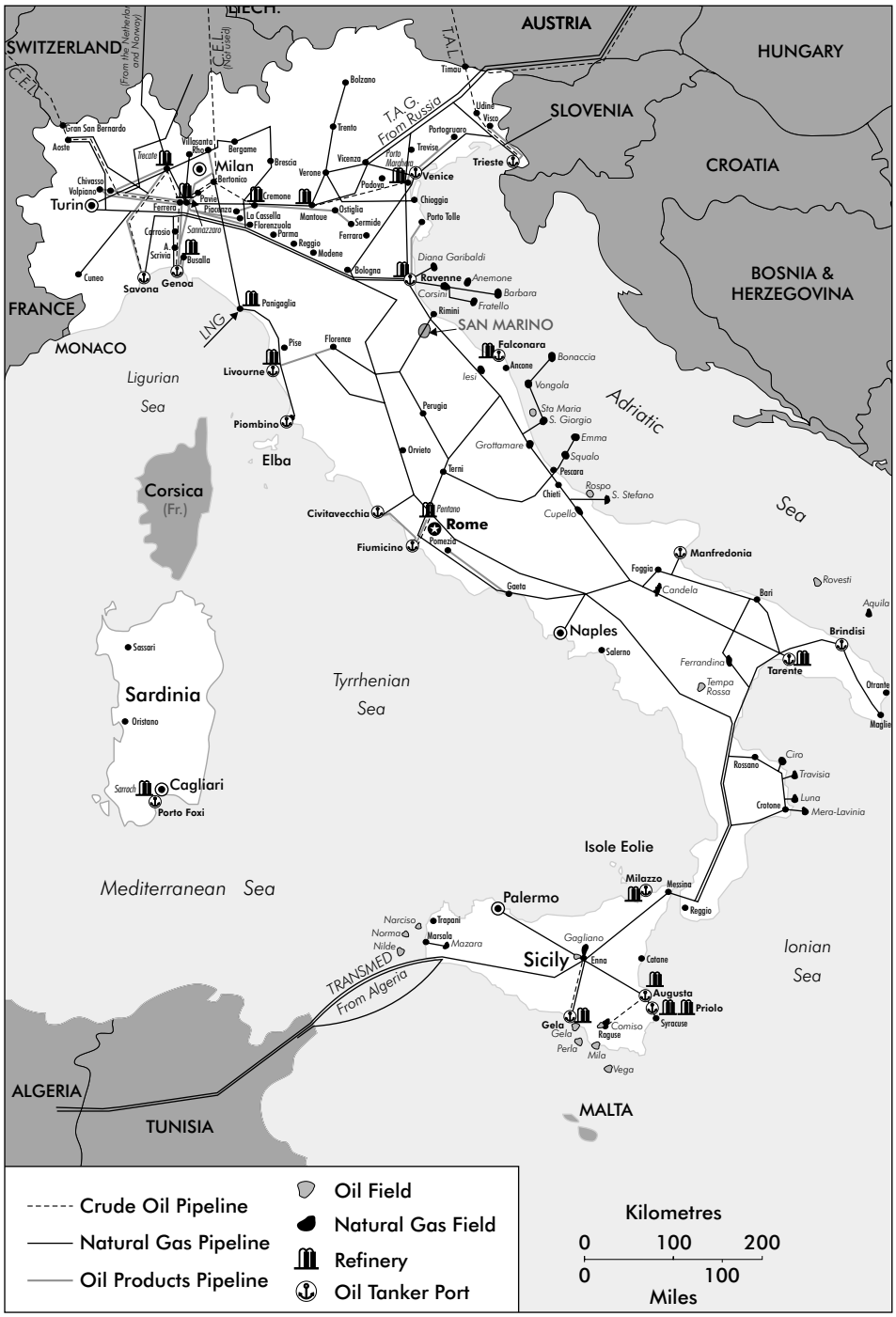
REFINING

In 1998, there were 18 refineries in Italy, with 12 situated on the coast (Figure 23). Total capacity was 100.8 million tonnes per year. Capacity utilisation increased from 89% in 1996 to 92% in 1997. In 1998, Agip Petroli owned six refineries and had a participation of 50% in the Milazzo refinery and of 15% in the Sarroch refinery[17]. Its refining capacity amounted to some one-third of total Italian refining capacity. The ratio of conversion capacity to distillation in Italy is higher than the EU average but differs widely between refineries.

17. In 1995, a co-operative agreement was signed with the Kuwaiti company KPC for the joint management of the 8 Mt/year refinery at Milazzo. In 1997, Agip Petroli sold 50% of the Milazzo refinery in Sicily to Kuwait Petroleum Italia (KPI), and its 20% of share in ISAB/Priolo was sold to Erg.

Figure 23

Map of the Italian Oil and Natural Gas Facilities



Source: Comité Professionnel du Pétrole.

Large investments are required in order for the refining sector to meet the new oil products specifications. The sector will also have to adapt to the changing structure of demand and to the decline in heavy fuel oil consumption by electricity plants. In 1997, about L 800 billion was invested in the refining sector (about the same amount as in 1996), of which around 70% was for environmental protection.

Electricity generation from refinery residues and tar gasification has benefited from favourable purchase prices by ENEL, the public electricity company, which were enacted to promote electricity generation mainly from renewables[18]. In 1997, the Ministry of Industry decided not to apply these two laws to projects elaborated after the first half of 1995. Support to renewables is being revised within the framework of EU Directives on Electricity and Natural Gas.

In 1998, electricity generation capacity from refinery residues amounted to 130 MW. The purchase price was L 149.1 per kWh[19]. Around 1 338 MW of tar gasification capacity is being built in three refineries at a cost of L 5 000 billion (Table 8).

Table 8
Tar Gasification Plants Projects

	*ISAB**	*SARAS***	*API****
MW	512	550	276
TWh/year	4	4	2
Tar Consumption (Mt/year)	0.9	0.9	0.5
Expected Completion	July 1999	Second Half 1999	Second Half 1999
Investment (L billion)	2 000	2 000	1 000

* 51% Erg Spa (the refinery owner), 49% Edison Mission Energy; feedstock: de-asphalted oil.

** 55% SARAS (the refinery owner), 45% Enron; feedstock: visbreaker residue.

*** 51% API Energia (the refinery owner), 25% ABB, 24% Texaco; feedstock: various oil residue streams.

Source: Unione Petrolifera.

TRANSPORT AND DISTRIBUTION

Present Situation

In Italy, there are few crude oil pipelines since most refineries are near the sea. Most pipelines are situated in the north of the peninsula. In 1997, there were 1 170 km of crude oil pipeline and 1 690 km of oil products pipelines. 60% of the crude oil pipelines and 43% of the oil products pipelines were owned by ENI (SNAM or

18. After the law on the introduction of competition in the electricity sector comes into force, electricity from refinery residues and tar gasification will be sold to the Network Operator (see Chapter 7).
19. This price comprised L 91.6 per kWh for the avoided cost and L 57.5 per kWh for the incentive part (see Chapter 7). This can be compared to a production cost of about L 83 per kWh for the most efficient IGCC plant in Italy (as calculated by the Regulatory Authority for Electricity and Gas).

ENI/AGIP). With so few pipelines, companies must sell and exchange products to balance their supply and demand in different geographic areas.

Distribution is mostly undertaken by integrated oil companies. In December 1997, there were 27 100 filling stations (Table 9), down from 28 200 in 1995 and 27 700 in 1996[20]. In 1998, ENI's two companies, Agip Petroli and IP, merged and had a share in the gasoline market of 43.6% (Agip Petroli 28.7%, IP 14.9%) and a share in the automotive diesel market of 43.1% (Agip Petroli 28.4%, IP 14.7%). Agip Petroli's share had been decreasing. In 1997, the volume sold by service stations was about 1 405 cubic metres, much lower than the European average[21]. The number of service stations is expected to fall to around 20 000 by year 2000 (see below).

Table 9
Number of Service Stations by Company, December 1997

	Number of Filling Stations	*Percent of Total*
Agip Petroli*	6 711	24.8
IP*	3 904	14.4
Esso	3 315	12.2
KPI	3 250	12.0
Erg	2 108	7.8
Tamoil	1 914	7.1
Shell	1 788	6.6
API	1 538	5.7
Fina	1 411	5.2
Other	1 161	4.3
Total	**27 100**	**100**

* The merger between Agip Petroli and IP became effective on January 1999.
Source: Unione Petrolifera.

Restructuring and Regulatory Changes

In 1996, the Antitrust Authority, in a report on competition in the oil sector, found the following:

- Existing legislation restricts competition in fuel distribution. Restrictions include those on opening hours and sales of non-oil products and on the behaviour of companies. Since the repeal of oil products price controls in 1994-1995, pre-tax prices of oil have risen uniformly, despite the fact that the cost structure varied among distributors.

20. About 35% of filling stations are managed by "convenzionati", i.e. dealers who own the filling stations. The dealer purchases oil products from the company and distributes them under the company's brand at a price decided by the company. A distribution margin is ensured for the dealer.
21. This compares with about 2 800 cubic metres in Germany and about 2 200 cubic metres in France and the Netherlands.

- Oil companies' dependence on Agip's logistical system has prevented them from independent, competitive behaviour in the distribution market.

In July 1997, an agreement was reached between oil companies, retailers and the Ministry of Industry to reduce the number of filling stations. Oil companies agreed to voluntarily reduce the number by between 4 500 and 5 000 in three years and to reduce independent retailers ("convenzionati") by 2 000. Companies agreed to close down the less profitable and poorly located service stations.

The municipalities authorise the opening of new filling stations. Decentralisation has brought more regional planning power to the municipalities regarding opening and closing of filling stations. Until June 2001, authorisation to open a new filling station will only be granted if another three stations have been shut down in the same regional area.

In February 1998, a decree on the "Rationalisation of Fuel Distribution" was published. The new regulatory system is expected to be in place by end 1999. Its main provisions are as follows:

- For the opening of filling stations, Italy will move from authorisations to a system of concessions granted by the municipalities on an automatic basis, provided that obligations related to environment and security are fulfilled. For stations situated along motorways, concessions will no longer be granted by the State but by the municipalities.

- Regulations related to the sale of non-oil products in filling stations will be simplified, and stations will be allowed to make minor mechanical repairs which were previously forbidden.

- When the number of filling stations falls to 20 000, opening hours will increase by 50% from the current limit of 52 hours per week.

- A fund will be established for the restructuring of filling stations, funded by a special tax on oil products.

- Third party access for unused oil products and crude oil storage facilities will be provided.

- An organisation for compulsory stocks has been created (see below).

EMERGENCY STOCKS AND EMERGENCY RESPONSE MEASURES

Stocks must exceed 90 days of inland consumption of the preceding year. Law No. 61 of March 1986, amended by Law No. 427 of 1993 and Law No. 30 of 1997, gives the Minister of Industry the authority to activate by decree the use of stocks.

Law No. 608 of May 1994 abolished the Interdepartmental Committee for the Co-ordination of Energy Emergencies. The responsibility for co-ordinating and implementing emergency policies and procedures now lies with the Executive Board, headed by the General Director of the Department of Energy Resources and Base Industries in the Ministry of Industry.

Law No. 22 of 10 February 1981 assigned ENI the duty to set up and manage on behalf of the Government the strategic oil stocks to be used in emergencies. Budget Law No. 30 of 28 February 1997 abolished government-owned oil stocks. The decision was related to government efforts to reduce its expenditures. Subsequently, the Italian Treasury approved tenders for the sale of the stocks during 1997. The sale of 750 kilotonnes of crude oil and oil products held in government storage was conducted by the ENI affiliate Sogesco between June and November 1997. The sale has not contributed to the decline in total emergency stocks because the obligation to hold the equivalent amount of stocks had been transferred to the industry. Operators now have an obligation to hold stocks covering 90 days of consumption, instead of the previous 87 days, as the previously held government stocks are no longer subtracted from the 90-day obligation for the industry.

Several measures to bring Italian emergency stocks to the level required by the International Energy Programme (IEP) have been considered. Among specific measures, the 1998 Decree on Rationalisation of Fuel Distribution also proposes the establishment of a stockholding agency. The Decree is very general; it authorises the Ministry of Industry to establish the Board of Directors, to approve the statutes of the agency and to comment on its internal operating rules, including the level of agency stocks and the degree of government control over these stocks. Membership in the agency will be mandatory for all entities which are subject to the requirement to maintain reserves in accordance with EU Directive 68/414/EEC. The initiative is not expected to alter the level, structure, ownership or financing of existing compulsory stocks.

Another measure contemplated by the Administration is an amendment to existing domestic legislation which would make a clear reference to stockholding obligations arising from the IEP and Co-ordinated Emergency Response Measures (CERM), and would change the method of calculating the stock obligation to conform with IEA practices.

The Italian Government regards demand restraint as the first line of response to an oil crisis and will adopt measures to safeguard the country's industrial sector, concentrating the restrictions primarily on the civil sector. The legal basis for demand restraint measures is provided by Law 608/1994 which transferred all relevant authority from the abolished Inter-ministerial Committee on Energy Emergencies to the Ministry of Industry. The Executive Board within the Ministry is now responsible for the development and implementation of all necessary demand restraint measures in an emergency, subject to approval by the Council of Ministers.

An increase in gas supply will allow some scope for switching from fuel oil to natural gas in power stations. ENEL, the state-owned utility, has the capacity to

replace about 9 million tonnes per year of heavy fuel oil (around 30% of Italian consumption) with natural gas. The actual switching potential will vary throughout the year, depending on the market situation and on economic factors. It will be extremely difficult to increase gas use for electricity generation in winter, but incremental supply will be available in summer, particularly from Algeria.

CRITIQUE

Oil and gas companies face several obstacles in the exploration and production of hydrocarbons, including environmental protection regulations and local policies in some regions. In the south of Italy, exploration and production activities were delayed for three years due to difficult negotiations with local authorities on the compensation for these activities. Procedures to obtain government licences are also lengthy and cumbersome.

The Government should eliminate all unnecessary obstacles to domestic hydrocarbon production so that indigenous resources can contribute to the energy security of the country. The reform which gave regional and local authorities part of the revenue from royalties should increase their interest in exploration and production. In the current environment of decentralisation, specific measures should be taken to clarify and to streamline the licensing process for exploration and production. Assomineraria (Association of hydrocarbons and raw materials producers) has proposed to set up an agency to deal with all questions related to hydrocarbons exploration and production ("One Stop Shop" system).

Because there is little competition in the downstream oil market, retail margins are quite high, which maintains a large number of service stations. Increased competition between companies should be sought because it would reduce prices and thus benefit consumers. As a welcome step, the 1998 Decree on the Rationalisation of Fuel Distribution addresses some of the regulations which impede competition, e.g., limits on opening hours and on non-oil activities. Although the Decree will only be implemented at end 1999, some companies have started to adapt their strategies to the prospect of increased competition. For instance, Agip Petroli has launched self-service stations (i.e. a Do-It-Yourself Programme in 2 200 service stations) and specific discounts. Many other companies have started similar activities. However, Agip Petroli still retains a dominant position, and this could be an impediment to developing effective competition.

The 1998 Decree should be implemented as soon as possible, and the Government should monitor the development of competition in the downstream oil sector. Administrative procedures at the local level should be monitored to ensure that filling stations can be freely opened or closed, provided that they meet regulations on safety and environmental protection. Regulations on the activities of service stations (e.g. opening hours, non-oil activities) should be as light-handed as possible to allow companies to freely choose their strategies. The Antitrust Authority should continue to investigate cases of abuse of dominant position or of cartel activities in

the retail market and in the oil products' wholesale market. The principle of mandatory third party access to storage could be extended to the concepts of non-discriminatory common-carrier pipelines. Since third party access to oil products pipelines and oil storage facilities would allow new entrants, denial of such access should be strictly scrutinised. Access tariffs should be equalised and should provide the pipeline owners with just and reasonable returns.

The question remains as to whether the level of the buy-back tariff for electricity generation from refinery residues, including tar gasification, is still justified. According to the Government, this incentive was intended to increase domestic electricity generation from renewable and assimilated energy sources (including refinery residues). The high buy-back tariff was necessary given the high incentive price which covers the large electricity generation costs. Law No. 9 of 1991 (Law 9/91), which promotes electricity generation from refinery residues, was rightly suspended, since it does not apply to projects elaborated after the first half of 1995. It is positive that the Law is being revised in the context of the new regulatory framework on electricity (see Chapter 7).

Law 9/91 applies to projects approved before the first half of 1995. As the buy-back tariff system was open to all Italian refiners, the Government considers that there is no distortion of competition between them. However, distortions may exist with non-Italian refiners which do not have access to the tariff system. The Regulatory Authority should ensure that the level of the buy-back tariff does not distort competition.

RECOMMENDATIONS

The Italian Government should:

- ☐ Clarify the regions' role in granting licences to ensure that there are no unnecessary obstacles to the production of hydrocarbons. Ensure a consistent approach between regions in granting production licences. Streamline and speed up licensing procedures at the national level.

- ☐ Implement the 1998 Decree on the Rationalisation of Fuel Distribution and ensure that filling stations can be freely closed or opened, provided that they meet regulations on environment and safety. Ensure that the municipalities' concession procedures do not impede competition.

- ☐ Closely monitor the evolution of competition, in particular to ensure that there is no cartel activity or abuse of dominant position, including on access to pipelines and storage.

- ☐ Support the Regulatory Authority in setting buy-back tariffs for electricity from refinery residues in order to avoid distortion of competition at the international level.

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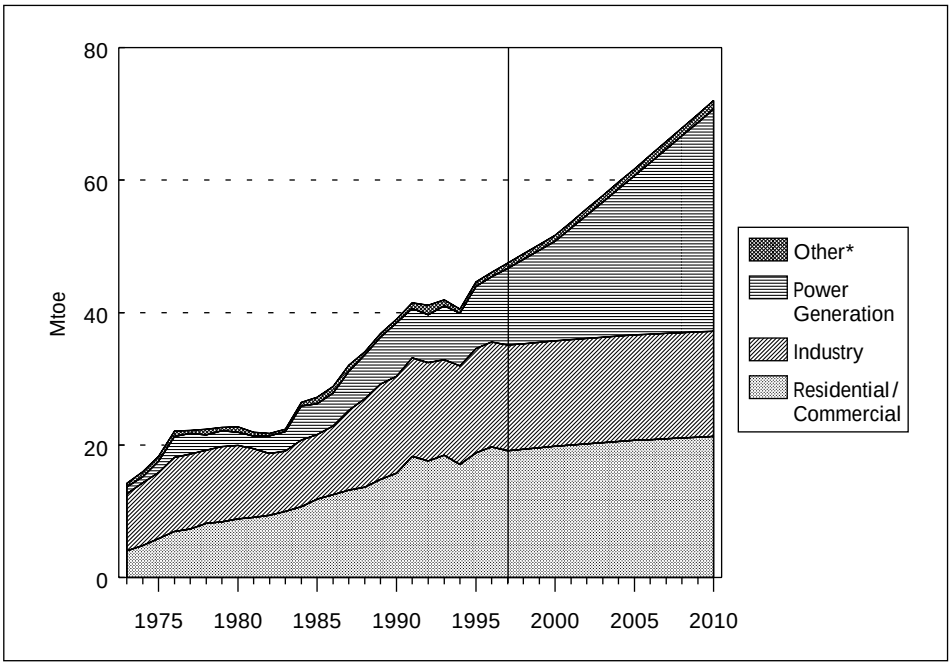
NATURAL GAS

SUPPLY

In 1997, natural gas supply was 47.5 Mtoe, a 3% increase over 1996. Between 1973 and 1997, natural gas supply increased more than threefold. The largest increase in demand was in the residential/commercial sector where consumption increased by an average of 6.7% per year between 1973 and 1997 (Figure 24). In 1997, the share of natural gas consumption in this sector reached 47.8% (63.7% excluding electricity from total consumption). Natural gas consumption in industry increased on average 2.6% per year from 1973 to 1997, and reached 35.6% of energy consumption in this sector (46.6% excluding electricity). In both the residential/commercial and industry sectors, the gas share in total consumption is higher than the IEA European average.

Natural gas use in power generation has grown rapidly, reaching a share of 24.9% of total electricity generation in 1997. Gas for power generation is mainly used in multi-fired power plants, where it is possible to switch to heavy fuel oil and coal. Interruptible customers in the industry sector amount to 8.7% of total gas sales.

Figure 24
Natural Gas Supply by Sector, 1973-2010



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

According to the Ministry of Industry forecasts, natural gas supply will increase to 72 Mtoe in 2010, or 38.8% of total energy supply. Gas consumption for electricity generation is expected to grow significantly. Gas imports are expected to increase to 59.6 Mtoe by 2010. The full implementation of the CO_2 tax (see Chapter 4) may lead to an even greater increase in natural gas consumption, in particular for electricity generation, at the expense of coal and oil.

In view of the great amount of gas delivered to residential customers, gas demand in Italy is subject to seasonal fluctuations. In general, demand in the winter is four times higher than in the summer (from 60 to 270 mcm per day), but winter demand can be five or six times higher depending on the year. These demand fluctuations are largely met by variations in imports (from Algeria) and by using storage and interruptible contracts.

PRODUCTION

Domestic gas production increased from the mid-1980s to the early 1990s. Since then, production has fallen slightly, and in 1997 it amounted to 15.8 Mtoe, i.e. one-third of natural gas supply. In 1998, production was estimated to be 15.7 Mtoe. Natural gas is produced mainly in the Po Valley (in the region of Emilia Romagna) and offshore in the Adriatic Sea (Figure 23 in Chapter 5). In 1997, onshore production accounted for about 20% of total production, but its share is declining. The Barbara, Porto Garibaldi and Agostino fields in the Adriatic Sea and the Luna field in the Ionian Sea represent nearly 50% of total natural gas production.

Edison Gas is a subsidiary of the conglomerate Edison which is also involved in electricity production and supply (see Chapter 7). It is the major private company involved in gas production and supply in Italy.

In 1997, Edison Gas produced 1.5 bcm and its proven reserves in Italy amounted to 30 bcm. Edison Gas has interests in exploration and production in the North Sea, Egypt and Pakistan. In September 1998, Edison signed a contract with the United Arab Emirates for the supply of 400 mcm of gas equivalent LNG. Imports started in October 1998. SNAM is responsible for gas transport from Abu Dhabi to Panigaglia.

Edison is considering two projects to import gas. One would import gas from Russia through a new pipeline to be built in a joint venture called Volta with Gasprom. The second would build an offshore regasification plant in a joint venture with Mobil along the Adriatic coast.

Since its acquisition of Elf Italia, Edison Gas owns over 70% of SGM (Società Gasdotti del Mezzogiorno), with a total pipeline transport network of 1 000 km in central and southern Italy.

In 1999, Edison concluded an agreement with In Salah Gas Ltd. (a joint venture of Sonatrach and BP/Amoco) for importing 4 bcm per year of Algerian gas for 15 years starting in 2003.

In 1997, ENI/AGIP (see Chapter 5) produced 89% of domestic gas. There are eight other smaller domestic gas producers; the largest one is Edison Gas (see box) which acquired Elf Italia, another gas producer, in 1998.

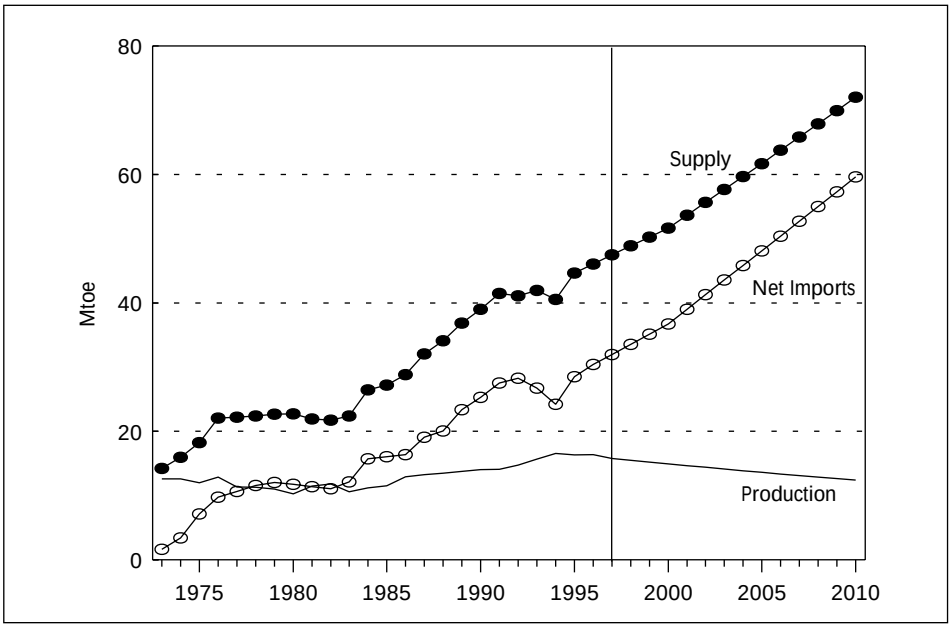
The royalty on natural gas production is 7%. Licensing procedures for exploration and production are often cumbersome and lengthy (see Chapter 5).

IMPORTS

In order to meet the growth in demand, natural gas imports have rapidly increased and in 1997 amounted to 32 Mtoe, i.e. 67.4% of total gas supply and 24% of total net energy imports (Figure 25). Imports are estimated to have been 35.2 Mtoe in 1998. A very limited amount of gas is exported to Switzerland. However, exports are expected to increase. In November 1997, ENI signed an agreement with Ina, the national Croatian oil and gas company, for 3 to 5 bcm per year of natural gas exports for 20 years[22].

Recent increases in natural gas demand have been met by imports from Russia and Algeria (Figure 26). In 1998, Algeria was the largest supplier with a share of 53.8%, followed by Russia (39.1%), the Netherlands (7%) and Abu Dhabi (2.7%). In 1998, SNAM accounted for 86.6% of total gas imports (Figure 27), followed by ENEL (9.5%)

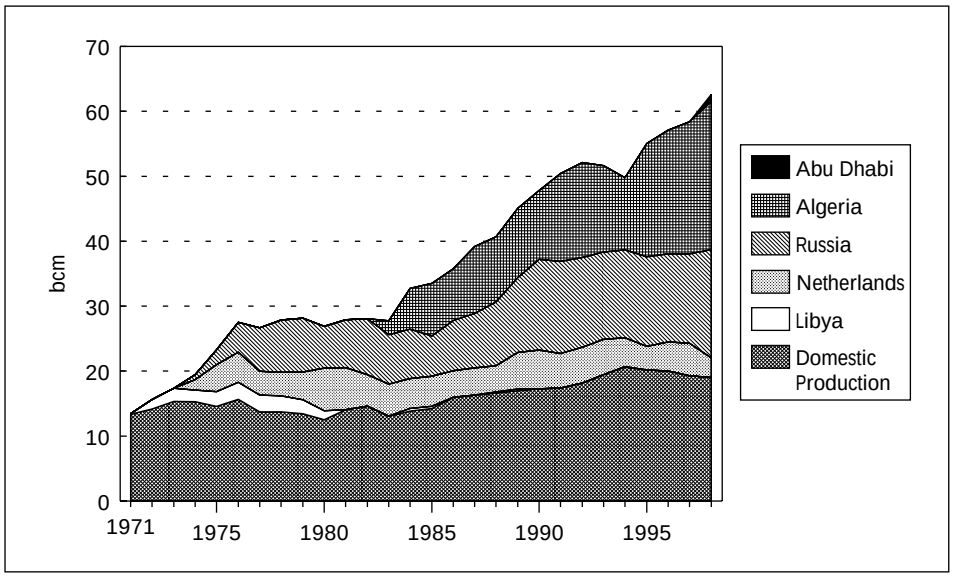
Figure 25
Natural Gas Production, Supply and Net Imports, 1973-2010



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

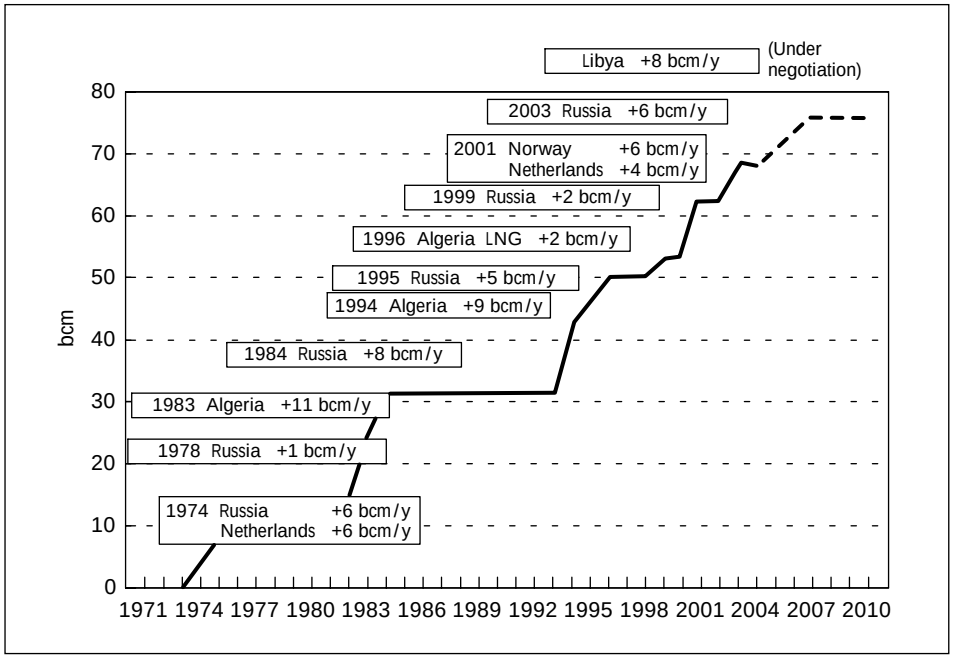
22. Natural gas will come partly from Italy and partly from Ivana, a field located 40 km west of Pola in the Adriatic, offshore Croatia.

Figure 26
Natural Gas Production and Imports by Country, 1971-1998



Source: Ministry of Industry.

Figure 27
SNAM Gas Import Contracts



Source: SNAM.

and Edison Gas (2.7% – see box p. 68). Gas companies have signed new gas contracts which will increase the diversity of supply in the future.

In 1997, SNAM signed a 25-year contract with Norway for natural gas imports of 6 bcm per year starting in 2000. In the same year, SNAM also signed a contract to import 4 bcm per year, with an option to increase imports up to 10 bcm per year, from the Netherlands as of 2000. SNAM and Gaz de France (GDF) agreed on the transit terms for the gas to be transported through France. In 1997, SNAM started to import LNG from Algeria. According to signed contracts, in 2010 SNAM expects to import per year 28 bcm from Russia, 22 bcm from Algeria, 10 bcm from the Netherlands and 6 bcm from Norway. SNAM is considering the possibility of importing Libyan gas through a new subsea pipeline. In 2010, the company expects to have contracted for nearly 75 bcm of gas, a slightly higher level of gas imports than that forecast in 1998 by the Ministry of Industry.

In 1992, ENEL, the national electricity company (see Chapter 7), signed a contract with the Algerian company, Sonatrach, for the supply of 4 bcm per year for 20 years starting in 1996. In 1995, the company also signed a contract with Nigeria LNG for the supply of 3.5 bcm per year of gas equivalent LNG for 23 years starting at the end of 1999 (see box). Edison also started to import gas (see above).

Gas Import Facilities for Nigerian LNG

Initially, ENEL planned to build a LNG import facility at Montalto di Castro near Rome. This project was abandoned, and SNAM decided to build a LNG terminal at Monfalcone on the Gulf of Trieste. In 1996, the population of Monfalcone rejected the project.

In December 1997, ENEL instead signed a swap agreement with GDF, the French national gas company. GDF will receive 3.5 bcm of Nigerian LNG at Montoire-de-Bretagne and, in return, will deliver 1.5 bcm of Algerian gas to the LNG import facility at Panigaglia and 2 bcm of Russian gas to Baumgarten, on the border between Austria and Slovakia.

TRANSPORT AND STORAGE

Gas transport facilities have developed rapidly to keep pace with growth in natural gas imports and demand (Figure 23). Major international links are as follows:

- The LNG terminal at Panigaglia on the Ligurian Sea near La Spezia was commissioned in 1971 to import LNG from Libya and has a regasification capacity of 3.5 bcm per year. After three years of upgrading works, it was reactivated in 1997 for Algerian LNG.

- The Transmed pipeline runs from Algeria through Tunisia. In 1995, its capacity was expanded to 25 bcm per year.

- Supplies from the Netherlands come from the TENP-TRANSITGAS system, via Germany and Switzerland into Italy at Gries Pass.

- Russian gas is imported through Ukraine, Slovakia and Austria, arriving at Tarvisio in Italy from Baumgarten (Austria) through the TAG pipeline.

- Italy is connected to Slovenia at Tarvisio allowing Algerian gas to be exported via Italy to Slovenia. To allow gas transit to Croatia, a subsea pipeline is expected to be built between northern Italy and Pula on the Croatian coast. The pipeline will eventually be extended to Karlovac near Zagreb.

In 1997, the high pressure network was 11 000 km with 22 compression stations. The medium pressure network was 18 000 km[23]. Extension work or upgrading is planned or under way in France, Switzerland, Germany, Austria and Italy to allow for the new gas imports. In particular, capacity in TENP-TRANSITGAS is expected to triple to 18 bcm per year in 2000 to accept gas imports from the Netherlands and from Norway. A gas pipeline will be built from Taisnières-sur-Hon, France, to the Swiss border where it will join the TENP-TRANSITGAS system. Building costs are expected to be above FF 3 billion.

Italy is well endowed with gas storage capacity and uses its total available volume both for seasonal and strategic storage. In 1997, total gas storage capacity reached 28.2 bcm, of which 15.1 bcm is recoverable and 13.1 is cushion gas. ENI/AGIP plans to increase working gas to at least 20 bcm over the coming years.

SNAM is responsible for most of gas transport; it owns and operates 28 100 km of transmission and transports around 97% of the gas sold in Italy. Distribution companies own and operate about 169 000 km of medium and low pressure lines. ENI/AGIP holds all of the gas storage capacity in Italy, except for two small depleted fields at Cellino and Collalto which are owned by Edison Gas.

Law No. 9 of 1991 (Law 9/91) obliges the pipeline companies, SNAM, Edison Gas and SGM to provide third party access[24] to natural gas in some very limited circumstances, i.e. when gas is produced in Italy and used in the following ways:

- In producers' own plants;

- In plants either owned by producers' controlling companies or their affiliates; and

- If it is to be delivered for power production to ENEL or to municipalities.

Pipeline owners are not required to increase transport capacity, and carriage is therefore confined to the system's marginal capacity.

23. No concession is required to build and operate a pipeline.
24. The term used in the law is "vettoriamento", which means carriage without the obligation to redeliver the same gas.

In December 1994, SNAM reached agreement with the Association of oil industries (Unione Petrolifera – see Chapter 5) and the Association of hydrocarbons and raw materials producers (Assomineraria) on terms and conditions for third party access for natural gas produced in Italy[25]. The essential features of the agreement are:

- All costs increase with distance and with the volume of gas, and must be paid by the third parties obtaining the access.
- All taxes and duties which may be levied on transported gas should be paid by the third parties obtaining the access.
- The transport fee is defined on the basis of the shortest and most economical route.
- Third party access to the network is granted based on the availability of transport capacity[26].

In March 1999, the Antitrust Authority took a decision which allowed for increased competition in the natural gas sector. Following an investigation which started in November 1997, the Antitrust Authority found SNAM guilty of abuse of dominant position. SNAM had rejected the request from Assomineraria to use SNAM's natural gas pipeline network, had refused to revise the 1994 tariffs for grid use, and had sought to control the end use of the gas transported on behalf of Edison Gas.

The Antitrust Authority concluded that there was no justification for SNAM's refusal to carry gas for third parties in cases other than those provided by Law 9/91, that the method for calculating charges for third party access led to unjustifiably onerous contractual conditions and that the conditions put by SNAM on Edison constituted a direct restriction on the capacity of Edison Gas to compete with SNAM. As a consequence, the Authority decided in March 1999 to fine SNAM L 3.6 billion, equivalent to 9% of its 1997 turnover from transporting natural gas for third parties.

DISTRIBUTION

SNAM is also dominant in gas distribution, having a virtual monopoly over sales to large industrial companies, power stations and distribution companies. In 1997, about 5 000 municipalities out of 5 140 received gas from SNAM. Municipalities also bought about 26.9 bcm of gas from SNAM out of 27.1 bcm. SNAM is not directly involved in town distribution but has significant shares in some of the largest distribution companies. In particular, it has a share of 41% in Italgas, which has 27% of the retail distribution (see box).

25. In July 1998, ENEL agreed with SNAM on the transport of natural gas from Algeria.
26. In 1997, natural gas produced in Italy and carried for third parties amounted to about 4 bcm, i.e. 2.5 bcm for ENEL and 1.5 bcm for independent producers.

Italgas is the major natural gas distributor in Italy. It is owned 40.91% by SNAM and about 10% by the Fondo Pensioni of Banca d'Italia; the remainder is held by numerous shareholders. Italgas distributes gas in around 1 000 municipalities including Rome, Naples, Turin, Florence and Venice. It owns and operates 93 000 km of distribution lines. In addition to natural gas distribution, Italgas is involved in water distribution, water cleaning and sewerage, and it plans to expand into co-generation and air conditioning.

Municipalities are in charge of the public service of gas distribution and thus of choosing the organisation of distribution. Distribution is managed by private and public companies. In 1997, there were more than 700 distributors supplying over 5 000 municipalities (Table 10). The distribution market is becoming more concentrated, but this evolution is slowed down by the length of the concessions, which are on average 20 to 30 years.

Table 10
Distribution Companies in Italy, 1997

	Total end 1997	*Municipal Companies*	*Private Companies*	*Public Companies*
Companies	714	292	302	120
Municipalities served	5 140	404	3 907	829
Users	15 000 000	1 039 000	9 224 000	4 737 000
Sales (mcm)	21 917	1 806	12 404	7 707

Sources: SNAM, and *Gas Distribution Study*, IEA/OECD Paris, 1998.

In the case of "municipal companies", municipalities distribute directly (Table 10). In the case of a "public company", a group of municipalities supply gas, by a special municipal company or by a company with mixed capital (public and private). The private companies are established with private capital, with concessions granted by the municipalities.

Municipal companies are the smallest in terms of sales per company and of the number of customers per company. On average, public companies are the largest both in terms of sales per company and in the number of customers. Private companies, however, account for close to 60% of total local distribution companies' (LDC) sales and serve more than 75% of the municipalities.

All LDCs are members of one of the three associations created to look after their interests: Federgasacqua for municipal companies, Anig (Associazione Nazionale Industriali Gas) for the large and private distribution companies, and Assogas for the small distribution companies. Anig has only 136 member companies, but accounts for almost half of total gas sales and supplies 7 million customers.

Some degree of horizontal integration exists between gas distribution and other sectors such as electricity and water. Some of the municipal companies distribute electricity (see Chapter 7). Involvement in water distribution and related services is more widespread.

TARIFFS AND PRICES

The Ministry of Industry, Commerce and Crafts together with the Inter-ministerial Committee for Economic Planning (CIPE) are responsible for establishing energy policy, including gas tariffs. More specific regulatory functions are under the responsibility of the Regulatory Authority for Electricity and Gas which was established in 1995 and became operative in April 1997 (see Chapter 3). Under the 1995 Law, Parliament established the principle of third party access for gas. The competences of the Regulatory Authority in the gas area are as follows:

- To define services that should be subject to concession or authorisation and to carry out modifications of such concessions.
- To ensure that access to services is competitive and transparent.
- To fix and update base tariffs for residential/commercial users and for small industry users (less than 200 000 cubic metres per year). The Authority is not responsible for industrial tariffs.
- To set tariffs for third party access to the grid.
- To publish directives on unbundling of accounts for the various services offered and to verify the cost of each service.
- To ensure that supply conditions are widely publicised.
- To deal with consumer complaints.
- To set and enforce directives for service quality standards.
- To ensure that all distribution companies render services according to public service rules, in particular those related to equal and impartial treatment of customers and continuous and regular service.

Pricing for small customers (consuming less than 200 000 cubic metres per year) is based on a methodology applied by the gas distribution companies aimed at standardising tariffs and at balancing the LDCs' revenues and costs. LDCs are allowed to pass through some costs, and, in 1993, elements of price capping were introduced to encourage cost minimisation. Gas tariffs for heating are priced against light fuel oil, and tariffs for hot water and cooking are lower than those for

heating. Gas prices differ substantially among regions. In 1997, there were over 1 100 tariff areas, and the tariffs varied between them by as much as a factor of two.

The price of natural gas sold by SNAM to LDCs and to industries is currently decided through a process of collective negotiation between suppliers and customers, resulting in medium- to long-term contracts which may be revised before their expiry, generally only in exceptional cases. The price is subject to a form of regulatory supervision introduced by a 1974 government resolution (the *sorveglianza*), whereby public authorities are not involved in the price negotiation but can intervene at their discretion when the market conditions require it or in the event of a dispute. Sales prices are indexed to the price of oil products and are updated every one or two months depending on the sector. SNAM, with over 99% of the market supplying large industries and LDCs, is a price-maker and independent supplier prices are generally closely aligned.

Natural gas supply to industrial plants consuming from 0.2 to 50 mcm per year is based on collective contracts between SNAM and the industrial confederations (Confindustria and Confapi). Sales to power generators are based on three types of contracts negotiated specifically with ENEL, with Federelettrica (representing the municipal generators) and with Unapace (representing the autoproducers)[27]. Gas sales to large industrial customers (above 50 mcm per year) are negotiated on an individual basis.

LDC sales contracts for subsequent sale to the residential, commercial and small industry consumers, are based on price agreements with the Association of Italian Municipalities (Anci), the Association of Public Distributors (Federgasacqua)[28] and the private associations (Anig and Assogas) representing the different distributors. In general, LDCs with lower consumption per user pay a lower price for their gas than companies with higher consumption per user.

Natural gas prices for households (and for industry since 1988) have increased (Figure 28). These prices are high in comparison with other IEA European countries, mainly because of high taxes, in particular in the household sector, where they account for more than 40% of the total price (Figures 28 and 29).

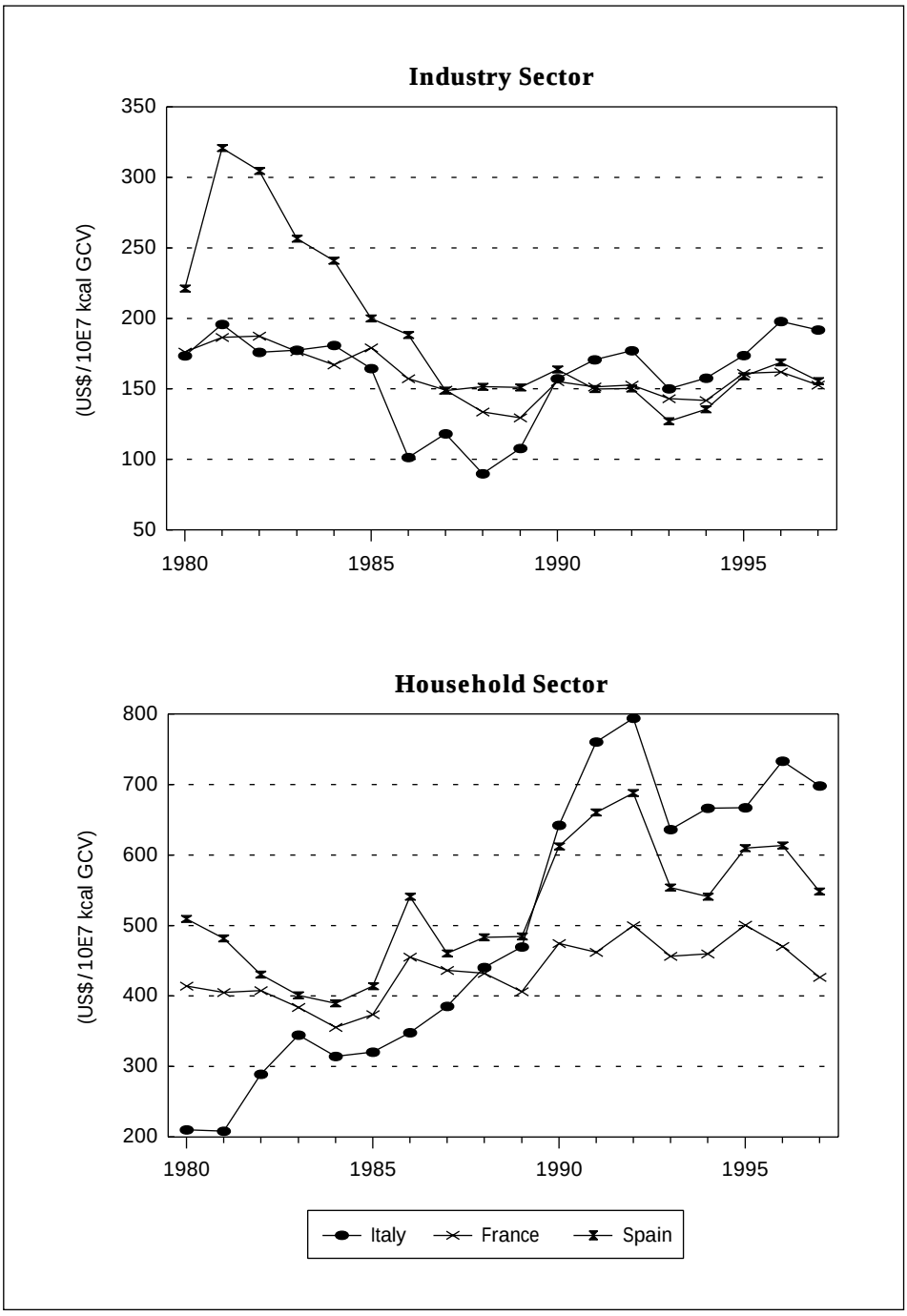
Tax rates for natural gas vary by sector, by use and by geographical location (see Chapter 4). In the residential/commercial sector, excise, regional and value added taxes are lower on gas for cooking and water heating than for heating purposes. Consequently, price increases with volume for small consumers as they move from one category of gas use to another.

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27. In 1998, ENI and Unapace signed new agreements on the transport of gas to power producers. This agreement is effective from June 1998 to end December 2006. It renews existing long-term contracts (10 to 15 years) and includes shorter-term contracts (3 years). The price for access has also been reduced.
28. The agreement with the gas distributors also covers sales to large hospitals consuming over 300 000 cm per year.

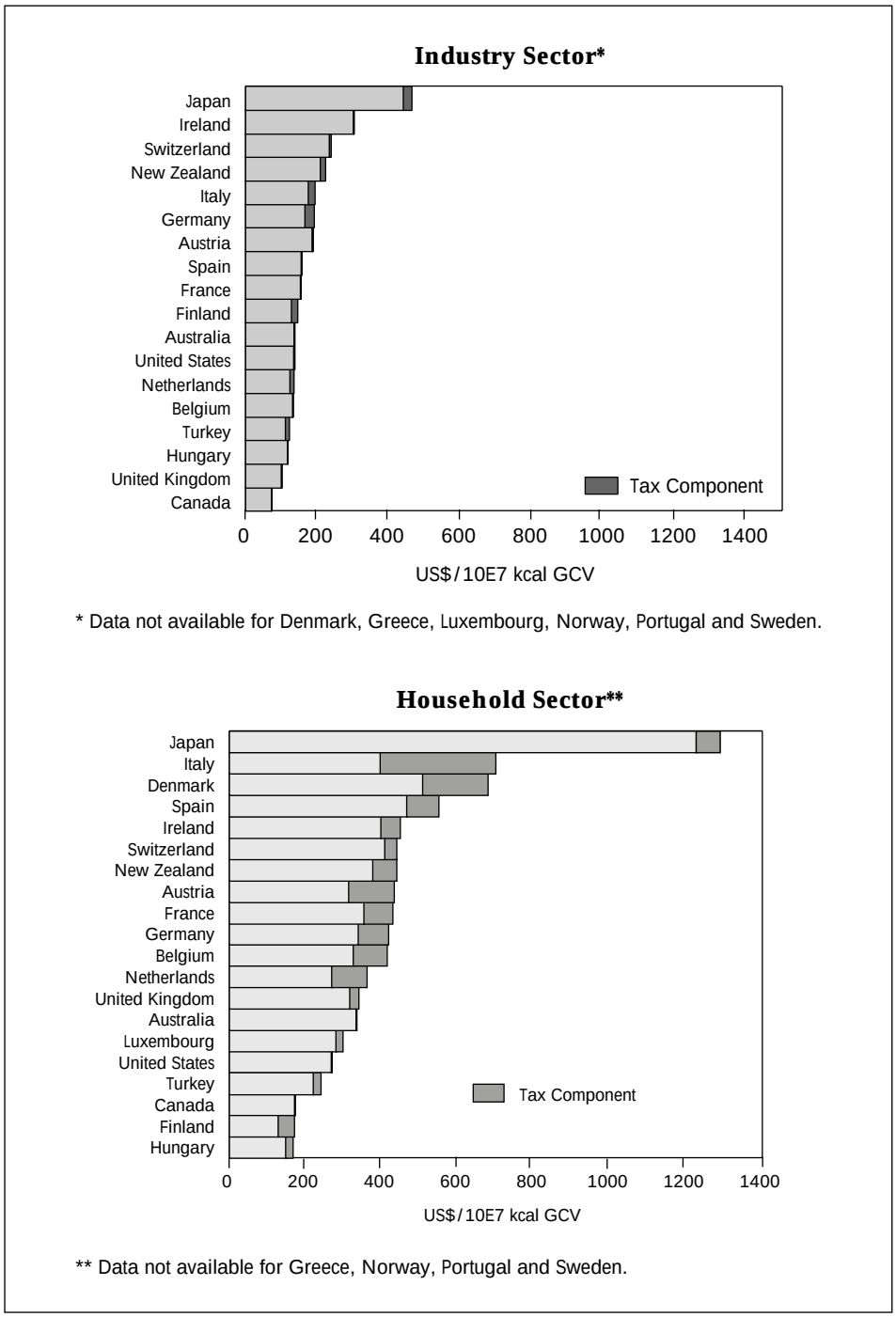
Figure 28

Gas Prices in Italy and in Other Selected IEA Countries, 1980-1997



Note: In 1993, the Italian and Spanish currencies fell against the US$.
Source: *Energy Prices and Taxes*, IEA/OECD Paris, 1999.

Figure 29
Gas Prices and Taxes in IEA Countries, 1997



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

In the industry sector, the price of natural gas is much lower than the price of light fuel oil[29] but is higher than the price of low sulphur fuel oil and steam coal (Table 11). In the household sector, there are regional disparities, but in general the price of natural gas is lower than the price of light fuel oil (Table 12). High taxes on light fuel oil in this sector have facilitated gas penetration (see Chapter 4). There are no recent data for the price of natural gas and heavy fuel oil for electricity generation.

Table 11
Energy Prices in the Industry Sector, 1996-1998
(L 1 000/toe)

	Light Fuel Oil		*Low Sulphur Fuel Oil*		*Nat. Gas*		*Steam Coal*	
	Incl. Taxes	*Excl. Taxes*	*Incl. Taxes*	*Excl. Taxes*	*Incl. Taxes*	*Excl. Taxes*	*Incl. Taxes*	*Excl. Taxes*
1996	1 365.2	483.1	299.4	252.6	339.3	310.6	122.7	122.7
1997	1 389.3	507.2	287.3	240.4	362.8	331.6	130	130
1998	1 327.9	445.8	246.6	199.7	330.7	298.4	n.a	n.a

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

Table 12
Energy Prices in the Household Sector, 1996-1998
(L 1 000/toe)

	Light Fuel Oil		*Nat. Gas*		*Electricity*	
	Incl. Taxes	*Excl. Taxes*	*Incl. Taxes*	*Excl. Taxes*	*Incl. Taxes*	*Excl. Taxes*
1996	1 624.6	483.1	1 257.1	691.1	3 188.4	2 382.6
1997	1 656.7	507.2	1 321.1	748.5	3 154.7	2 317.4
1998	1 592.7	445.2	n.a	n.a	n.a	n.a

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

REFORMS

In 1998, the Regulatory Authority for Electricity and Gas modified the base tariffs for small consumers. Natural gas prices were previously linked to the domestic price of light fuel oil which has increased more than the import price. The Regulatory Authority linked gas prices to the import prices of light fuel oil and gas prices fell. The Authority plans to modify the existing tariff system in 1999 to better reflect the costs of transport, operating conditions and service. Tariffs will

29. This leads to the removal of light fuel oil in industry in the areas where natural gas is available.

continue to be capped. Some price reduction for low-income customers may be implemented.

In May 1999, Parliament mandated the Government to implement the EU Directive on Natural Gas within one year under the following conditions:

- To set rules to guarantee the continuity, the quality and the security of public service which will be monitored by the Regulatory Authority;
- To ensure that there will be no discrimination between enterprises for building and managing gas plants and infrastructures;
- To ensure the security of supply, to promote the building of new infrastructure for production, storage and imports, and to foster competition and the rational use of existing facilities;
- To unbundle the accounts for import, transport and storage activities and to separate the integrated firms if it is useful to develop the domestic market;
- To guarantee transparent and non-discriminatory regulated access for third parties to gas infrastructure;
- To ensure that the opening of the national market takes place in the framework of European integration and incorporates the principle of reciprocity to avoid imbalances and discriminations.

CRITIQUE

Gas demand in Italy has doubled in the past fifteen years. Natural gas use has increasingly substituted for oil demand, thus reducing Italian oil dependency and increasing energy security of supply. Natural gas import sources and routes are also becoming more diverse. Although SNAM remains the dominant importer, ENEL and Edison are becoming more active in gas imports, adding diversity to this market. Italy is still expected to remain very dependent on Algerian and Russian gas, which is expected to account for two-thirds of gas supply in the future. Signed contracts with these two countries are quite substantial and gas from other sources may not be competitive.

Domestic gas production, which amounts to a significant share of gas supply, is valuable for supply security. The Government should ensure that procedures for granting licences for hydrocarbon exploration and production activities are not too lengthy and cumbersome and that the fiscal system encourages exploration and production. Increased international natural gas links, new import facilities, interruptible consumers and gas storage are all important in enhancing security of gas supply. The Government should ensure that procedures are streamlined for granting authorisations for the building of gas infrastructure such as LNG plants or

pipelines. The Government should continue to monitor the evolution of the gas market to ensure security of gas supply.

Competition should be introduced in the gas market as soon as possible to complement the reform in the electricity sector. Because of the links with the electricity market, a non-competitive gas market could impede competition in the electricity market. Natural gas is expected to take a large market share in electricity generation. The Government should therefore avoid allowing a company that benefits from market power in the gas sector to take an advantageous position in the electricity sector.

There is no legal monopoly in the Italian gas sector. The Law 9/91 allows third party access in limited circumstances so that there are several companies active in the gas market. This constitutes a good basis for developing competition. However, the major impediment to the creation of a competitive gas market is SNAM's dominant position in gas imports and transport, and its important share in distribution. ENI/AGIP's dominant position in storage also plays a role. As SNAM is fully owned by ENI, competition is not possible between SNAM and ENI/AGIP. Because of SNAM's dominant position, several measures are necessary to ensure effective competition and in particular to ensure that end-users fully benefit from this competition through lower, cost-reflective tariffs and improved services.

First, the present government-supervised system of negotiation between SNAM and large customers (industries and LDCs grouped in associations) should be switched to a system of customer choice with ensured third party access. With the privatisation of SNAM, control should be delegated to the Regulatory Authority for Electricity and Gas. Parliament rightly mandated the Government to implement regulated third party access, where customers have transparent information on access, rather than the system of negotiated access, where customers negotiate directly with SNAM, which has the dominant position. Regulated access should be ensured for pipelines, storage and gasification plants, so that both incumbents and newcomers are treated equally. Fair conditions of access should also be set by the Regulatory Authority. Cost-reflective tariffs for transit should include an adapted capacity element in order to avoid bottlenecks.

The Government expects gas demand to increase more than forecast due to measures to reduce CO_2 emissions and to the introduction of competition in the electricity market. However, SNAM's take-or-pay contracts are likely to cover a large amount of gas imports. These contracts could be an impediment to other companies wanting to import and market gas. Gas companies may want to take advantage of the existing oversupply in the European gas market and to buy gas at prices lower than those in SNAM's contracts. If, however, third party access to pipelines can be denied because of difficulties with the existing take-or-pay contracts, there will not be any competition to SNAM.

The Government should seek means to reduce the effects of take-or-pay contracts which impede competition. At the minimum, take-or-pay contracts should not be used as a pretext to close the market by refusing pipeline access. Reasons for

refusing access should be kept to a minimum, i.e. to a lack of capacity; otherwise the State could purchase these contracts and resell them through a bidding system.

Second, supply, transmission, distribution, and non-gas activities should be unbundled to allow gas companies to compete on a level playing field. At the distribution level, gas sales would then be unable to subsidise other activities such as water supply. When distribution is undertaken directly by municipalities, the gas distribution activity should be separated from the administration of the municipality as an independent legal entity and should be corporatised[30].

Third, the largest possible degree of market opening should be sought to encourage competition. In particular, the Government could allow small gas consumers to group together in order to become eligible, similar to small electricity consumers (see Chapter 7).

Fourth, gas retail tariffs for captive customers should be strictly regulated to avoid cross-subsidies between captive customers and eligible customers. The Regulatory Authority for Electricity and Gas has already implemented changes, including lower tariffs for small consumers, and further measures are expected to better reflect the cost of gas supply.

The independence of the Regulator should be ensured. The Regulator should be given enough power to track down anti-competitive practices and to take appropriate measures. Co-operation is also needed with the Antitrust Authority which is responsible for complaints against abuses of dominant position (see Chapter 3).

RECOMMENDATIONS

The Italian Government should:

- ☐ Continue to monitor the evolution of the gas market to ensure security of supply.
- ☐ Introduce competition into the natural gas market as soon as possible.
- ☐ Seek means to reduce the effects of take-or-pay contracts which impede competition.
- ☐ Implement regulated third party access to ensure maximum transparency in transmission and distribution tariffs and to prevent any discrimination between users. These tariffs should be designed to allow for additional investment and to prevent any bottlenecks in transport.

30. Corporatisation of public enterprises implies that gas companies are managed according to the same rules that apply to private companies, free of political interference in their corporate strategy, in investment decisions and in daily management.

- ☐ Ensure effective unbundling between supply, transmission, distribution and non-gas activities to create a level playing field for competition in gas supply. Ensure that all gas companies are effectively corporatised.

- ☐ Promote the largest possible degree of market opening when defining eligible consumers.

- ☐ Ensure the independence of the Regulator. Its role in promoting effective competition in the gas market should be well recognised and respected.

7

ELECTRICITY AND RENEWABLE ENERGY SOURCES

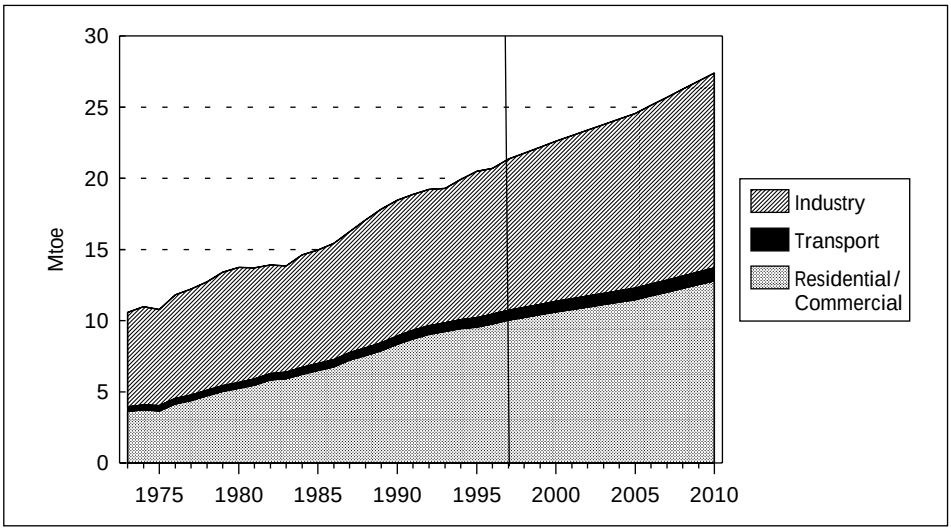
DEMAND

In 1997, electricity demand was 271.4 TWh, a 3.2% increase over 1996 and a 15.5% increase over 1990. Since 1990, electricity consumption has increased more quickly in the residential/commercial sector than in industry (Figure 30), but industry has remained the largest electricity consumer (49.8% of electricity consumption in 1997). Italy's electricity consumption per GDP is low in comparison with the IEA European average, but this ratio is increasing (Figure 11 in Chapter 4).

Electricity consumption is higher in the north of the country. Consumption per inhabitant is highest in Val d'Aosta and Friuli-Venezia Giulia and lowest in Sicily and Campania. Consumption per inhabitant and per GDP is comparable to the EU average in the north and the centre of the country but is lower in the south.

There is excess production of electricity in the northeast of Italy (due to hydro plants) as well as in Sicily and Calabria (due to thermal plants). Electricity flows from the north to the centre and south, and from Sicily to the south of the peninsula. In 1997, there were 9 590 km of 380 kV lines and 13 037 km of 220 kV lines (Figure 31).

Figure 30
Electricity Consumption by Sector, 1973-2010



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

Figure 31

Map of the Electricity Grid



Source: ENEL.

INDUSTRY STRUCTURE

The electricity sector is dominated by ENEL, the state-owned utility (see box). There are also about 760 electricity suppliers (excluding autoproducers) as follows:

- 165 municipal utilities distribute electricity to 2.4 million customers in 195 municipalities[31]. 17 municipal companies generate and distribute electricity. The largest municipal companies are in Rome (ACEA-Rome), Milan (AEM-Milan) and Turin (AEM-Turin). Others are in smaller towns mainly in the north of the country (e.g, Brescia, Modena, Bolzano, Verona, Trieste, Parma, San Remo, Vercelli, Cremona, Voghera, Seregno and Sondrio). In the three largest cities and in some small towns, there are two distribution companies, ENEL and the local distribution company. The largest municipal utilities have announced plans for privatisation. In the north, municipal utilities plan to develop joint management.

- There are about 599 independent generators, mostly private, which produce electricity mainly from small hydro plants. Most of these companies were not nationalised in 1962 when ENEL was created from different companies.

ENEL

ENEL is the vertically integrated state-owned electricity utility. It was corporatised and became a joint stock company in 1992. ENEL reports to the Ministry of Treasury, which is the shareholder representing the State. There has been no decision on its privatisation, although several plans have been made since 1994.

ENEL is the second largest electricity utility in Europe after Electricité de France. Since the early 1990s, the company has made efforts to increase productivity before privatisation. Staff levels decreased from 114 082 in 1988 to 81 194 in March 1999.

ENEL is the largest Italian company in terms of operating income, which was L 8 689 billion in 1997 (L 8 235 billion in 1996). Return on invested capital after amortisation was 11.4% in 1997 (7.9% in 1996). ENEL's investments have decreased since 1992, mainly in generation and in distribution. In 1998, investments were L 5 871 billion.

In 1997, ENEL owned 80% of Italy's electricity generation capacity (82.3% in 1990) and provided 74% of Italy's electricity generation (84% in 1990). ENEL owns the 380 kV electricity grid, 81.5% of the 220 kV grid and 93% of the distribution grid.

ENEL signed its first natural gas contract with Sonatrach (the Algerian oil and gas company) in 1992 for a supply of 4 bcm per year for 20 years beginning in 1996. A second contract with Nigeria was concluded in 1993 and provided for a total LNG import equivalent of 3.5 bcm per year between end 1999 and 2022.

31. They own 7% of the total distribution grid.

The functioning of the electricity sector before February 1999[32] was as follows (Figure 32):

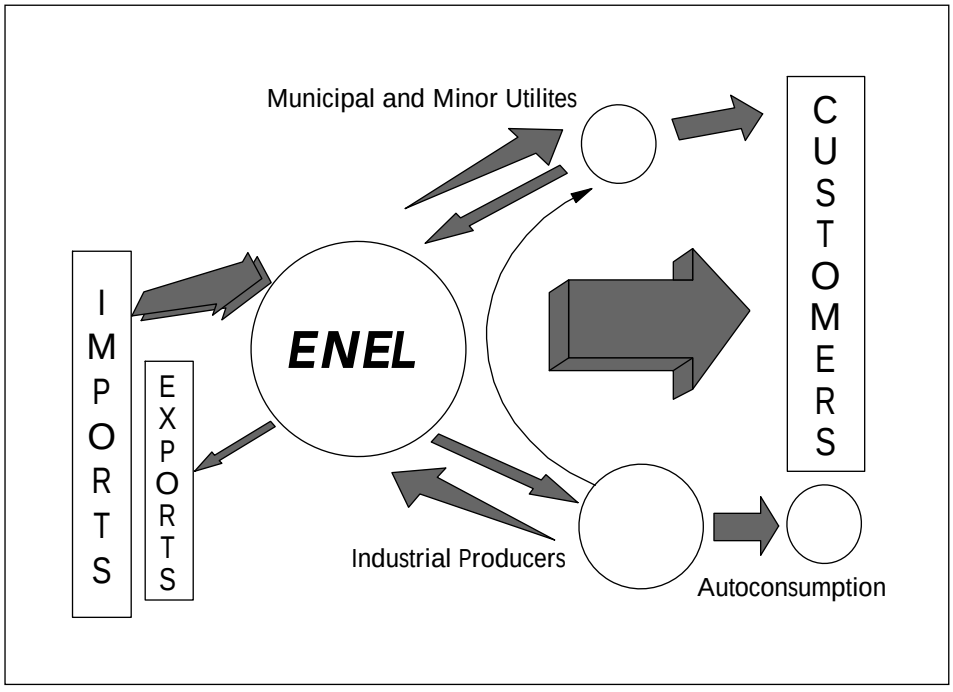
- Prior to 1999, ENEL had a *de facto* monopoly on imports and exports; the Ministry of Industry only granted ENEL concessions for electricity imports and exports. ENEL's 20-year concession for electricity imports ended in February 1999.

- ENEL had the obligation to carry electricity for third parties in limited circumstances, i.e. from an autoproducer to its subsidiary. ENEL applied the conditions of access to its network, including the tariff, according to a series of regulations.

- Municipal generators could sell their electricity to their own distribution network, to another municipality or to ENEL.

- Industrial producers sold their excess electricity to ENEL[33].

Figure 32
Functioning of the Italian Electricity Industry until February 1999



Source: ENEL.

32. In February 1999, the Legislative Decree implemented the EU Electricity Directive (see below).
33. Small quantities of electricity were also sold to other utilities.

Capacity and Generation

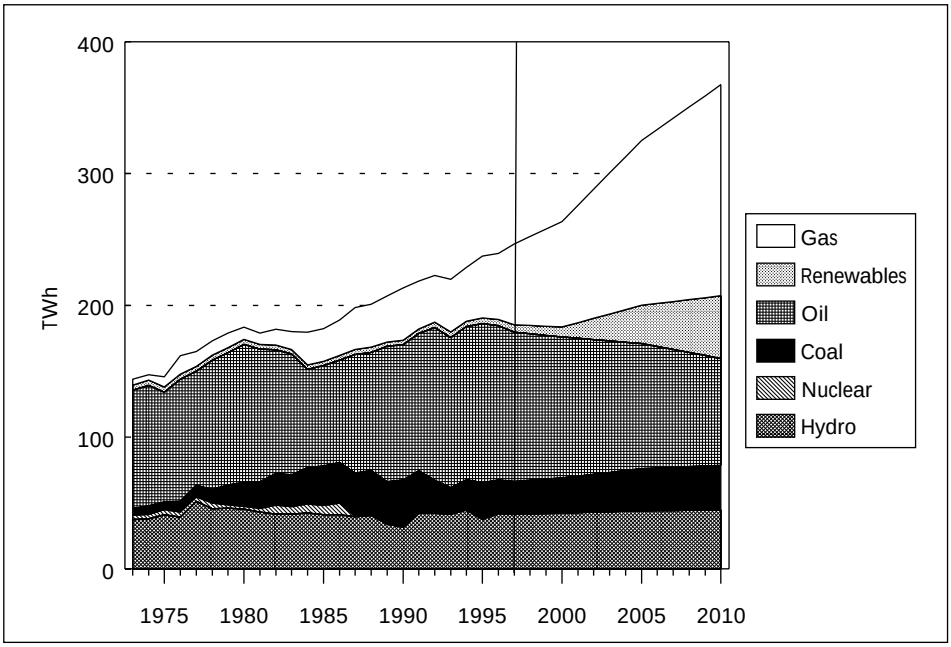
In 1997, electricity capacity was 70.4 GW and net electricity generation was 239.3 TWh. Heavy fuel oil is the main fuel for electricity generation (Figure 33), mainly for base load. Demand for heavy fuel oil rose until 1995 when it levelled off, accounting for 46% of electricity generation in 1997. Italy has the second highest share of oil use for power generation in the OECD area after Mexico. Gas use

Coal Use in Power Generation

The opposition of some municipalities to the use of coal for power generation forced the owners of the plants to enter into negotiations with the municipalities. For example:

- At Brindisi, the generation of electricity from coal at the 2 400 MW multi-fired power plant was allowed if some natural gas was also used.
- At La Spezia, operation of the 2 000 MW coal-fired power plant was limited. In 1997, an agreement was reached between ENEL and the local authorities to continue the conversion of two 320 MW units into two 600 MW CCGTs, to equip a 660 MW coal unit with desulfuration and de-NO_x units and to decommission a second 660 MW coal unit.

Figure 33
Electricity Generation by Fuel, 1973-2010



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

increased more than 50% between 1990 and 1997, accounting for 24.9% of electricity generation in 1997. At the same time, coal use decreased more than 30%. Some municipalities refuse to allow ENEL to use coal for generation (see box).

Nuclear Power

Following a 1987 referendum, the Government placed a moratorium on electricity generation from nuclear energy until 1992. Four nuclear power plants were closed, and the construction of two others was stopped. There are no plans to restart the nuclear programme.

In May 1998, the Regulatory Authority for Electricity and Gas published a report on the cost of abandoning nuclear power. By 1998, L 15.32 trillion had been paid to ENEL and to contractors for the cost of work-stoppage and for decommissioning of the plants. The Authority decided the following:

- The remaining compensation payments for work-stoppage should be paid to ENEL before the end of 1999.
- Other responsibilities (storage of 1 300 tonnes of nuclear waste and decommissioning) should be transferred to a new public company owned by the Ministry of Treasury. These responsibilities, including finding a storage site for the 1 300 tonnes of nuclear waste, must be paid for with public funds.

1991 Laws for Building Generation Capacity using Renewables and Assimilated Sources

To make up for the loss of nuclear capacity and to avoid increasing dependence on electricity imports, the National Energy Plan of 1988 (PEN-1988) envisioned the repowering of old power plants and the building of new capacities. In 1990, a plan for increasing the generation capacity of ENEL was established. This plan was followed by partial deregulation for co-generation and generation from renewable sources (see below). The "Accordo Quadro", between the administration and some major private electricity generators, also encouraged the generators to increase their capacity.

Law No. 9 of 1991 (Law 9/91) encouraged the development of electricity generation from renewable sources, assimilated sources and co-generation, allowing for a certain number of new plants to sell power to ENEL. A selection procedure was implemented every six months: independent projects were proposed to ENEL who, considering how much new capacity could be connected to the network, proceeded to select some projects for approval by the Ministry of Industry. These projects have been ranked from "A" (renewable sources, including small hydro) to "B" (tar gasification) and "C" (process fuels and industrial waste) and to "D" (large co-generators). Within the same rank, the most efficient plants were chosen. A-type

plants and plants with a capacity less than 10 MW were given highest priority. D-type plants were subject to an "efficiency index" whose terms were fixed by a government decree. Municipalities could also build plants with the approval of ENEL. In 1997, this system was suspended for projects decided after the second half of 1995, until it is adapted to the new electricity regulatory framework.

In 1998, construction authorisation was granted to more than 8 000 MW, out of 11 000 MW proposed by ENEL (Table 13). A large portion of this increased capacity is expected to be completed by 2002. Construction authorisation has not been granted to the other projects.

Table 13
New Electricity Capacity Under Law 9/91
(MW)

	Agreed	*Completed and Planned (Cumulative)*			
		31/12/98	*1999*	*2000*	*After 2002*
Category A					
Hydro	690.7	402	470	504	670
Wind	708.9	152	326	511	701
Biomass	479.8	22	134	315	415
Biogas	93.8	58	78	86	93
Wastes	673.2	43	101	356	640
< 1 MW	146	0	0	0	172
Others [a]	112.4	66	88	121	180
Total Renewables	*2 904.8*	*743*	*1 196*	*1 893*	*2 872*
Category B [b]	1 310	0	1 315	1 315	1 315
Category C [c]	454.2	152	152	454	454
Category D [d]	1 170.2	779	978	1 113	1 157
Previous Agreements [e]	2 517.9	2 365	2 365	2 365	2 511
Total General [f]	**8 357.1**	**4 039**	**6 006**	**7 140**	**8 310**

a) Co-generation from gas, LPG and hydrocarbons from small isolated wells.
b) Tar gasification.
c) Energy recovered from process fuels and industrial waste.
d) Co-generation over 10 MW.
e) Agreements on co-generation capacity signed with Sondel, Edison, Fiat and Ilva before the publication of the Decree.
f) In addition to this total, ENEL was allowed to build some plants using renewable energy. A capacity of 1 289 MW has been agreed upon and 692 MW was completed at end 1998.

Source: Country submission.

Law No. 10 of 1991 (Law 10/91) allows plants authorised by ENEL under Law 9/91 to sell electricity to ENEL at a regulated price. The Directive No. 6 of 1992 (CIP 6/92) provides the following buy-back tariff to these plants:

- A subsidy is granted for the first eight years of the plants' operation. The amount depends on the type of plant. A second sum is granted which is equal to the avoided cost of using fuel by ENEL during the contractual period. This period varies by project. Both subsidies are financed by electricity prices during the contractual period.

- A sum equal to ENEL's avoided costs of investment, operation and maintenance is paid by ENEL to the plants during the contractual period.

In January 1997, a Ministerial Decree suspended the Directive CIP 6/92. The buy-back tariff is being revised by the Regulatory Authority for Electricity and Gas (see below). The eight-year subsidy is being maintained for projects already approved.

Increase in Electricity Capacity and Generation

Electricity capacity increased 18.3% between 1990 and 1997. ENEL accounted for most of this increase. Net electricity generation increased 17.4% between 1990 and 1997. Most of the increase came from autoproducers' generation. ENEL's electricity generation increased only 3.5% (Table 14).

Table 14
Electricity Capacity and Generation by Category of Producers, 1990-1997

	1990	*1997*
Capacity (GW)		
ENEL	49.0	56.2
Municipal Utilities	2.5	2.7
Autoproducers	7.7	10.8
Independent Power Producers	0.3	0.7
Total Capacity	**59.5**	**70.4**
Net Generation (TWh)		
ENEL	171.2	177.2
Municipal Utilities	7.1	8.9
Autoproducers	25.3	51.1
Independent Power Producers	0.3	2.1
Total Net Generation	**203.9**	**239.3**

Source: Country submission.

In the past decade, ENEL has increased the number of its multi-fired power plants to avoid dependence on any single fuel (Table 15). In 1997, total capacity (mostly owned by ENEL) was 24.3 GW, a 49% increase over 1990. Heavy fuel oil and natural gas power plants accounted for 70% of total multi-fired power capacity in 1997. In 1992, it was decided that the nuclear power plant of Montaldo would be transformed into a multi-fired power plant. No new multi-fired plants are planned in the future.

Laws 9/91 and 10/91 provided a strong incentive for the development of autoproducers, mainly industrial co-generators (Table 16). There are about 595 electricity autoproducers, mainly privately owned. Edison is the second largest electricity producer in Italy, followed by Agip-Enichem.

Table 15
Multi-fired Generating Capacity, 1990-1997
(GW)

	1990	*1996*	*1997*
Coal/ Heavy Fuel Oil	6.02	4.91	4.91
Heavy Fuel Oil/ Natural Gas	9.24	16.18	17.00
Coal/Heavy Fuel Oil/ Natural Gas	0.98	2.10	2.34
Total	**16.24**	**23.28**	**24.25**

Source: *Electricity Information*, IEA/OECD Paris, 1997.

Table 16
Electricity Co-generation Capacity and Production by Industrial Branch, 1990-1997

	1990		*1996*		*1997*	
	MW	*GWh*	*MW*	*GWh*	*MW*	*GWh*
Chemicals	2 326	9 548	1 659	6 604	1 612	6 400
Metallurgy	192	804	710	1 685	713	4 807
Oil	439	1 614	2 883	16 714	3 869	21 775
Paper	545	1 654	744	2 936	758	3 354
Other	1 037	2 520	1 095	3 259	1 114	3 524
Total	**4 539**	**16 140**	**7 091**	**31 198**	**8 066**	**39 860**

Source: Country submission.

Renewable Energy Sources

In addition to the organisation of specific measures for the building of new capacities and to initiating favourable buy-back tariffs, Law 10/91 provided for two other measures to promote renewables:

- Granting subsidies of 30 to 80% of the capital cost of a renewable energy plant.
- Requiring regions to produce regional energy plans identifying the potential of renewables, including hydro, energy from waste and district heating possibly based on renewable sources.

Given budget constraints, very few subsidies have been granted (see Chapter 4). Government expenditures were mostly dedicated to R&D on renewable sources, and they amounted to L 63.5 billion in 1997 (15% of energy R&D)[34]. The increase in energy production from renewable sources has been due to the measures put forth in Law 9/91 and to the generous buy-back tariff for electricity from renewable sources.

In 1998, the Italian Government agreed to build a total capacity of 2.9 GW, mostly hydro (Table 13). Hydropower generated around 42 TWh in 1997, i.e. about 17% of total electricity. In 1997, hydro capacity was 20 GW and is expected to grow to 23.6 GW by 2010. However, hydropower is a very mature technology in Italy, and most available significant hydro sites have been exploited.

Energy supply from non-hydro renewable sources amounted to 4.2 Mtoe in 1997 (2.6% of total supply). Supply from these sources increased rapidly over the past decade, i.e. more than 30% since 1990. However, in 1997, the share of non-hydro renewable sources in Italian energy supply was lower than the IEA European average. Non-hydro renewable sources are used mainly for electricity generation (see box).

Trade

In 1997, net electricity imports were 38.8 TWh, a 11.8% increase over 1990, making Italy the second largest importer of electricity in the OECD area after the United States (Figure 34). Net electricity imports accounted for about 14% of demand in comparison with 15% in 1990. Electricity is imported from France (17.3 TWh in 1997), Switzerland (20 TWh), Austria (1.6 TWh) and Slovenia (1 TWh). A small quantity (1 TWh in 1997) is exported, mainly to Slovenia (0.6 TWh). Until February 1999, electricity was imported by ENEL, mostly through long-term contracts signed after the 1987 nuclear moratorium.

Interconnection capacity with neighbouring countries is around 10 GW. The main interconnections are with France (4.4 GW) and Switzerland (3.8 GW). According to ENEL, the overall exchange capacity for continuous loading is about 5 GW. The building of a 500 kV line between the south of Italy and Greece is under way, and completion is expected for the end of 2000.

FORECASTS

Electricity Generation and Imports

According to government forecasts, electricity generation is expected to increase more than 3% per year between 1997 and 2010, reaching 367.5 TWh in 2010. This growth is

34. Regions have also granted some subsidies to renewable sources.

Energy Production from Non-Hydro Renewables

In 1997, geothermal energy amounted to 2.5 Mtoe, contributing 1.5% to Italy's TPES, and used mainly for electricity generation. In percentage terms, geothermal energy's contribution to total energy supply is the second highest in IEA countries after New Zealand.

In 1997, energy production from domestic biomass was 1.1 Mtoe. Including imports, total energy use from biomass was 1.4 Mtoe (0.8 Mtoe in 1990). The majority of this was used in the residential sector, although some quantities were also used in coke ovens and in industry. Some biomass was also used for electricity generation and in CHP plants and produced 436 GWh of electricity in 1997 (0.18% of total electricity generation). Only commercial wood is accounted for in official statistics, and actual wood consumption is estimated to be four times the official data.

The use of municipal and industrial waste was 0.2 Mtoe in 1997 and generated 384 GWh of electricity, i.e. 0.16% of electricity generation.

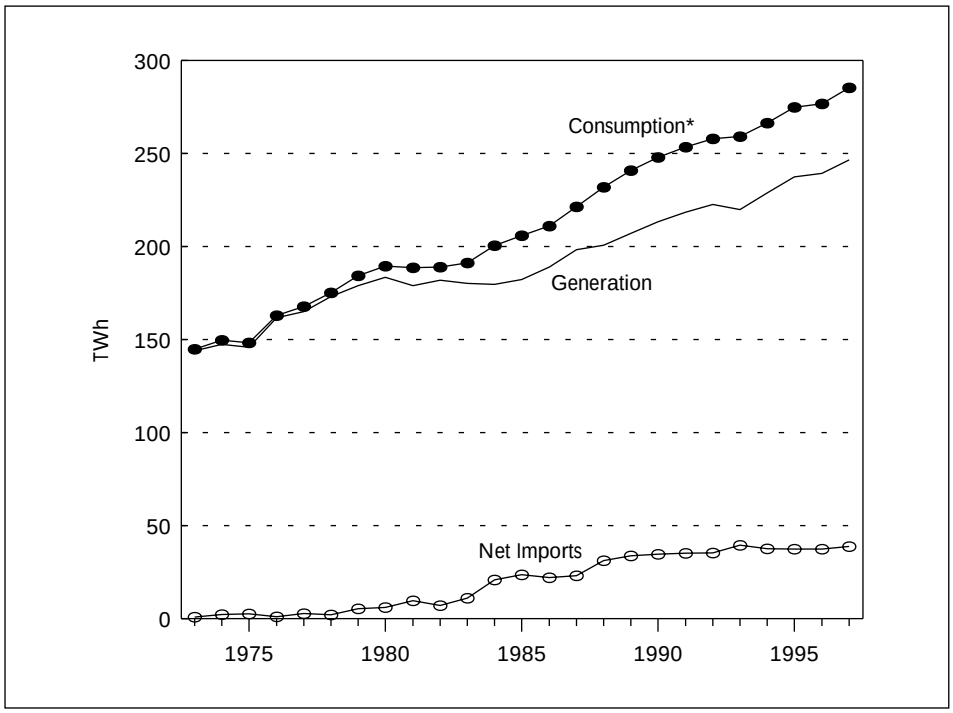
Wind-generated electricity is limited, although its use is rising. In 1997, wind power generated 118 GWh of electricity in comparison with 2 GWh in 1990. Because of more favourable wind conditions, much of the new capacity is planned to be built in rural, mountainous regions. In these areas, however, the distribution grid is not well developed and substantial reinforcement would be needed in order to be able to accept significant quantities of wind electricity.

Total photovoltaic (PV) generation stood at 6 GWh in 1997. There are over 7 MW of grid-connected photovoltaic plants in Italy and more small plants for water desalination. In 1995, a 3.3 MW grid-connected PV plant was commissioned at Serre which can produce approximately 5 GWh per year.

Limited support for liquid biofuels has been available since 1993. A fixed annual quota of diester is exempt from excise tax (the amount was set at 125 kilotonnes in 1994). Subsidies of L 15 billion were allocated by the Government for the production of diester from set-aside land. Ethanol, however, does not benefit from any tax exemptions, so its production is negligible. There are plans to increase support to biofuels.

expected to be higher than growth in electricity consumption (below 2% per year). Generating capacity is expected to increase from 70.4 GW in 1997 to 73.9 GW in 2000 and 81.3 GW in 2010. Coal is expected to reduce slightly its share in generation, while the share of natural gas is expected to increase from 24.9% in 1997 to 43.6% in 2010 with the building of new CCGT plants. Oil's share is expected to fall by more than half, to 22%. Electricity imports are expected to decrease.

Figure 34
Electricity Generation, Consumption and Net Imports, 1973-1997



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

The implementation of the CO_2 tax (see Chapter 4) may change the fuel mix by further increasing the share of natural gas at the expense of oil and coal. In addition, as the CO_2 tax does not apply to electricity imports, net imports may be larger than forecast.

Renewable Energy Sources

In the policy framework to reduce CO_2 emissions, a White Paper on renewable sources was released in November 1998. The paper set the goal of doubling energy production from renewable sources between 1996 and 2010, leading to an annual reduction in CO_2 emissions of 20 million tonnes (including non-electric use of renewable sources such as wood used for heating). Required investments by 2010 are estimated to be around L 50 trillion (in constant terms). According to forecasts from the Ministry of Industry, the contribution of non-hydro renewable sources to electricity generation is expected to surge from 2.2% in 1997 to 13% in 2010. The most significant increases are expected to be in power generation from biomass, followed by hydro, wind energy, gothermal, energy from waste and solar energy (Table 17).

Table 17
Proposed Energy Production from Renewables and Related Costs, 1996-2010

	1996 (Mtoe)	*1996 (MWe)*	*2010 (Mtoe)*	*2010 (MWe)*	*1996-2010 (L Billion 1997)*
Hydro >10 MW	7.3	13 909	8.2	15 600	9 350
Hydro <=10 MW	1.95	2 159	3.01	3 400	6 600
Electricity from Geothermal	0.83	512	1.62	1 000	2 400
Wind	0.007	69.7	1.32	3 000	4 600
Photovoltaic	0.003	15.8	0.06	300	3 150
Elec. from Biomass+Biogas	0.08	171.9	2.64	2 000	7 200
Electricity from Waste	0.053	80.3	0.79	800	5 600
Geothermal	0.213		0.4		1 000
Solar Thermal	0.007		0.2		2 900
Biomass Thermal	2.150		3.5		5 300
Wastes, Thermal	0.096		0.2		1 000
Biofuels	0.045		2		500
Total	**12.73**	**16 917.7**	**23.94**	**26 100**	**49 600**

Note: Data may differ from the Energy Indicators (see Annex A) due to different methodology and conversion factors.
Source: *White Paper on Renewable Energy*, 1998.

REGULATORY REFORMS BEFORE FEBRUARY 1999

Abolition of ENEL's Monopoly

In 1992, a law provided for the corporatisation of ENEL and abolished its monopoly rights in generation, transport, distribution, imports and exports. The monopoly rights were replaced with concessions granted by the Ministry of Industry.

Under the Law of 1995, municipal utilities started to receive concessions from the Ministry of Industry instead of from ENEL. Electricity companies were required to unbundle their generation, transmission and distribution accounts.

The Regulatory Authority for Electricity and Gas

The Regulatory Authority for Electricity and Gas was created in 1995. In 1997, responsibility for tariff setting was transferred from the CIPE (Inter-ministerial Committee for Economic Planning) to the newly created Regulatory Authority. This Authority has the following responsibilities:

- Monitoring that services are provided under fair conditions, with special attention to small consumers.
- Setting maximum tariffs for electricity according to a price cap formula. The maximum tariff is the same for all consumers in each category.

- Setting tariffs for third party access to the grid.
- Setting buy-back tariffs.
- Making proposals on renewal, modification and suppression of concessions.
- Establishing and enforcing service quality standards and penalties for non-compliance.
- Dealing with customers' complaints.
- Advising the Government and Parliament on electricity issues.
- Setting directives for accounting methodology and unbundling.

Administrative Procedures for Building Power Plants

Prior to 1998, administrative procedures for building new industrial plants, including power plants, were complex and fraught with delays. With the aim of streamlining the process, the 1998 Legislative Decree on decentralisation (see Chapter 3) gave the regions the responsibility for licensing of plants below 300 MW_{th}. New plants over 300 MW_{th} still need authorisation from the Ministry of Industry, the Ministry of Health and the Ministry for the Environment.

TARIFF REFORM

Previous Tariff System

Before the tariff system was reformed, fuel costs, electricity import costs, the cost of electricity purchased from independent generators, and transport and distribution costs were passed to the final consumers through tariffs. The additional costs arising from the nuclear moratorium were added to the price of electricity. Since consumers bore the burden of these costs, utilities were given the incentive to increase electricity supply.

In 1961, a mechanism was set up to compensate companies for differences in generation costs. This mechanism became necessary as, on the one hand, the supply costs of several electricity companies differed and, on the other hand, the same national tariff system was applied across the country. Differences in variable costs accounted for most of the compensation; differences in fixed costs were only compensated for small island utilities. In total, the compensation system implied that small companies were reimbursing ENEL (L 600 billion in 1997). This system changed in 1997 (see below).

A special tariff (called a "social tariff") is set for households with a subscribed demand up to 3 kW. This social tariff extends to around 18 million households. Only 4 million households have not subscribed to the social tariff and thus pay higher electricity prices. This system is to be changed (see below).

Electricity prices for households increase with growth in demand, and households with low consumption pay a low price for electricity. However, prices for households who do not benefit from the social tariff are much higher (Table 18). According to the Regulatory Authority for Electricity and Gas, large industrial customers pay low electricity prices relative to the cost of supply, while small and medium enterprises pay high prices relative to the cost of supply.

Table 18
Electricity Tariff for Households
(1st January 1999)

		Up to 3 kW			
Tariff		*< 1 800 kWh*		*> 1 800 kWh*	
		< 1.5 kW	*1.5 kW< >3 kW*	*< 1.5 kW*	*1.5 kW< >3 kW*
1. Fixed Part	L/Month (US$/Month)	1 475 (0.89)	3 280 (1.98)	1 475 (0.89)	3 280 (1.98)
2. Price of kWh per Year					
< 900	L/kWh (US$/kWh)	38.90 (0.023)	39.90 (0.024)	38.90 (0.023)	39.90 (0.024)
900 – 1800		54.80 (0.033)	76.80 (0.046)	54.80 (0.033)	76.80 (0.046)
1 800 – 2 700		126 (0.076)	126 (0.076)	126 (0.076)	126 (0.076)
> 2 700		159 (0.096)	159 (0.096)	159 (0.096)	159 (0.096)
3. Additional Rate		20.20 (0.012)	20.20 (0.012)	70.60 (0.043)	70.60 (0.043)
		Above 3 kW			
		3 kW< >6 kW		*6 kW< >10 kW*	
1. Fixed Part	L/Month (US$/Month)	28 960 (17.45)		48 260 (29.08)	
2. Price of kWh per Year	L/kWh (US$/kWh)	159 (0.096)		159 (0.096)	
3. Additional Rate	L/kWh (US$/kWh)	70.60 (0.043)		70.60 (0.043)	

Notes: For every domestic consumer, L 8.3/kWh (US$ 0.005/kWh) is added for nuclear costs, L 6.4/kWh (US$ 0.0038/kWh) for the avoided cost of fuel and L 7/kWh (US$ 0.042/kWh) for the support to renewable sources.
For consumers of more than 10 kW, the price increases by L 24 130 (US$ 14.5) for any additional 5 kW.
For consumers between 3 kW and 4.5 kW, the fixed part is L 21 720 (US$ 13.1).
On 1st January 1999, 1 US$ = L 1 659.3.

Sources: Country submission and IEA calculations.

Revised Tariff System

At end 1997, the Regulatory Authority for Electricity and Gas started to revise the structure of electricity tariffs for end-use consumers. This reform was aimed at reducing costs to utilities, but some social considerations, e.g. smoothing regional differences, were maintained with minor modifications.

Under the revision, the full costs of generation are not passed directly on to consumers. A mechanism of standard costs was set to encourage electricity generators to use the cheapest fuel and to make efficiency improvements. Under the new mechanism, the Regulatory Authority calculates the average cost of using fuels according to a specific basket of fossil fuels used by all generators and to the average efficiency of thermal production. The calculation is changed every two months to account for price changes. Electricity import costs are based on generation costs at domestic thermal power plants.

This mechanism of standard costs is expected to have a substantial impact on fuel choice. At present, taking into account variable costs, the Regulatory Authority estimates that coal is the cheapest fuel, followed by heavy fuel oil and natural gas. This ranking will change if the CO_2 tax is fully implemented. According to the association of coal users, the CO_2 tax rate envisaged for 2005 will make the variable cost of using coal the highest, followed by the cost of using heavy fuel oil and natural gas. As competition equalises marginal costs, most of coal capacity and a large part of heavy fuel oil are expected to be eliminated. The CO_2 tax and the new tariff system would also increase hydro's competitiveness relative to generation from fossil fuels.

Companies are compensated for standard costs of generation. If their generation costs fall below the standard costs, they can benefit from the difference. The Regulatory Authority also plans to compensate utilities for the difference in costs of distribution according to standard distribution costs in defined areas.

The surcharge for the cost of the nuclear moratorium was reduced to an average of L 7.90/kWh in 1998 (L 8.3/kWh for consumers in the low voltage grid, 7.8 for the medium and 7.7 for the high voltage grid).

The Regulatory Authority for Electricity and Gas is revising the buy-back tariff for electricity from renewable sources and co-generation. In 1997 and 1998, it revised the calculation of ENEL's avoided costs to reflect the utility's decreasing costs of generating electricity. Buy-back rates in 1998 are shown in Table 19. European Commission estimates for 1997 prices paid for renewable energy sources are shown in Table 20.

In 1998, the Regulatory Authority released a report on tariffs for third party access to the grid. Transmission and grid connection tariffs will be set in 1999. The transmission tariff (for high voltage grid) will cover the depreciation costs, associated ancillary service costs and energy losses (users will be charged in line with their contribution to overall losses, depending on their geographical location, the time of day and the network load). Distribution tariffs (for the low and medium voltage grid) will be based on the distance between the supplier and the customer.

Table 19
Buy-back Rates for Electricity, 1998*
(L/kWh)

Type of Plant	*Non-Autoproducers***		*Plants Selling Surplus Electricity*	
	Peak	*Off-Peak*	*Peak****	*Off-Peak*****
PV, Municipal Waste, Biomass	294.4	294.4	313	58.4
Wind, Geothermal	202.4	202.4	162.8	58.4
Run of River Hydro < 3 MW	160.3	160.3	84	58.4
Hydro > 3 MW	298.7	58.4	162.8	58.4
Process Fuel, Industrial Waste	160.3	160.3	94	58.4
Oil and Gas				
> 60% Efficiency	167.1	58.4	33.8	58.4
< 60% Efficiency	183.7	58.4	50.1	58.4
Coal	139.8	139.8	62.7	58.4

* Provisional.
** The avoided cost for 1998 has been evaluated at L 98.3/kWh (L 102 in 1997).
*** The avoided cost for 1998 has been evaluated at L 84.3/kWh (L 88 in 1997).
**** The avoided cost for the fuel has been evaluated at L 58.4/kWh (L 54.7 in 1997).
Source: Ministry of Industry.

Table 20
Prices Paid for Renewable Energy Sources in Selected European Countries, 1997
(€/kWh)

Belgium	*Denmark*	*France*	*Germany*	*Italy*	*Netherlands*	*Portugal*	*Spain*	*UK*
0.052	0.079	0.056	0.086	0.083	0.036	0.053	0.068	0.049

Source: European Commission.

After setting tariffs for third party access to the grid, the Regulatory Authority plans to make retail tariffs for consumers more cost-reflective and to eliminate cross-subsidies. The social tariff is to be maintained but restricted to around 3 million households (instead of 18 million). For other households, a more cost-reflective tariff will be set. Prices to small and medium enterprises are expected to fall as they pay a price much higher than their cost of supply.

Trends in Electricity Prices

Electricity prices for households, calculated in the national currency, have decreased since 1995, while they have continued to increase for industry (Table 21). In 1997, electricity prices for households and industry were higher than the IEA average

(Figures 35 and 36). Taxes on electricity are differentiated by use and by regions (see Chapter 4).

Table 21
Electricity Prices For Households and Industry, 1990-1997
(L/kWh)

	Households		*Industry*	
	Ex-Tax	*Total Price*	*Ex-Tax*	*Total Price*
1990	136.6	187.9	88.6	117
1991	155.5	214.2	100	129.9
1992	164.9	224.2	108.7	138.7
1993	171.9	229.2	114.5	142.9
1994	203.8	264.7	119.3	147.5
1995	209.6	275.7	124.1	151
1996	204.9	274.2	129.1	156.5
1997	199.3	271.3	132.1	160.2

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

IMPLEMENTATION OF THE EU ELECTRICITY DIRECTIVE

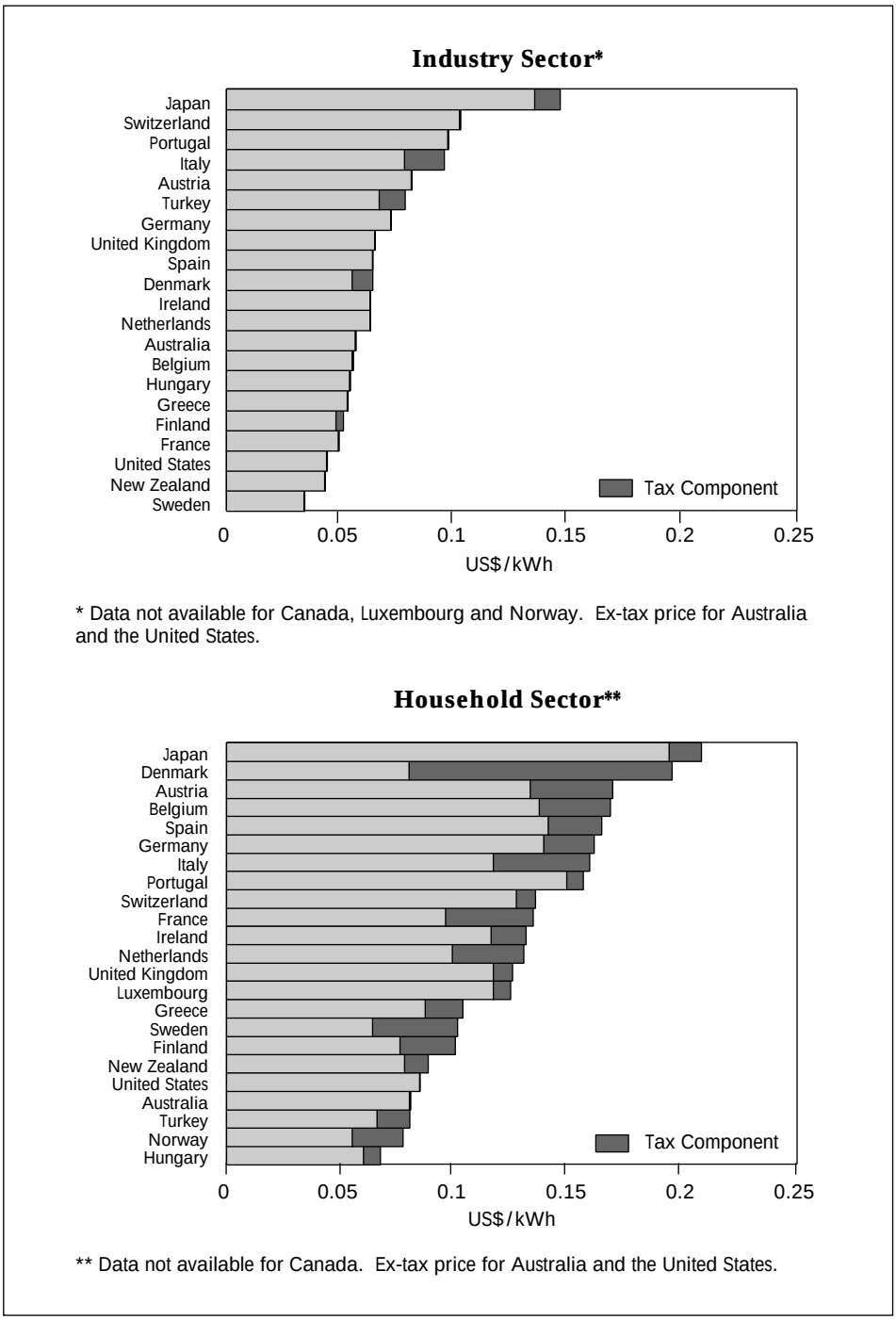
Enactment of the Legislative Decree

In April 1998, Parliament set the following guidelines for the Government to implement the EU Electricity Directive:

- To liberalise electricity generation, ensuring diversification of supply routes and fuels, and to respect "public service conditions".
- To eliminate the *de facto* monopoly in electricity imports and exports.
- To set a single purchase system for non-eligible consumers (called in the law "Single Buyer").
- To create an independent body for transmission network operation and dispatching.
- To allow IPPs (independent power producers) and autoproducers to sell electricity to eligible customers.
- To guarantee fair competition.
- To ensure a solution to the objective of rationalising distribution in areas covered by more than one operator.
- To ensure electricity supply using medium- and long-term planning.

Figure 35

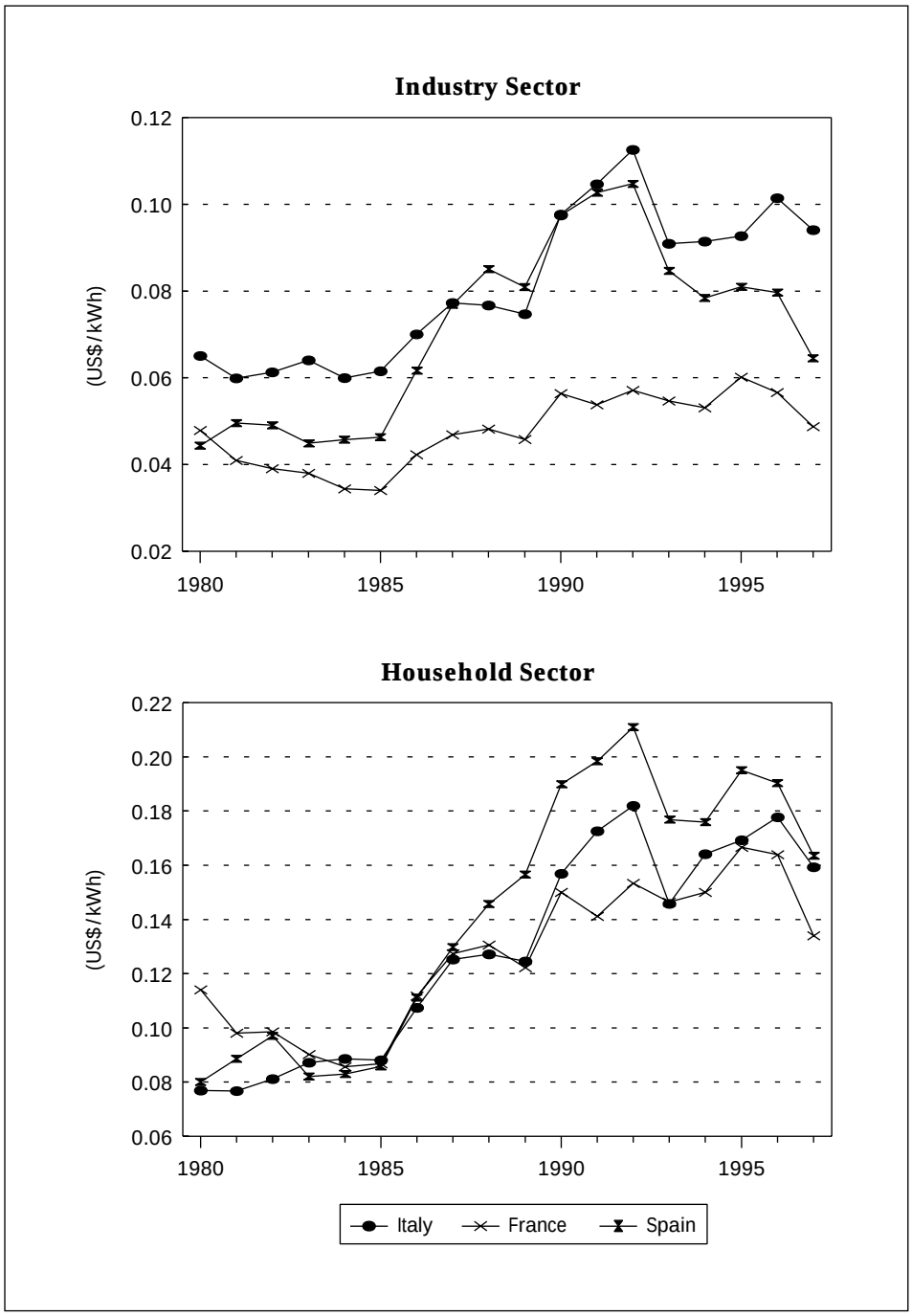
Electricity Prices and Taxes in IEA Countries, 1997



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

Figure 36

Electricity Prices in Italy and in Other Selected IEA Countries, 1980-1997



Note: In 1993, the Italian and Spanish currencies fell against the US$.
Source: E*nergy Prices and Taxes*, IEA/OECD Paris, 1999.

In November 1998, the Government issued a draft proposal which was discussed in Parliament, although its views were non-binding. In February 1999, the Legislative Decree on the introduction of competition in the electricity sector was issued. The major elements in this Legislative Decree are described below and in Figure 37. For its implementation, several decrees need to be issued.

Eligible Customers

Initially, customers with annual consumption of more than 30 GWh, including autoproducers with a total demand for at least 30 GWh, are eligible to choose their electricity suppliers. The threshold will fall to 20 GWh from January 2000 and to 9 GWh from January 2002. Distribution companies are eligible up to the amount of electricity consumed by their eligible clients.

Companies in the same municipality or in close municipalities can be eligible by forming a consortium of buyers. The threshold for a consortium is the same as for eligible customers, provided that consumption for each member of a consortium is 2 GWh when the law is implemented and 1 GWh after January 2000. Multi-site customers exceeding 40 GWh per year will also be eligible starting January 2002, provided that every site has consumption of at least 1 GWh per year.

The thresholds will be revised if the share of eligible consumers is lower than 30% in February 1999, 35% in February 2000 and 40% in January 2002. When they become eligible, consumers can choose to be in the same situation as captive consumers for four years.

ENEL's Structure

ENEL is expected to create separate companies for generation, ownership of the transmission network, distribution, and retail to eligible customers[35]. ENEL's nuclear activities will be transferred to a separate company owned by the Treasury.

By January 2003, no utility will be allowed to retain more than 50% of the total electricity generated and imported in Italy. In addition, ENEL has been requested to divest at least 15 GW of its generation capacity also by 2003. This deadline may be postponed for one year if market conditions are not favourable. ENEL has to submit a programme for this divestiture to the Ministry of Treasury and the Ministry of Industry.

To adapt to the Legislative Decree, ENEL plans to change its structure into a holding company, comprising companies involved in generation, transmission and distribution. In addition, in 1997, ENEL announced the creation of a joint venture

35. The same kind of unbundling is requested for the other vertically integrated utilities.

with ENI, the oil and gas conglomerate, to supply electricity to the Italian market. Other joint ventures were announced with ENRON and Fiat[36]. ENEL's partners plan to contribute to the joint venture with either assets (ENI) or cash (ENRON). The companies will be listed on the stock market which will provide capital for upgrading the plants which ENEL considers to be stranded assets. The Government's first evaluation of stranded costs caused by the introduction of competition were estimated at the maximum level of L 15 trillion.

Imports from EU countries are only subject to available grid capacity and reciprocity. Imports from non-EU countries are also subject to reciprocity and to environmental protection considerations.

Basic Features of the Electricity Market

New generation plants are granted an authorisation according to a standardised procedure for each category of plant. One authorisation covers the building of the whole plant and associated facilities, in contrast to the previous system in which several authorisations were needed. A 30-year limit is fixed on ENEL's concessions for hydro plants. Other concessions for hydro plants will end in December 2010 unless the concession expires later, in which case the original terms are maintained. Renewal of concessions will be subject to a tender procedure.

The Operator of the National Transmission Network (also called the Network Operator) is owned by the Ministry of Treasury to operate transmission[37] and dispatching. ENEL will keep the ownership of the transmission network, but the Operator will retain the right to use the network and the associated facilities. The Operator's responsibilities are as follows:

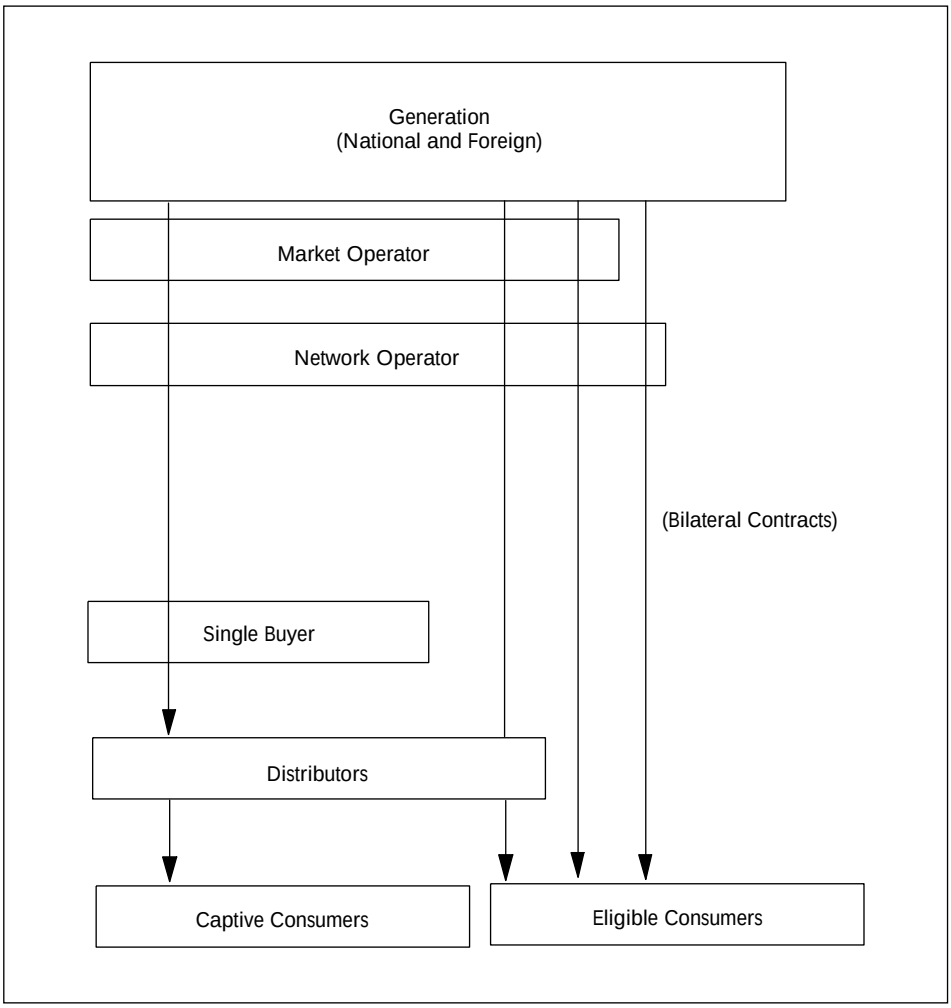
- Managing the network without discriminating between users.
- Providing ancillary services.
- Taking decisions on network maintenance and developments.

The Network Operator, in co-operation with the Regulatory Authority, is in charge of issuing regulations to ensure equal access to the network and priority in dispatch to renewable sources and co-generation.

The "Single Buyer" is owned by the Network Operator. Ownership will be opened to distributors with a 10% limit on direct and indirect participation. The Single Buyer makes purchase contracts with the generators and sale contracts with the distributors for resale to the franchise market based on its forecasts of electricity

36. A joint venture with Entergy failed in 1998.
37. The transmission network includes wire of 220 kV, along with some 120 to 220 kV wires.

Figure 37
The New Italian Competitive Electricity Market



Source: Ministry of Industry.

demand. The Single Buyer sells electricity to the distributors at a tariff so as to allow distributors to set the same price to captive clients throughout Italy. The tariff is set by the Regulatory Authority and is designed to encourage the Single Buyer to perform its activity according to the criteria of economic efficiency. The Single Buyer has to follow the guidelines of the Ministry of Industry to ensure the diversity of energy sources, the use of renewable energy sources and the purchase of electricity from co-generation.

The Market Operator will be owned by the Network Operator, and will be established within one year after the publication of the Legislative Decree. This

Operator is in charge of balancing electricity supply and demand and of determining the merit order for dispatching as of January 2001.

Bilateral contracts between generators and eligible customers are subject to agreement from the Network Operator and need the authorisation of the Regulatory Authority for Electricity and Gas.

Distribution

Existing distribution enterprises are granted concessions from the Ministry of Industry until 2030. When these concessions terminate, new concessions will be granted on the basis of a call for tender. Only one concession will be granted in a municipality. Distributors other than ENEL which supply more than 20% of the customers in their areas may ask to buy, by 31 March 2001, the distribution assets owned by ENEL at the market price. If the parties do not agree on the sale conditions by 30 September 2000, an arbitration procedure will be set up.

Distribution companies with more than 300 000 final customers have to create separate companies for retail and distribution. Companies with less than 300 000 final customers need only to unbundle their accounts.

Renewable Energy Sources

In order to further promote renewable sources, the 1999 Legislative Decree on electricity sets the following measures:

- Electricity from renewables and co-generation have a priority in dispatch.

- Generators and importers with an annual production or imports of more than 100 GWh will be obliged as of 2002 to generate electricity from new renewable power plants up to a level of 2% of the generation above 100 GWh. This obligation excludes electricity from autoconsumers and co-generators. Utilities may decide to purchase electricity from renewable sources. The Government can decide to increase the 2% level. When this electricity from renewable sources is not sold to other generators, it is sold to the Network Operator under conditions and prices that the Authority for Electricity and Gas will establish.

- Existing plants built according to Law 9/91 sell their electricity to the Network Operator at prices set by the CIP 6/92 regulation (but as indicated above, the system does not apply to projects decided after the second half of 1995). The Regulatory Authority is revising these prices.

- Regions and provinces are allowed to promote renewable energy sources through tender procedures.

CRITIQUE

Following the 1987 nuclear moratorium, the Italian Government was successful in increasing electricity supply in order to meet the increase in demand. This success was achieved through several measures. First, ENEL effectively managed the electricity supply and demand balance by increasing imports and production capacity. Second, the agreement between the administration and some major private generators increased private generation capacity. Third, Law 9/91 and CIP 6/92 increased the electricity supply from co-generators and from renewable sources. However, the costs of this additional generation were high because of the buy-back tariffs, and these costs were ultimately passed on to final consumers.

Although these measures were effective in meeting demand increases, they took place in a highly regulated and non-competitive framework, and had a negative effect on the economic efficiency of electricity supply. The operation of multi-fuel units, developed in the past with the aim of diversifying the primary energy mix, was also affected by restrictions on the use of the cheapest fuel (namely, coal) as a result of local pressures and regulations.

The costs from additional supply have not been shared equally among electricity consumers. The social tariff has maintained low prices for small domestic consumers. Large electricity consumers have also managed to obtain low electricity prices. As a consequence, the additional cost of electricity supply has been shared between a small portion of domestic consumers who have not benefited from the social tariff and small and medium businesses.

The introduction of competition in the electricity sector, for which the Government has worked to reach a consensus among all major players, and the rationalisation of tariffs for end-use customers are expected to improve the efficiency of supply, to reduce costs and to decrease prices for end-use customers. The expected benefits for Italy are great, given its high average electricity prices. A reduction in electricity prices for small and medium enterprises will increase their competitiveness and benefit the Italian economy.

ENEL retains a dominant position in the Italian electricity sector, which may impede the development of competition. The divestiture of assets, mandated by the Legislative Decree, is expected to foster competition between suppliers and to improve efficiency. ENEL has used joint ventures as a means of divestiture and the Government should ensure that the joint ventures enhance competition. The planned joint venture between ENEL and ENI to supply electricity from gas-fired power plants would involve two dominant suppliers of electricity and gas. Joint ventures should not strengthen ENEL's dominant position, and competitors using gas for electricity generation should not face barriers to entry.

The electricity market should be monitored to prevent any abuse of dominant position, taking into account that ENEL will compete with other European utilities. When granting authorisations for building new plants, there should be no discrimination against independent generators. Administrative procedures for

building new power plants should be rapid and transparent, and companies should not face extra requirements other than existing regulations. Procedures and regulations should be consistent for all regions.

ENEL is the dominant player in the distribution sector. Concessions for electricity distribution will be limited to one company per municipality. This, combined with the possibility for small distribution companies to buy ENEL's assets, is expected to improve the effectiveness of distribution. The dominant position of ENEL makes it difficult to compare distribution costs and to set tariffs for third party access in distribution. The Government should therefore ensure that ENEL's market power is reduced, rather than increased.

ENEL will retain a significant part of electricity supply in Italy and will continue to own the transport network. Generation, transport, distribution, and non-electricity activities should therefore be effectively unbundled. Regulated and unregulated activities should be clearly separated to avoid cross-subsidies and to ensure efficient competition. All companies owned by municipalities should also be corporatised[38] to ensure that all electricity companies compete on a level playing field.

The Regulatory Authority for Electricity and Gas is essential for developing effective competition in the electricity market and for allowing consumers to benefit from competition. Because of ENEL's large market share, the Regulatory Authority should have the power to reveal any anti-competitive practice. Its independence from any market players, including ENEL and the Government, must be ensured. The Regulatory Authority and the Antitrust Authority must co-operate in their attempts to find cases of possible abuse of dominant position.

Stranded cost payments should not distort competition in the domestic or international market by giving undue advantage to the public utility. The stranded costs should be carefully scrutinised by the Regulatory Authority, given the fact that many electricity companies may overestimate their amount in their calculations. They should be calculated fairly, using the EU rules.

The privatisation of ENEL has been controversial. Decisions relating to market structure and to the terms of ENEL's divestiture should be fully established before privatisation. The market value of the company should be clear when it is privatised.

Regulations should ensure the effective functioning of the electricity market. Early decisions and announcements on its functioning would help market participants by reducing uncertainty. To function effectively, the market should be designed to allow maximum participation. The clearing price and the way it is set should be fully transparent to all participants.

38. Corporatisation of public enterprises implies that gas companies are managed according to the same rules which apply to private companies, free of political interference in their corporate strategy, investment decisions and daily management.

The number of eligible customers should be enlarged. The Legislative Decree rightly allows some smaller consumers to form consortia in order to become eligible. Since small and medium enterprises are important to the Italian economy, the Government should seek more flexible mechanisms to allow them to form consortia of buyers in order to qualify as eligible consumers.

The Legislative Decree does not elaborate the various functions of the Network Operator, the Single Buyer and the Market Operator, causing uncertainty to market participants. There is not a clear definition of tasks necessary for efficient communication and co-operation between the three bodies on issues such as supply contracts and merit order. Their responsibilities and the relationship between them and the Regulatory Authority need to be well defined with public information made available.

The Network Operator, Market Operator and Single Buyer should be independent of the utilities. The Regulatory Authority should ensure that there is a functional separation between the three bodies. To ensure that outsiders and incumbents have the same opportunity and conditions of access, the Network Operator should be independent of all grid users, especially ENEL. The Regulatory Authority should ensure that there is no discrimination between the grid users, and should have adequate powers to take rapid and appropriate measures in case of discrimination.

The Regulatory Authority should ensure that the Single Buyer does not discriminate against non-eligible customers. The Single Buyer should not be used as an instrument to pursue non-energy goals, i.e. social policy objectives, at the expense of captive customers. In its directives to the Single Buyer, the Government should ensure that no unnecessary burden is put on the captive market relative to the liberalised market.

Increased competition is the primary driver for the decline in supply costs, but the recent reform in tariff calculation is also significant as it leads to a more efficient choice of fuels for electricity generation. Under the previous tariff system, the fuel-cost pass-through system, the problems with using coal in power generation and the nuclear moratorium were the reasons for the high share of oil in power generation.

The reform of the social tariff will rightly make the tariff structure more cost-reflective by limiting the number of households who benefit from a below-cost price of electricity. Generally, social objectives are more efficiently achieved through direct social policies than through electricity pricing, which can lead to market distortions and cross-subsidies. The tariff and tax structure for domestic consumers, with prices increasing with consumption, may have encouraged households to keep low consumption and capacity. However, this system may be only benefiting small households, i.e. allowing a single person to use more electricity while restricting use by large families. The effects of the revisions to the tariff and tax structure need to be examined with the aim of looking for a solution to counterbalance a possible reduction in the incentive to use less electricity.

Improving the tariff structure should encourage companies to improve efficiency in non-competitive areas of the market. The Regulatory Authority is revising tariffs for

transmission and distribution and should draw on other countries' experience in choosing the tariff system which best fits the Italian situation. The tariff system should allow for effective competition and should encourage cost reduction in transport and, in particular, in distribution. It should encourage investment to strengthen the transmission grid, mainly in the south of the country. Capacity-based tariffs should be the preferred option if capacity increases are necessary. Since bottlenecks limit the number of suppliers who can compete in a given area, capacity-based tariffs should enhance security of supply and promote competition.

Despite the fact that energy production from renewable sources has increased rapidly since 1990, the new target set by the Government, i.e. to double energy production from renewable sources between 1996 and 2010, is very ambitious[39]. The generous buy-back tariff for electricity from renewable sources has been the key to the increase in renewable energy use. However, its cost to electricity consumers has been very high. The Regulatory Authority for Electricity and Gas estimated that the tariff increases the price to final consumers by L 11 per kWh out of a total of L 150 per kWh, i.e., an increase of more than 7%. The total price paid by electricity consumers for this support is estimated to be around L 2 000 billion per year. The Regulatory Authority is rightly revising the buy-back tariffs (including for electricity from co-generation) to make them more cost-reflective.

This buy-back system did not fit the new organisation of the electricity sector. After the introduction of competition, ENEL could not be solely responsible for promoting renewable sources. Because electricity from existing renewable energy plants has now to be sold to the Network Operator which operates transmission and dispatching, electricity companies can compete on a level playing field

The new system, which obliges utilities to build new plants which use renewable energy, is aimed at sharing the burden among utilities. It is expected that plants will try to reduce the cost of producing electricity from renewable sources. However, this new system needs to ensure the following:

- All electricity companies should have equal access to building electricity plants using renewable sources. There should be no entry barriers such as delays in administrative concessions or authorisations for new entrants.

- There should not be any discrimination between companies that sell electricity from renewable sources to the Network Operator.

- To build new electricity plants using renewable sources, companies need to forecast their future production. Because the level of future production is uncertain, need for new plants may be overestimated, giving an advantage to large utilities over smaller ones.

39. As stated in Chapter 4, in order to keep the cost of reducing CO_2 emissions as low as possible, a cost-effectiveness comparison of various measures such as increasing energy efficiency is necessary.

■ The purchase price for renewable sources should be designed to encourage a decrease in the cost of electricity generation from renewables.

The introduction of the CO_2 tax on fossil fuels for domestic power generation will raise the cost of generating electricity in Italy relative to the cost in other European countries because it does not apply to electricity imports. The new system to promote renewable sources will apply to electricity imports and thus will reduce distortions in competition, but it will contribute to increased electricity prices to final consumers.

The regions are rightly involved in the policy to promote renewable sources because they are best able to assess the need for capacity expansion. Some barriers to building plants based on renewable sources do exist at the local level, e.g. through difficulties in getting authorisations. These barriers should be removed. State and regional subsidies should be made transparent, and it should be ensured that these subsidies do not distort competition between utilities.

RECOMMENDATIONS

The Italian Government should:

☐ Monitor the electricity market to prevent any abuse of dominant position, taking into account the development of competition in the European electricity market.

☐ Consider whether joint ventures involving ENEL will deliver effective competition in the generation sector. Ensure that there is no discrimination against independent generators.

☐ Ensure that the dominant position of ENEL in the distribution sector is reduced.

☐ Ensure effective unbundling of the different activities of electricity companies.

☐ Ensure the independence of the Regulatory Authority. Its role in promoting effective competition in the electricity market should be well recognised and respected.

☐ Take a fair view on stranded costs payments.

☐ Define clearly the relations between the Regulatory Authority, the Network Operator, the "Single Buyer" and the Market Operator.

☐ Ensure effective independence of these newly created institutions to avoid discrimination between users of the system.

- ☐ Ensure that directives to the "Single Buyer" place no unnecessary burden on the captive market, relative to the liberalised market.

- ☐ Support the Regulatory Authority in setting tariffs in a cost-reflective manner, properly allocating costs between different types of customers. Transmission and distribution tariffs should be set to provide an incentive for efficiency improvements, to allow for competition and to ensure security of supply.

- ☐ Continue to seek the most cost-effective ways of promoting renewable sources, make efforts to decrease the cost of their use for generation and avoid distortions of competition between utilities.

8

ENERGY TECHNOLOGY, RESEARCH AND DEVELOPMENT

POLICY FRAMEWORK AND OBJECTIVES

From 1996 to end 1998, Italian energy research and development (R&D) policy was carried out according to the three-year Activity Plan approved by the Inter-ministerial Committee for Economic Planning. National research and national energy policy were reflected in the Plan.

The Government is reorganising its R&D policy. In June 1998, legislation introduced a new framework for co-ordinating, programming, and evaluating scientific and technological research policy. The legislation states that a National Research Programme (PNR) should be established to carry out research objectives for a period of three years. The Programme should be updated annually and should cover the Government's plans and programmes on scientific and technological research, including those for energy.

The Government considers that its major role in energy R&D should shift from direct planning and operating of all R&D projects to the setting-up of framework conditions which allow private industries to carry out short-term R&D. The Government should be in charge of medium- and long-term energy R&D projects as, in competitive markets, there is a risk of inadequate private sector support for long-term R&D projects.

The National Conference on Environment and Energy[40] concluded that the Government's role in energy R&D should focus on the need to promote and support the following:

- Major medium- and long-term research projects, such as global climate change, renewable energy and thermonuclear fusion.

- Technological innovation, aimed at broadening the range of options for sustainable environmental and socio-economic development, as well as addressing the more general goal of the country's competitiveness.

At the Conference, the Government expressed its commitment to increase its R&D budget (in particular for development and demonstration) and to optimise its use. The Government intends to achieve the following:

- To promote programmes which are jointly carried out by public and private institutions to improve market deployment of R&D.

- To promote the provision of R&D services to small and medium-sized firms.

40. The conference was held by the Government with participants from industries and unions in November 1998 (see Chapter 3).

- To include energy and the environment more extensively in education and training programmes both inside and outside schools.

ORGANISATIONAL STRUCTURE

The National Agency for New Technology, Energy and Environment (ENEA) is responsible for research, development and dissemination of technology and for covering energy efficiency, renewables and environmental technologies. ENEA is a public institution supervised by the Ministry of Industry, the Ministry for the Environment and the Ministry for University, Technological and Scientific Research.

ENEA designs R&D programmes and implements projects. The agency works closely with both large and small enterprises to transfer and disseminate relevant technologies. It also provides scientific and technological consulting and support services to national and regional administrations for their planning and implementing of energy and environmental measures.

ENEA has approximately 3 700 employees divided into three departments: Energy, Environment and New Technologies. There is a synergy among them for relevant issues. For example, the Energy and Environment Departments work together on issues such as recuperation of materials and energy from waste. They also co-operate on issues concerning global climate change.

The on-going reorganisation of government R&D policy also involves changes in the organisational structure for public R&D. The Government is considering structural changes in order to increase the efficiency of R&D activities, and to achieve co-ordination and coherence among public bodies at the regional and national levels. It is expected that both ENEA's mission and its structure will be affected by this general reform.

In the framework of this reorganisation, the National Scientific Council (CSN) will be established in order to co-ordinate scientific and technological policies at the government level. A Committee for Orienting and Evaluating Research (CIVR) will also be established with the aim of orienting, promoting and disseminating the scientific and technological evaluation activities.

R&D FUNDING AND ACTIVITIES

Italy's energy R&D public budget is the fifth largest among IEA Members. This budget has substantially decreased over time, and in 1998, became less than half its level ten years ago (Table 22). In real terms, it was less than one-third the 1988 level. Although most of this decrease is due to the rapid reduction in nuclear R&D after the 1987 moratorium, funding in some other energy R&D sectors has also decreased substantially since the late 1980s, in particular for power and storage technology. In 1997, the public energy R&D budget, excluding nuclear, in comparison with GDP was lower than the average ratio for IEA countries (Figure 38).

Table 22

Italian Government Energy R&D Budget by Sector*, 1987-1998

	1987		*1996*		*1997*		*1998***	
	L Billion	*%*	*L Billion*	*%*	*L Billion*	*%*	*L Billion*	*%*
Conservation	70.1	7.7	93.3	20	88.4	20.6	90.5	21
Fossil Fuels	6.3	0.7	0	0	0	0	0	0
Renewables	40.9	4.5	67.4	14.6	63.5	14.8	60.8	14.1
Nuclear	543.6	59.8	193.7	42.1	195	45.4	188	43.7
Power & Storage	45.5	5	27.7	6	26.1	6.1	28	6.5
Other***	202.1	22.2	78.5	17	56.6	13.2	62.7	14.6
Total	**908.6**	**100**	**460.5**	**100**	**429.6**	**100**	**430**	**100**

* Figures for the Italian public energy R&D budget only include ENEA's budget for energy-related R&D activities since consistent figures for the activities in other public bodies and universities are not available.

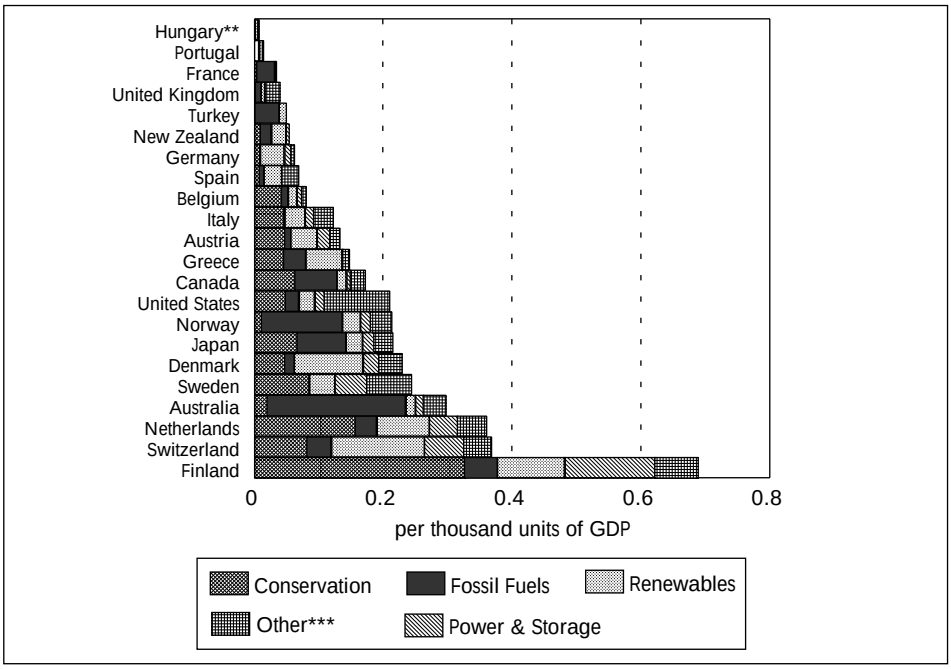
** Provisional.

*** Cross-cutting technologies, system analysis, hydroelectric, hydrogen and energy technology information dissemination.

Source: Country submission.

Figure 38

Energy R&D Public Budget (excluding Nuclear) vs GDP in IEA Countries*, 1997



* Data not available for Ireland and Luxembourg.

** 1996.

*** Cross-cutting technologies, system analysis, hydroelectric, hydrogen and energy technology information dissemination.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 1998, and *National Accounts of OECD Countries*, OECD Paris, 1998.

In spite of a rapid decrease in total budget expenditure, the largest proportion of ENEA's budget continues to be focused on nuclear fission and fusion, followed by conservation and renewable energy sources which receive less than half of the nuclear budget. No significant change in terms of the share among energy technology areas has been seen over the last three years.

Current activities on energy R&D are mostly concentrated on the following areas:

- Nuclear fission and fusion: the main focus is on the contribution to the International Thermonuclear Experimental Reactor project under the auspices of the International Atomic Energy Agency. Activities also include R&D on radioactive waste management and research on nuclear fusion under the co-operative framework of EURATOM. Other fusion reactor concepts are also being studied.

- Energy conservation: promotion of technology development and implementation in the industry, residential/commercial and transport sectors. Activities include information dissemination, training of energy managers and technical support to regional governments.

- Renewable energy sources: the main activities are technology development and demonstration for photovoltaic power generation, biomass energy and wind energy. Some of the activities are carried out in collaboration with ENEL.

ENEA relies on general funding from the Treasury for more than half (L 460 billion in 1998) of its budget. The remainder comes from specific programme agreements with ministries (Industry, Environment and Scientific Research) and contracts with regional administrations, private organisations (L 205 billion), and contributions from EU programmes (about L 150 billion). The proportion of income from sources other than regular government funding has grown steadily from 14% in 1992 to 43.6% in 1998. ENEA's total budget was around L 815 billion in 1998, of which L 430 billion went towards energy activities. It is however becoming increasingly difficult to separate activities and budgets among Energy, Environment and Technology Innovation R&D.

Major energy companies made a substantial contribution to national energy R&D projects. ENI's total R&D expenditure amounted to L 475 billion in 1997, of which about three-quarters went to energy-related activities. These activities covered research on oil and gas exploration and production, natural gas supply, transmission and distribution and oil refining and marketing. In the area of exploration and production, efforts have concentrated on the reduction of costs for research and development of hydrocarbons fields and on the optimisation of marginal reserves. ENI has developed innovative know-how on reservoir characterisation, deep-sea horizontal drilling technology, and systems for deep underwater production.

ENEL's total R&D budget is expected to amount to about L 230 billion in 1999, a 15% reduction compared with 1998. ENEL's R&D activities cover four areas: generation, transmission, distribution and final uses, and environment. In

generation, work has concentrated on new technologies such as advanced supercritical gas turbines with higher efficiency and environmental compatibility. In the area of distribution and final uses, work continues on new technologies, including power electronics, and innovative components such as super-conducting cables and storages.

INTERNATIONAL COLLABORATION

Italy participates in 22 IEA Implementing Agreements. Of these, three are information centres, three are fossil fuel agreements, six are renewable energy agreements, and ten are efficient energy end-use agreements. ENEA is the contracting party for most of these agreements, but ENEL and other national entities are also involved in some of them. Italy, together with other EU countries, also participates in all of the IEA Fusion Implementing Agreements through EURATOM. Italy participates in the research, development and demonstration programmes of the European Commission. ENEL takes part in other international co-operative projects on energy technology such as the ELCOGAS IGCC project, biomass energy and advanced electric utilisation programmes.

CRITIQUE

The Government is wisely reconsidering its R&D policies with the aim of improving their effectiveness. When established, the National Research Programme can function as an effective tool for setting clear objectives and priorities for public R&D, including those for energy. This programme should be established as soon as possible and should keep energy R&D policies in line with national energy policies and measures.

The conclusions of the National Conference on Environment and Energy were significant, especially since the Conference was organised to create a consensus among participants from both public and private sectors. These conclusions should be considered in the formulation of the National Research Programme. The Government also rightly announced its commitment to increase R&D funding, although it remains unclear how this decision will be implemented.

R&D activities in the energy industry, especially long-term R&D, are expected to continue to be greatly affected by the current move towards deregulation and increased competition. The Government should therefore ensure sufficient funding for public sector energy R&D activities, for example by increasing support for long-term R&D and keeping future technical options available to respond to climate change objectives.

The National Scientific Council would be effective in establishing the strategic priorities for the R&D activities. Prioritisation should ensure that sectoral funding

is consistent with energy policy goals, and emphasis should be given to renewable sources and energy efficiency in order to meet the Kyoto target. The Council would need to co-ordinate R&D activities within ENEA, between ENEA and other institutions and between regions and the Government. Assessment of the results of public R&D needs to be substantially improved and, likewise, the newly created Committee for Orienting and Evaluating Research has to function effectively. The Government should therefore ensure that concrete procedures are set up and implemented for efficient prioritisation, co-ordination and evaluation of energy R&D activities.

Close collaboration with industry and interaction with end-users are the key strengths of ENEA. The government collaborative programmes with industry seem to be effective and should be encouraged to better meet end-user needs and to reduce deployment time for new technologies. Along with the on-going reforms to the electricity and gas markets, relations between ENEA, ENI and ENEL should be re-defined as part of the co-operation of ENEA with private industries in order to replace a system which used to be characterised by co-operation between public bodies.

In line with the reorientation of public sector energy R&D, ENEA should continue to strengthen its expertise in R&D, in energy policy issues and in particular on energy efficiency policies and measures which address the Kyoto target. This expertise should be made available to the public and to policy-makers.

RECOMMENDATIONS

The Italian Government should:

- ☐ Set up a National Research Programme reflecting the conclusions of the National Conference on Environment and Energy.
- ☐ Ensure sufficient funding for energy R&D, consistent with energy policy goals and continue to carry out long-term energy R&D.
- ☐ Take appropriate measures to implement the plan for the co-ordination of energy R&D activities and their evaluation.
- ☐ Encourage collaboration with industry to better secure market deployment of technology.
- ☐ Continue to increase ENEA's expertise in R&D and energy policy issues.

A

ANNEX

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit: Mtoe

SUPPLY

		1973	1990	1996	1997	2000	2005	2010
TOTAL PRODUCTION		**20.1**	**24.8**	**29.3**	**29.3**	**29.2**	**31.3**	**33.3**
Coal[1]		0.3	0.3	0.0	0.0	0.0	0.2	0.2
Oil		1.1	4.8	5.7	6.2	6.0	5.8	5.5
Gas		12.6	14.0	16.4	15.8	14.9	13.6	12.4
Comb. Renewables & Wastes[2]		0.2	0.9	1.2	1.2	1.9	4.5	7.0
Nuclear		0.8	–	–	–	–	–	–
Hydro		3.2	2.7	3.6	3.6	3.6	3.8	3.9
Geothermal		1.8	2.0	2.4	2.5	2.5	2.6	2.8
Solar / Wind / Other[3]		–	0.0	0.0	0.1	0.2	0.9	1.6
TOTAL NET IMPORTS[4]		**109.3**	**130.4**	**133.2**	**133.0**	**136.4**	**142.6**	**152.5**
Coal[1]	Exports	0.4	0.1	0.1	0.1	..	..	..
	Imports	8.2	13.9	11.5	10.8	..	..	..
	Net Imports	7.7	13.7	11.5	10.7	11.2	11.7	12.3
Oil	Exports	29.4	20.1	19.0	21.5	..	..	..
	Imports	136.4	111.1	109.2	110.5	..	..	..
	Bunkers	7.1	2.7	2.3	2.4	2.4	2.4	2.4
	Net Imports	99.9	88.3	87.8	86.6	85.2	82.9	80.6
Gas	Exports	–	0.0	0.0	0.0	..	..	..
	Imports	1.6	25.3	30.5	32.0	..	..	..
	Net Imports	1.6	25.3	30.4	32.0	36.7	48.1	59.6
Electricity	Exports	0.2	0.1	0.1	0.1	..	..	..
	Imports	0.3	3.1	3.3	3.4	3.3	..	..
	Net Imports	0.1	3.0	3.2	3.3	3.3	..	..
TOTAL STOCK CHANGES		**–0.9**	**–1.9**	**–1.3**	**1.0**	**–**	**–**	**–**
TOTAL SUPPLY (TPES)		**128.6**	**153.3**	**161.1**	**163.3**	**165.6**	**173.9**	**185.8**
Coal[1]		8.1	14.6	11.2	11.3	11.2	11.9	12.5
Oil		100.1	91.0	93.2	93.5	91.2	88.6	86.1
Gas		14.2	39.0	46.1	47.5	51.7	61.7	72.0
Comb. Renewables & Wastes[2]		0.2	1.0	1.4	1.6	1.9	4.5	7.0
Nuclear		0.8	–	–	–	–	–	–
Hydro		3.2	2.7	3.6	3.6	3.6	3.8	3.9
Geothermal		1.8	2.0	2.4	2.5	2.5	2.6	2.8
Solar / Wind / Other[3]		–	0.0	0.0	0.1	0.2	0.9	1.6
Electricity Trade[5]		0.1	3.0	3.2	3.3	3.3	–	–
Shares (%)								
Coal		*6.3*	*9.5*	*7.0*	*6.9*	*6.7*	*6.8*	*6.7*
Oil		*77.9*	*59.3*	*57.8*	*57.3*	*55.1*	*51.0*	*46.4*
Gas		*11.1*	*25.4*	*28.6*	*29.1*	*31.2*	*35.5*	*38.8*
Comb. Renewables & Wastes		*0.2*	*0.6*	*0.9*	*1.0*	*1.2*	*2.6*	*3.8*
Nuclear		*0.6*	–	–	–	–	–	–
Hydro		*2.5*	*1.8*	*2.2*	*2.2*	*2.2*	*2.2*	*2.1*
Geothermal		*1.4*	*1.3*	*1.5*	*1.5*	*1.5*	*1.5*	*1.5*
Solar / Wind / Other		–	–	–	–	*0.1*	*0.5*	*0.8*
Electricity Trade		*0.1*	*1.9*	*2.0*	*2.0*	*2.0*	–	–

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

Please note: Data for 2000 and 2005 are IEA Secretariat estimates.

Unit: Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	1996	1997	2000	2005	2010
TFC	**98.7**	**117.6**	**124.3**	**125.5**	**126.8**	**130.0**	**133.8**
Coal[1]	3.3	3.4	2.7	2.7	2.6	2.5	2.4
Oil	72.1	64.2	63.8	64.6	63.8	63.5	63.0
Gas	12.8	30.6	35.8	35.4	36.1	37.2	38.0
Comb. Renewables & Wastes[2]	–	0.8	1.1	1.2	1.4	1.9	2.4
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	0.0	0.0	0.0	0.0	0.1	0.2
Electricity	10.6	18.5	20.7	21.3	22.6	24.6	27.4
Heat	–	0.2	0.2	0.2	0.3	0.3	0.4
Shares (%)							
Coal	*3.3*	*2.9*	*2.1*	*2.2*	*2.1*	*1.9*	*1.8*
Oil	*73.0*	*54.6*	*51.4*	*51.5*	*50.3*	*48.8*	*47.1*
Gas	*12.9*	*26.0*	*28.8*	*28.2*	*28.5*	*28.6*	*28.4*
Comb. Renewables & Wastes	–	*0.7*	*0.9*	*0.9*	*1.1*	*1.5*	*1.8*
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	*0.1*
Electricity	*10.7*	*15.7*	*16.7*	*17.0*	*17.8*	*18.9*	*20.5*
Heat	–	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.3*
TOTAL INDUSTRY[6]	**47.6**	**44.6**	**43.6**	**44.9**	**44.4**	**44.8**	**45.5**
Coal[1]	2.6	3.3	2.6	2.6	2.5	2.4	2.3
Oil	29.7	16.9	14.7	15.5	14.4	13.7	12.7
Gas	8.7	14.6	15.8	16.0	16.0	15.9	15.9
Comb. Renewables & Wastes[2]	–	0.2	0.2	0.2	0.3	0.6	0.9
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	6.6	9.5	10.2	10.6	11.3	12.3	13.7
Heat	–	–	–	–	–	–	–
Shares (%)							
Coal	*5.6*	*7.3*	*5.9*	*5.8*	*5.6*	*5.3*	*5.0*
Oil	*62.3*	*37.9*	*33.8*	*34.4*	*32.4*	*30.4*	*27.9*
Gas	*18.2*	*32.9*	*36.3*	*35.6*	*35.9*	*35.5*	*35.0*
Comb. Renewables & Wastes	–	*0.5*	*0.5*	*0.5*	*0.7*	*1.3*	*2.0*
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	–	–
Electricity	*13.9*	*21.4*	*23.5*	*23.7*	*25.4*	*27.4*	*30.1*
Heat	–	–	–	–	–	–	–
TRANSPORT[7]	**20.5**	**35.3**	**40.0**	**40.6**	**40.8**	**41.2**	**41.7**
TOTAL OTHER SECTORS[8]	**30.6**	**37.8**	**40.7**	**40.0**	**41.6**	**44.0**	**46.7**
Coal[1]	0.5	0.1	0.1	0.1	0.1	0.1	0.2
Oil	22.5	12.8	10.1	9.5	9.7	10.0	10.3
Gas	4.0	15.7	19.7	19.1	19.8	20.7	21.3
Comb. Renewables & Wastes[2]	–	0.6	0.9	1.0	1.1	1.3	1.5
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	0.0	0.0	0.0	0.0	0.1	0.2
Electricity	3.6	8.3	9.8	10.0	10.6	11.5	12.8
Heat	–	0.2	0.2	0.2	0.3	0.3	0.4
Shares (%)							
Coal	*1.5*	*0.3*	*0.3*	*0.3*	*0.3*	*0.3*	*0.3*
Oil	*73.5*	*33.9*	*24.7*	*23.8*	*23.3*	*22.7*	*22.1*
Gas	*13.1*	*41.6*	*48.4*	*47.8*	*47.7*	*47.1*	*45.7*
Comb. Renewables & Wastes	–	*1.6*	*2.1*	*2.4*	*2.5*	*3.0*	*3.2*
Geothermal	–	–	–	–	–	–	–
Solar / Wind / Other	–	–	–	–	–	*0.1*	*0.4*
Electricity	*11.8*	*22.1*	*24.0*	*25.1*	*25.5*	*26.1*	*27.4*
Heat	–	*0.5*	*0.5*	*0.5*	*0.6*	*0.7*	*0.9*

Unit: Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	1996	1997	2000	2005	2010
ELECTRICITY GENERATION[9]							
INPUT (Mtoe)	**27.6**	**42.4**	**46.0**	**46.8**	**49.2**	**59.7**	**70.6**
OUTPUT (Mtoe)	**12.4**	**18.3**	**20.6**	**21.2**	**22.7**	**28.0**	**31.6**
(TWh gross)	143.9	213.2	239.4	246.5	263.6	325.0	367.5
Output Shares (%)							
Coal	*3.6*	*16.8*	*10.6*	*10.0*	*10.1*	*9.8*	*9.2*
Oil	*62.4*	*48.2*	*48.9*	*46.0*	*40.6*	*29.2*	*22.0*
Gas	*3.1*	*18.6*	*21.0*	*24.9*	*30.4*	*38.5*	*43.6*
Comb. Renewables & Wastes	*0.9*	*0.1*	*0.3*	*0.3*	*0.8*	*4.6*	*7.6*
Nuclear	*2.2*	*–*	*–*	*–*	*–*	*–*	*–*
Hydro	*26.1*	*14.8*	*17.6*	*16.9*	*16.0*	*13.5*	*12.2*
Geothermal	*1.7*	*1.5*	*1.6*	*1.6*	*1.5*	*1.2*	*1.1*
Solar/Wind/Other	*–*	*0.0*	*0.2*	*0.3*	*0.6*	*3.1*	*4.3*
TOTAL LOSSES	**29.5**	**35.8**	**36.8**	**37.9**	**38.8**	**43.9**	**52.0**
of which:							
Electricity and Heat Generation[10]	15.3	23.9	25.2	25.4	26.3	31.4	38.6
Other Transformation	6.0	2.7	2.3	2.7	2.5	2.4	2.4
Own Use and Losses[11]	8.3	9.2	9.3	9.8	10.0	10.1	11.0
Statistical Differences	**0.3**	**–0.0**	**0.0**	**0.0**	**–**	**–**	**–**

INDICATORS

	1973	1990	1996	1997	2000	2005	2010
GDP (billion 1990 US$)	688.66	1093.95	1164.36	1181.92	1254.26	1384.80	1528.94
Population (millions)	54.75	56.74	57.38	57.52	57.30	57.15	57.00
TPES/GDP[12]	0.19	0.14	0.14	0.14	0.13	0.13	0.12
Energy Production/TPES	0.16	0.16	0.18	0.18	0.18	0.18	0.18
Per Capita TPES[13]	2.35	2.70	2.81	2.84	2.89	3.04	3.26
Oil Supply/GDP[12]	0.15	0.08	0.08	0.08	0.07	0.06	0.06
TFC/GDP[12]	0.14	0.11	0.11	0.11	0.10	0.09	0.09
Per Capita TFC[13]	1.80	2.07	2.17	2.18	2.21	2.27	2.35
Energy–related CO_2 Emissions (Mt CO_2)[14]	348.2	408.2	419.7	424.3	426.2	444.8	464.0
CO_2 Emissions from Bunkers (Mt CO_2)	22.6	8.4	7.2	7.5	7.5	7.5	7.5

GROWTH RATES (% per year)

	73–79	79–90	90–96	96–97	97–00	00–05	05–10
TPES	1.5	0.8	0.8	1.4	0.5	1.0	1.3
Coal	4.3	3.1	–4.3	0.7	–0.4	1.2	1.1
Oil	–0.0	–0.8	0.4	0.4	–0.8	–0.6	–0.6
Gas	8.1	5.1	2.8	3.1	2.9	3.6	3.1
Comb. Renewables & Wastes	23.4	1.2	5.9	12.8	6.9	18.4	9.5
Nuclear	–2.9	–	–	–	–	–	–
Hydro	3.4	–3.3	4.9	–1.0	0.6	0.8	0.4
Geothermal	0.1	1.2	2.5	3.5	0.8	0.8	1.1
Solar/Wind/Other	–	–	41.4	92.5	24.9	43.7	11.0
TFC	1.3	0.9	0.9	0.9	0.3	0.5	0.6
Electricity Consumption	4.0	3.0	1.9	3.1	1.9	1.7	2.2
Energy Production	0.2	1.8	2.8	0.2	–0.2	1.4	1.2
Net Oil Imports	–0.4	–0.9	–0.1	–1.4	–0.5	–0.6	–0.6
GDP	3.5	2.3	1.0	1.5	2.0	2.0	2.0
Growth in the TPES/GDP Ratio	–1.9	–1.5	–0.2	–0.1	–1.5	–1.0	–0.7
Growth in the TFC/GDP Ratio	–2.1	–1.4	–0.1	–0.6	–1.6	–1.5	–1.4

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

Footnotes to Energy Balances and Key Statistical Data

1 Includes lignite and peat, except for Finland, Ireland and Sweden. In these three cases, peat is shown separately.

2 Comprises solid biomass and animal products, gas/liquids from biomass, industrial waste and municipal waste. Data are often based on partial surveys and may not be comparable between countries.

3 Other includes tide, wave and ambient heat used in heat pumps.

4 Total net imports include combustible renewables and waste.

5 Total supply of electricity represents net trade. A negative number indicates that exports are greater than imports.

6 Includes non-energy use.

7 Includes less than 1% non-oil fuels.

8 Includes residential, commercial, public service and agricultural sectors.

9 Inputs to electricity generation include inputs to electricity, CHP and heat plants. Output refers only to electricity generation.

10 Losses arising in the production of electricity and heat at public utilities and autoproducers. For non-fossil-fuel electricity generation, theoretical losses are shown based on plant efficiencies of 33% for nuclear, 10% for geothermal and 100% for hydro.

11 Data on "losses" for forecast years often include large statistical differences covering differences between expected supply and demand and mostly do not reflect real expectations on transformation gains and losses.

12 Toe per thousand US dollars at 1990 prices and exchange rates.

13 Toe per person.

14 "Energy-related CO_2 emissions" specifically means CO_2 from the combustion of the fossil fuel components of TPES (i.e. coal and coal products, peat, crude oil and derived products and natural gas), while CO_2 emissions from the remaining components of TPES (i.e. electricity from hydro, other renewables and nuclear) are zero. Emissions from the combustion of biomass-derived fuels are not included, in accordance with the IPCC greenhouse gas inventory methodology. TPES, by definition, excludes international marine bunkers. INC-IX decided in February 1994 that emissions from international marine and aviation bunkers should not be included in national totals but should be reported separately, as far as possible. CO_2 emissions from bunkers are those quantities of fuels delivered for international *marine* bunkers and the emissions arising from their use. Data for deliveries of fuel to international *aviation* bunkers are not generally available to the IEA and, as a result, these emissions have not been deducted from the national totals. Projected emissions for oil and gas are derived by calculating the ratio of emissions to energy use for 1997 and applying this factor to forecast energy supply. Future coal emissions are based on product-specific supply projections and are calculated using the IPCC/OECD emission factors and methodology.

B

ANNEX

INTERNATIONAL ENERGY AGENCY
"SHARED GOALS"

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

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

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

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

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

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

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

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

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

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

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

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

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

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

C

ANNEX

GLOSSARY AND LIST OF ABBREVIATIONS

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

bcm	billion cubic metres.
CCGT	Combined Cycle Gas Turbine.
CHP	combined production of heat and power; sometimes, when referring to industrial CHP, the term «co-generation» is used.
CIPE	Inter-ministerial Committee for Economic Planning.
ENEA	The National Agency for New Technology, Energy and Environment.
EU	The European Union, whose members are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom.
GDP	gross domestic product.
GHG	Greenhouse gas.
GW	gigawatt, or 1 watt $\times 10^9$.
IEA	International Energy Agency whose Members are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, the United States.
IGCC	Integrated Gasification Combined Cycle.
kV	kilovolt.
LDC	local distribution companies.
LNG	liquefied natural gas.
LPG	liquefied petroleum gas; refers to propane, butane and their isomers, which are gases at atmospheric pressure and normal temperature.
mcm	million cubic metres.
MICA	Ministry of Industry, Commerce and Crafts.

Mt	million tonnes.
Mtoe	million tonnes of oil equivalent; see toe.
MW	megawatt of electricity, or 1 Watt $\times 10^6$.
MWh	megawatt-hour = one megawatt $\times$ one hour, or one watt $\times$ one hour $\times 10^6$.
NEA	the Nuclear Energy Agency of the OECD.
OECD	Organisation for Economic Co-operation and Development.
PPP	Purchasing power parity: the rate of currency conversion that equalises the purchasing power of different currencies, i.e. estimates the differences in price levels between different countries.
R&D	research and development, especially in energy technology; may include the demonstration and dissemination phases as well.
SB	Single Buyer.
SLT	Standing Group on Long-Term Co-operation of the IEA.
TFC	total final consumption of energy; the difference between TPES and TFC consists of net energy losses in the production of electricity and synthetic gas, refinery use and other energy sector uses and losses.
toe	tonne of oil equivalent, defined as 10^7 kcal.
TPA	third party access.
TPES	total primary energy supply.
TW	terawatt, or 1 watt $\times 10^{12}$.
TWh	terawatt $\times$ one hour, or one watt $\times$ one hour $\times 10^{12}$.