Panorama of energy

Energy statistics to support EU policies and solutions

This second edition of the Panorama on energy endeavours to deliver global characteristics of the energy situation in Europe, using the most recent official data available in Eurostat. It covers the main energy themes for EU-27 as well as for each individual Member State and quantifies them. Community energy policies receive deserved attention and in order to demonstrate the dynamic nature of the subject and how new policies call for new solutions, a few statistical projects will illustrate recent development work in cooperation with the Member States. A CD is included which apart from a substantial amount of documentary information, invites the reader to review statistical data by means of an easy-to-use numerical presentation tool.

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KS-GH-09-001-EN-C

Panorama of energy ■ Energy statistics to support EU policies and solutions

2009 edition

ISBN 978-92-79-11151-8

Price (excluding VAT) in Luxembourg: EUR 30

Publications Office
Publications.europa.eu

ISSN 1831-3256

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Luxembourg: Office for Official Publications of the European Communities, 2009

ISBN 978-92-79-11151-8
ISSN 1831-3256
doi 10.2785/26846
Cat. No. KS-GH-09-001-EN-C

Theme: Environment and energy
Collection: Statistical books

Printed in Belgium

Printed on white chlorine-free paper

EUROSTAT
L-2920 Luxembourg — Tel. (352) 43 01-1 — website http://ec.europa.eu/eurostat

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European Union energy policy

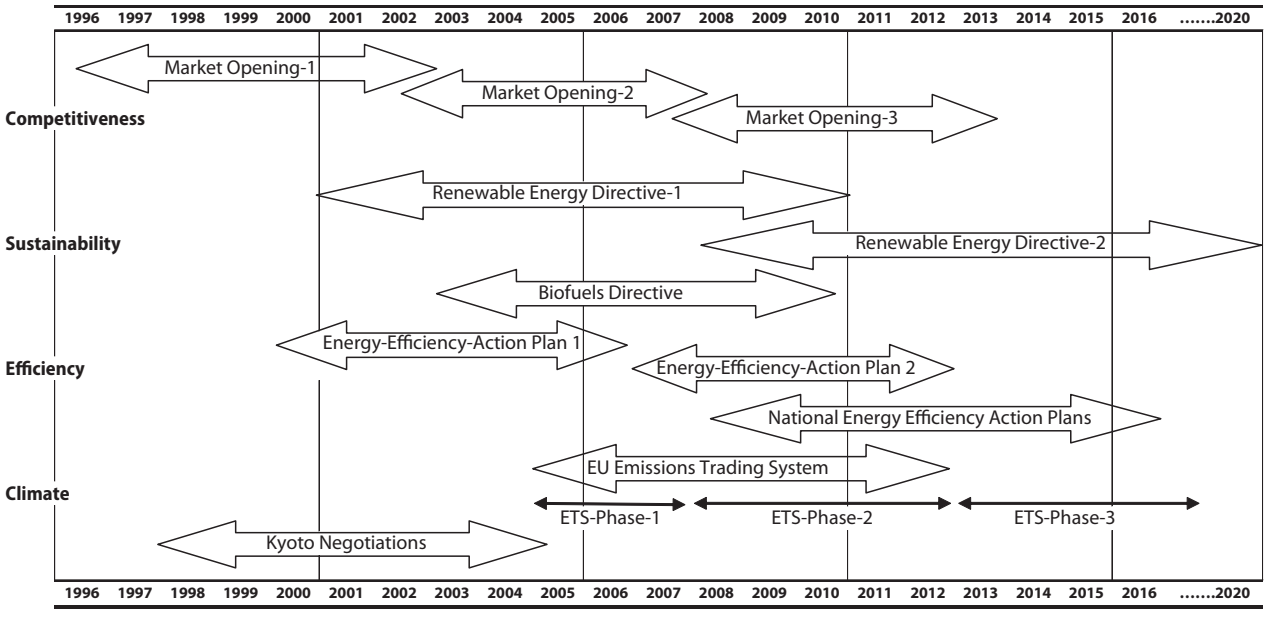
Introduction

A new era is at hand for energy and environment in the European Community. The current legislative and regulatory agenda for energy is arguably broader and more complex than it has ever been, with proposals now being debated on renewables, fuel quality, the internal market, emissions trading, and a host of related issues. The shear number of new proposals, initiatives, dialogues, regulations, and international fora is overwhelming, even as the Community must also deal with the challenge of absorbing 12 new Member States during the past four years.

It is instructive to note various phases across the key dimensions of EU energy policy. Selected developments are depicted in Figure 1.1. The market opening is now entering its third phase, the EU emissions trading system (ETS) has entered its second phase, the second Energy Efficiency Action Plan is underway and renewable energy legislation is entering its second phase. Integrated approaches are becoming the norm; the Renewables Directive was part of the major energy and climate package unveiled by the Commission in early 2008. The coming years will be challenging, given the variety and complexity of energy and climate targets established. The National Energy Efficiency Action Plans aim for 9% savings by 2016 while the proposed Renewables Directive aims for 20% of all energy to come from Renewables by 2020[1]. The ETS along with other climate policy instruments are aimed at a 20% GHG reduction by 2020[2].

The climate challenge has emerged as the main pillar of EU policies aimed at accelerating the transition to sustainable energy. As the world's leader on energy and climate policy, the EU faces the twin challenge of living up to its ambitions, while at the same time aiming to stimulate global markets towards a sustainable energy future. More traditional concerns such as energy security and competitiveness also remain high on the agenda. This chapter reviews some of the essential elements of European Union Energy Policy, with special emphasis on recently enacted or proposed legislation and the implications for reaching the fundamental objectives of a secure, competitive and sustainable energy future for Europe.

Figure 1.1: Development of EU energy policies over time



1.1 Overview and historical background

The two treaties that formed the basis for the emergence of the European Union—the European Economic Community (EEC) and the European Atomic Energy Community (EURATOM)—continue to represent some of the fundamental challenges in the energy policy arena. The EEC inherited a special focus on energy cooperation in coal and steel, while EURATOM continues to provide the basis for peaceful use of nuclear power in the Community, which has seen a resurgence of interest in recent years. Recent modifications to the statutes of the Euratom Supply Agency (ESA) recognised the need for restructuring in light of the enlarged Union; one important set of changes involved the make-up of the advisory committee and its terms of reference, which were adjusted to be compatible with the needs of the new Member States[3].

Fifty years after the entry into force of the Treaties of Rome, the evolution of energy issues over the past five decades provides a reminder of the importance of consistency and continuity in policies and regulations. Some of the same issues that arose in the mid-point of this five-decade period in the 1970s—such as oil import dependence or the need for diversification in electricity production—are emerging again in different contexts. In the case of oil, there is a shift in the geographical centre of dependence. In the case of electric power, the emphasis has switched from the baseload power provided by coal and nuclear to a more dispersed and diverse set of renewable sources. The consistent emphasis on flexible and open markets in combination with the continuity of purpose in EU legislation has contributed to the ability of the enlarged Community to draw on its experience in addressing the new challenges.

Foremost among the energy-related challenges is climate change, and the EU is at the forefront of the global science-policy nexus trying to meet the challenge. Many European scientists and organisations were instrumental in creating the Intergovernmental Panel on Climate Change (IPCC), which received the Nobel Prize last year and is celebrating its twentieth anniversary in 2008. In early 2007, the Commission put forth its ambitious energy-climate package, which unambiguously illustrated the role of the EU in leading the effort to create a climate-compatible energy system. The "20/20" package included the goals for 2020 of reducing GHG emissions by 20%, improving energy efficiency by 20%, achieving a 20% share of renewable energy, and a 10% share of biofuels[4]. It is both fortuitous and appropriate that the next two UNFCCC conferences will be held within the EU (Poznan, Poland and Copenhagen, Denmark), thereby providing the opportunity for the EU to display its leadership within its own territory at a critical juncture in the negotiations over a post-2012 agreement.

1.2 The Internal Market

Efforts are continuing on the completion of the internal market for energy, a process that began in earnest with the first Electricity Market Directive issued in 1996 5 and the first Gas market Directive in 1998 6. The second round of Directives in 2003 further advanced the internal market in electricity and gas, with market liberalisation, streamlined regulatory efforts and improved technical cooperation. A new integrated set of proposals from the Commission aims to further improve market competitiveness through measures to encourage unbundling and reduce market barriers. The process of completing the internal market is aimed at improving the security of supply, making energy services more affordable, giving consumers more choices, and insuring the economic and environmental integrity of the internal markets.

The two Directives currently in place — one for the electricity market (2003/54/EC) — and one for the natural gas market (2003/55/EC) – are considered as having achieved the fundamental objective of all Member States fully opening their markets to competition. Although Member States have met the legal requirements of the Directives, this does not necessarily insure that markets are as competitive as they could be: the Commission has identified a number of issues, especially the persistence of price differences, concentration of actors, limitations on the independence of network operators, and major differences in the regulatory power accorded by different Member States to their regulators 7.

The new integrated set of proposals aims to address these issues and to achieve unbundling of generation from distribution and transmission in order to prevent discrimination against third parties.

1.3 Energy security and import dependence

The emphasis on open markets and environmental objectives that has characterized EU energy policies in recent years has raised some other concerns, such as the safety, reliability, and overall security of energy supplies. One example is the special role of natural gas as the 'cleanest' fossil fuel in combination with the open markets of the EU, which has led to increasing dependence on imported natural gas. The increasing reliance on imported natural gas can be countered in a number of ways, such as by improving interconnections, diversifying sources, and by substitution with biogas and other fuels. The recent agreement between Hungary and Romania to connect their gas transmission grids offers an example of continuing efforts to integrate the gas networks of Central and Eastern Europe, thereby improving energy security as the Union enlarges[8].

During 2007 and 2008, world oil prices climbed rapidly to their highest level ever, raising renewed concerns for European industries and consumers. Even with increasing oil prices, the lack of alternatives in the transport sector means that consumption has not been significantly affected in most parts of the EU, so that an increasing portion of income has to be devoted to paying for imported oil. The high cost of oil dependence is among the reasons that the Commission attached considerable importance to the promotion of biofuels in its recently proposed Renewables Directive (see section 1.5 below). In response to concerns about oil supply disruptions, the Commission recently launched a public consultation on the emergency oil stocks regime, with the eventual goal of consolidating all related legislation[9].

Although coal was historically plentiful in Europe compared to oil, it has also become an issue in terms of security and imports. Much of the coal available within the Community is lignite, and higher quality hard coal is increasingly being imported in order to minimise environmental impacts and maximise value. The reliance on imported coal adds yet another dimension to the energy security aspects. The quality of imports was addressed already several years ago in a Directive aimed at establishing a comprehensive monitoring system, which includes a combination of price, quantity, and quality attributes[10]. The system is also intended to assist in assuring a diversity of sources and suppliers in order to reduce the risk of disruptions.

Nuclear power was originally viewed as an effective mechanism for addressing growing import dependence in the EU and has made some contribution to the extent that it has helped to reduce fossil fuel use. However, the perceived value of nuclear power is now more as a cost-effective option to reduce GHG emissions. Although nuclear has regained popularity for just such reasons, it continues to raise safety concerns, particularly in relation to radioactive waste. A recent survey showed that although European consumers/citizens are somewhat positive about nuclear power, they remain concerned about its safety, feel the need for more information and would like to see a more integrated European approach to radioactive waste disposal[11]. The Commission presented in 2007 the 'Nuclear Illustrative Programme', the fifth such communication under EURATOM since its founding in 1958, which provides a concise summary of the rationale and the key implementing elements of the Community nuclear programmes and policies[12].

It is also widely recognised that the old notions of the security of energy supply must be dispatched in favour of a more pluralistic, open, and democratic approach. A modern version of energy security eschews the 1970s obsession with securing oil supplies and recognises the importance of consumer choice, the crucial value of environmental sustainability, the needs of developing countries, and the need for fair and equitable international trade. Furthermore, such an approach recognises that demand-side policies can make an equally important contribution to overall energy security, and EU energy policy has therefore put increasing emphasis on demand-side efficiency, as discussed in the next section.

1.4 Towards an energy-efficient European economy

A key component of the Commission's energy and climate package is the commitment to reduce energy consumption by 20% by 2020, compared to the business-as-usual scenario. Energy efficiency is perhaps the only domain of energy policy that contributes to all the fundamental goals of the Community: energy efficiency reduces GHG emissions, addresses energy security, lowers the cost of energy services for consumers, and improves economic competitiveness. The innovation that accompanies energy efficiency programmes contributes to new jobs and new interfaces within the knowledge-based economy. Energy efficiency improves the competitiveness of European industry and reduces the vulnerability of European infrastructure to sudden changes in weather or in energy prices.

The portfolio of energy efficiency programmes has widened and deepened in recent years, encompassing all major sectors and also operating at all scales—local/regional, national, EU, and international. The sector with the largest potential savings is commercial/services, estimated to be about 30% by 2020,

while the other sectors (residential, transport, industry) each have potential savings of 25-27%[13]. The Commission's Action Plan in late 2006 laid out clearly ten priority areas and the instruments that could be used to address them, covering all sectors and calling for action at all scales, and demonstrating the importance of cross-sector and cross-scale efforts[14].

Energy consumption labels have been an important policy instrument for nearly two decades in addressing the consumer side, and have been applied to products such as freezers, refrigerators, dishwashers and washing machines[15]. More recently, the approach has been streamlined through a common regulation that adapts the procedures for office equipment, whose connection to the U.S. Energy Star programme will be strengthened by clarifying the applications and by creating a European Community Energy Star Board (ECESB) to review the implementation of Energy Star performance labelling[16]. The collaboration with Energy Star exemplifies the strong international character of Community energy efficiency policy as well as its pragmatism: by teaming up internationally for products with large markets in the U.S. and Europe, market signalling coordination reduces administrative costs and helps to transform global markets.

The Eco-design Directive[17] opened up a range of new possibilities by facilitating measures that can address energy consumption of components as well as entire products. The Directive also places the energy-using characteristics within the broader context of environmental performance, including the entire product life cycle, and creates incentives to address environmental performance from the design stage onward. A new initiative that follows from the Directive is the development of a regulation on standby electricity losses from various products (mainly residential) that could save 35 TWh out of the estimated 50TWh annually consumed from products operating in standby mode[18].

The Energy Services Directive[19] provided a broad and yet detailed framework for improving energy efficiency by setting indicative targets, specifying policy instruments to remove market barriers to efficiency, creating the necessary conditions to develop a market for energy services, and establishes delivery mechanisms for efficiency measures, such as public procurement. The Directive also required that Member States draw up National Energy Efficiency Action Plans (NEEAPs) for each of the three three-year periods covered by the Directive. An indicative target of a minimum 9% improvement in energy efficiency was established. The Commission's review of a first set of 17 NEEAPs submitted by 1 December 2007 showed that about half had addressed the basic requirements while the others either did not cover the whole nine-year period, did not meet the 9% minimum reduction target, or otherwise deviated from the objectives[20]. Consequently, it is clear that a considerable amount of follow-up work will be needed in this area.

Energy consumption and GHG emissions have been increasing steadily in the transport sector, and consequently the Commission has stepped up its activities in relation to energy efficiency and emissions reduction, particularly for road transport, which accounts for the overwhelming majority of emissions. Progress has been slower than expected in reaching the target of an average of 120 g CO2/km for all new passenger cars by 2010. The Commission's review in 2007 showed that the target should be achievable by 2012, and also indicated a commitment, through a variety of measures, to reduce the value to 95 g CO2/km by 2020[21]. The Commission has also issued a package of "greening transport" measures to address the entire sector, including regional planning, mode switching, and other aspects in addition to technical efficiency[22].

1.5 Renewable energy

During the past decade, the EU has emerged as the world's leading region in developing and implementing renewable energy technologies; about one-third of the estimated global investment of 150 billion USD in energy efficiency and renewable energy was in the EU in 2007[23]. The existing Renewables Directive sets a target of 21% of electricity generated in 2010 to come from renewable energy sources in the EU[24]. The recently proposed Renewables Directive that is being intensively debated during 2008 creates an overall target of 20% renewables across all energy sectors by 2020; it takes a broader approach by integrating the power sector, transport, and heating and cooling[25]. Member States can tailor their approach to their own available resources and conditions based on the most suitable combination across the sectors.

The Commission nevertheless chose to propose a minimum target of 10% renewable fuels in the transport sector, which was expected to be composed mainly of biofuels[26]. The rationale was based on the fact that the transport sector has seen the slowest progress in addressing GHG emissions and also that the target does not unduly impose on individual Member States since liquid fuels for transport are easily traded across borders. The biofuels target was accompanied by elements in the Directive that were aimed at insuring the sustainability of biofuels, based on criteria such as avoidance of growing biomass in ecologically-sensitive areas and a proposed minimum level of GHG reduction of 35%. The calculation of GHG emissions and the procedures for verification and reporting were specified in several articles of the Directive and its annexes[27].

The biofuels target and the accompanying sustainability criteria have become the subject of considerable controversy since the proposal was made, due to rising global food prices and concerns about the impacts of biofuels in some developing countries. Some have argued for abolishing the target while others have been more focused on strengthening the criteria.

An important element in the Directive was the inclusion of heating and cooling, which have previously not been part of the Community's legal framework for promoting renewable energy and have not developed significantly compared to the power and transport sectors. Although currently representing a much smaller share of energy than the transport sector or the power sector, heating and cooling are important because they can offer high efficiency solutions and can match end-use needs. Furthermore, the Directive includes both small-scale options such as geothermal heat pumps and therefore provides policy guidelines that are cross-scale as well as cross-sector.

1.6 International cooperation

With an increasingly global economy and the emergence of climate change as the world's major environmental challenge, it is neither possible nor desirable for the EU to act unilaterally in developing and implementing its energy policy. The Community actions and legislation are more and more tied into international developments, leading to interdependence that must in turn, be incorporated into new policies. Issues that are particularly noteworthy relate with respect to external relations are regional energy cooperation, international energy trade, and development cooperation. An important contribution to improving technical competence in the EU and internationally is the Strategic Energy Technology plan, which was released in late 2007[28].

There has been considerable progress in regional cooperation in Europe through the Energy Community Treaty with Albania, Bulgaria, Bosnia-Herzegovina, Croatia, Macedonia, Montenegro, Serbia and the Kosovo region. This treaty provides for the creation of an integrated market in natural gas and electricity in South-East Europe, with a stable regulatory and market framework that is capable of attracting investment in gas networks, power generation and transmission networks. The Energy Community Treaty also aims to enhance the security of supply by extending access and allowing for mutual assistance in the event of a disruption in service.

EU cooperation on energy with developing countries facilitates technology transfer, allows exchange of knowledge, stimulates investment, and creates new opportunities for advancing sustainable development, particularly through new platforms for renewable energy. The objectives of EU development cooperation include the integration of energy as a horizontal element of EU development aid programmes, enhancing institutional capacity, and providing technical assistance. Regional cooperation along the lines of the EU model is promoted so that smaller developing countries can benefit from more competitive markets, cross-border investment opportunities, and the standardisation of energy technologies and products.

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(26) Ibid. It should be noted that there was some confusion as to whether the requirement was for biofuels or for all renewable fuels. Technically the proposal involved all renewable fuels, including electricity from sources certified as renewable. However, it was subsequently referred to as a biofuels target and was widely interpreted as such.

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2

Analysis of energy trends in the European Union

The EU encompasses a diverse group of states with wide variations in the many physical and economic aspects of energy systems, such as resource endowments, physical infrastructures, distribution systems and pricing structures. Energy statistics support analyses of spatial and temporal similarities and differences, provide input to policy makers, and facilitate a dialogue among stakeholders that is grounded in a common reference system ("methodology"). Sound energy policies rely on comparable and comprehensive energy statistics, including production, consumption, trade, prices, infrastructure and related supporting or complementary data.

This chapter reviews the different energy sources and end-use sectors, focusing especially on recent developments and trends, and illustrates, where appropriate, the linkages to the basic tenets of EU energy policy. The review includes primary fuels, transformation, end-use sectors, and energy-related emissions. Only greenhouse gas emissions are considered, since they currently have highest prominence and arguably have the closest relation to energy systems and energy policies: more than 80% of the overall greenhouse gas emissions are the result of fuel combustion.

Overview of selected energy system trends and issues

The past 15 years have seen tremendous changes in the structure of the energy system in the EU. A few major trends are worth noting by reference to some key energy statistics (see Table 2.1). One is the fairly significant downward trend in energy intensity, even in recent years when the euro was gaining in strength. The EU-15 has been steadily reducing their energy intensity, in spite of having very mature economies where the energy-saving opportunities are more costly.

In basic production and consumption trends, one finds that the EU has seen reduced primary production in favour of imports. The transport sector has seen unabated growth, expanding to 29% of final energy consumption in 2006. With an increasingly service-oriented economy, it is little surprise that electricity's share of final consumption has increased from 16% to 19%. Legislation and initiatives aimed at mitigating climate change and improving energy security have contributed to a decreasing use of fossil fuels; the decrease is due mainly to replacement of coal with other sources.

Table 2.1: Selected EU energy indicators

	1991	1996	2001	2006
Energy Intensity (kgoe/1000 EURO)				
EU-15	215.42	209.35	190.69	179.54
EU-27	:	240.36	214.71	202.45
Energy per capita (kgoe/cap)				
EU-15	3.72	3.84	3.96	3.96
EU-27	3.53	3.60	3.64	3.70
Production/Consumption (EU-27)				
Primary Production Share of Gross Inland Consumption	55%	57%	53%	48%
Net Imports Share of Gross Inland Consumption	46%	45%	49%	55%
Transport Sector Share of Final Consumption	24%	25%	28%	29%
Electricity Share of Final Consumption	16%	16%	18%	19%
Fossil Fuels Share of Primary Energy Consumption	83%	81%	79%	79%
Renewable Energy (EU-27)				
Renewables Share of Primary Production	8%	9%	11%	15%
Renewables Share of Gross Inland Consumption	5%	5%	6%	7%
Renewables Share in Electricity Generation	13%	13%	15%	15%
Biomass Share of Gross Inland Consumption	3%	3%	4%	5%
Biofuels share of road transport energy consumption	0%	0%	1%	3%
Transport/petrol (EU-27)				
Road transport share of petrol for transport	85%	85%	84%	83%
Share of petrol in aviation	11%	12%	13%	14%
Ratio of diesel/petrol in refineries	1.45	1.53	1.65	1.70
Ratio of diesel/petrol in consumption	1.64	1.73	2.02	2.50

Source: Eurostat

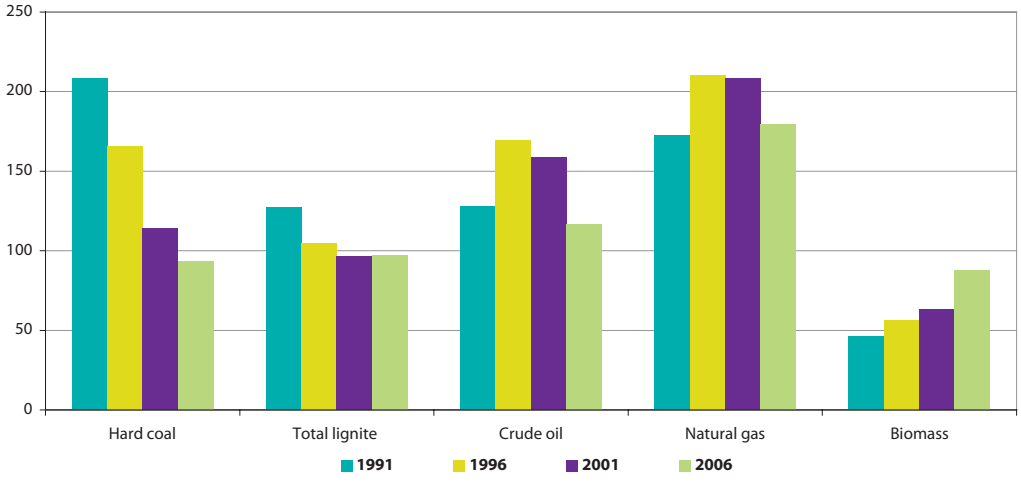
The promotion of renewable energy in the EU supports climate mitigation goals, adds diversity to the energy system and supports the long-term transition to sustainable energy. Until the mid-1990s, support schemes for renewable energy were driven by largely national programmes. By the end of the 1990s, efforts at harmonising renewable energy policies were well underway and resulted in the first renewables Directive in 2001, which has contributed to the increase in renewables to 7% of consumption in 2006. The biofuels Directive in 2001 has supported the uptake of bio-ethanol and bio-diesel into the market, reaching 3% in 2006. The share of renewables has also been boosted considerably by the expanded availability of efficient end-use technologies for biomass, such as residential wood stoves and small-scale biomass boiler systems, along with its use in medium-scale heat and power systems. The expansion in biomass, accompanied by the decline in coal and oil production in the EU, are the main factors behind renewables increasing to 15% of primary production in 2006.

In the transport sector, the popularity of air travel has resulted in significant increases in demand for jet fuel, with the result that air travel now accounts for 14% of petroleum products used in the transport sector. Another development in the transport sector is the shift to diesel for cars; the ratio of diesel to petrol increased to 2.5 in 2006, far beyond even the increased ratio in refinery output. The heavy reliance on diesel is somewhat unfortunate in terms of biofuel substitution, since it complicates the creation of markets for bio-ethanol. It can create incentives for bio-diesel, however, which have been pursued vigorously in several countries, especially Germany, which produced 51% of all biodiesel in the EU in 2007[1].

Primary fuels

The single largest fuel in terms of primary production[2] within the EU is natural gas, which was roughly equal, in energy terms, to total production of hard coal and lignite combined. Over time, natural gas and biomass have substituted for coal. In 1991, hard coal and lignite accounted for nearly half of all primary energy produced in the EU. The absolute levels of primary production are nevertheless lower now for natural gas, after the gas boom that started in the mid-1990s and lasted for several years. Biomass has increased considerably, with production in 2006 now nearly double its value of 1990-91 (Figure 2.2).

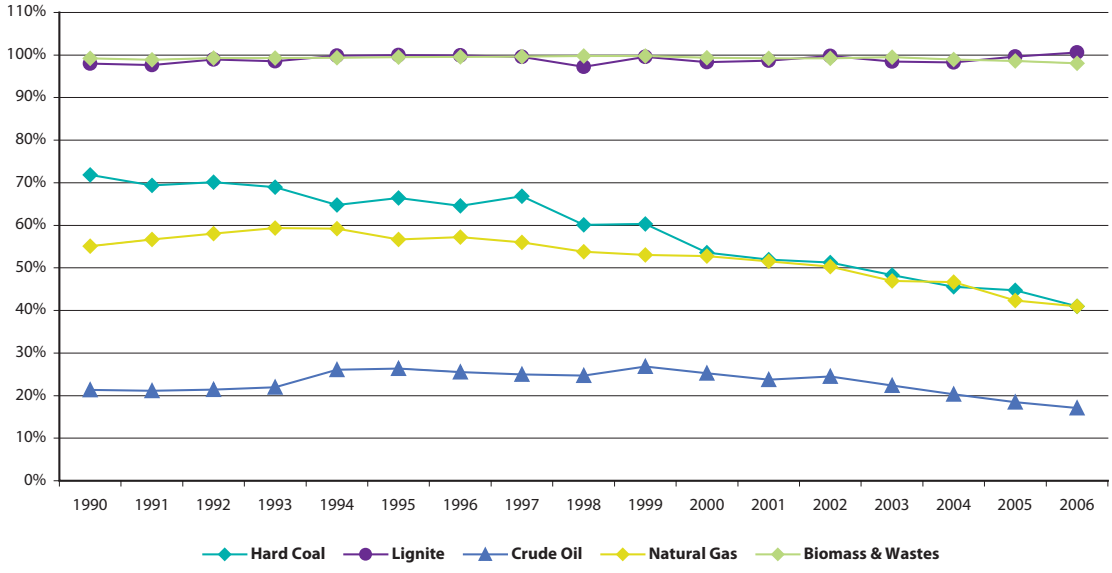
Figure 2.2: Primary production of fuels in the EU-27, in Mio toe



Source: Eurostat

The relationship between primary production and consumption has been shifting in recent years, accompanied by an increasing dependence on fossil fuel imports. With market liberalisation and freer trade, imports have become less costly in relative terms during the past 5-10 years at the same time that several major fossil fuel resource sites within the EU are in decline. Consequently the major commodities (crude oil, natural gas, and hard coal) all exhibit significantly decreasing share of primary production in gross inland consumption (see Figure 2.3).

Figure 2.3: Share of primary production in the gross inland consumption, per fuel

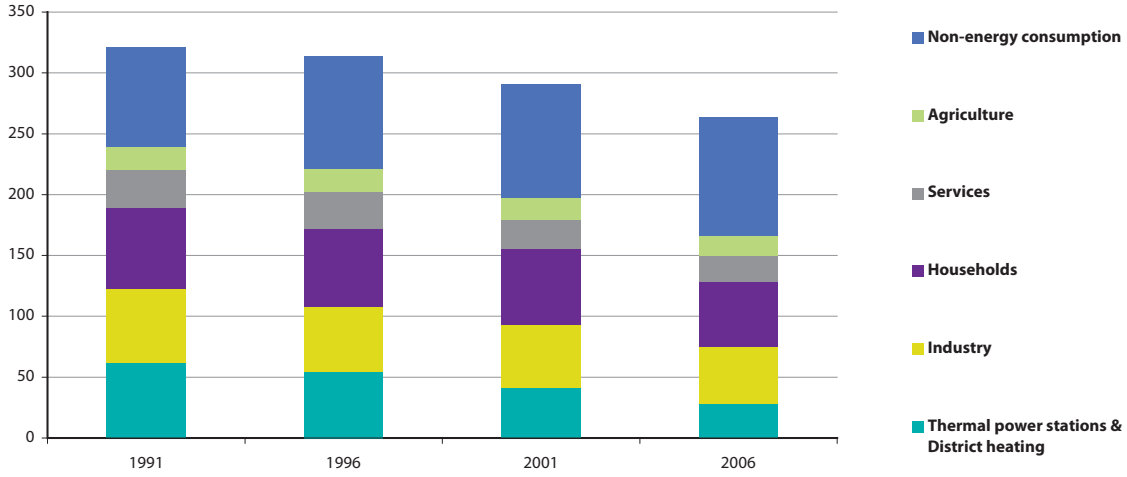


Source: Eurostat

The lower energy density of lignite compared to hard coal means that it is less amenable to international trade. The situation is similar for biomass, which tends to have a lower energy density, although some types of prepared biomass, such as pellets, have seen increasing international trade. Lignite and biomass are therefore mainly domestic fuels and therefore have ratios close to one in Figure 2.3. The decreasing availability of hard coal within the EU has led to increasing imports, while natural gas demand has increasingly outstripped supply within the EU; as a result, the share of primary production of hard coal and natural gas in gross inland consumption has been decreasing steadily, as shown in Figure 2.3. The rate of decline for oil is similar to that of gas and hard coal (i.e. similar slope to the curves in Figure 2.3), although starting at a much lower base.

Petroleum products are used in virtually all sectors and also have a variety of non-energy uses in chemicals, construction and other industries (see Figure 2.4). There is also some effort put into policies and regulations directed at reducing oil consumption in sectors other than transport, since there are often substitutes available in other sectors that have fewer negative impacts. Oil consumption has decreased in uses other than transport, especially in the case of district heating and electricity generation; only 8% of non-transport consumption of oil was for the latter sector in 2006, compared to 16% in 1991.

Figure 2.4: Oil consumption by sector/use (excluding transport), in Mio toe

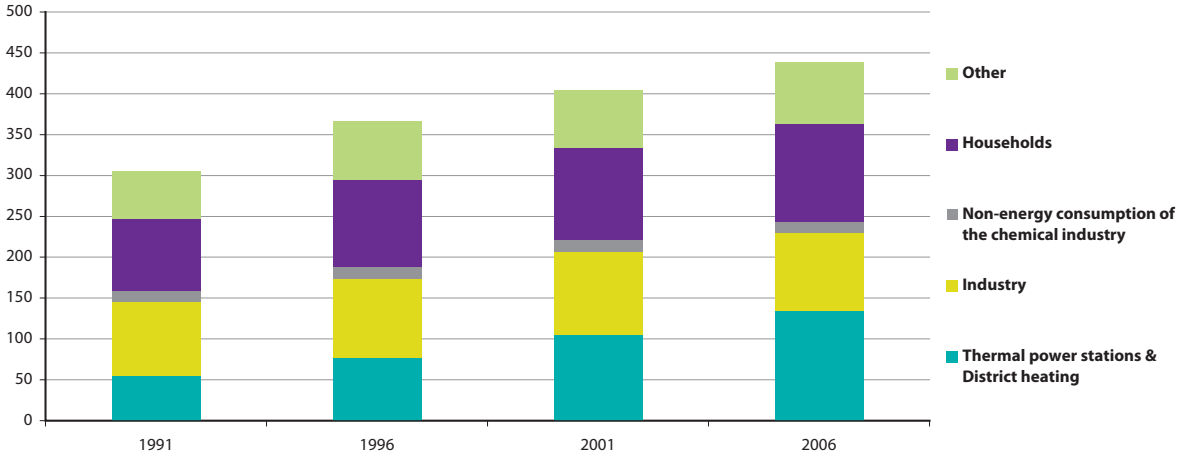


Source: Eurostat

Oil consumption in the household, services and industry sectors has also decreased, albeit at a more modest pace. The non-energy use of petroleum products in the industry has increased fairly significantly, which is due to the economic significance of the chemicals sector in the EU. Even in such cases, alternatives are available; the 'green' chemicals sector can provide bio-based feedstocks to substitute for petroleum both for bulk chemical industries as well as for fine chemicals used by final consumers (e.g. pharmaceuticals).

By far the most dramatic change in the primary energy system has been the tremendous increase in natural gas consumption (see Figure 2.5). Total natural gas consumption increased by 44% between 1991 and 2006, while consumption in district heating plants and thermal power stations increased by 144%. Consumption in buildings, in both residential and service sectors, also saw significant increases, facilitated by the substantial expansion in natural gas pipelines. Industry and non-energy uses have remained fairly flat over this period, due in part to the industrial contraction in eastern and central Europe.

Figure 2.5: Natural gas consumption by sector/use, in Mio toe

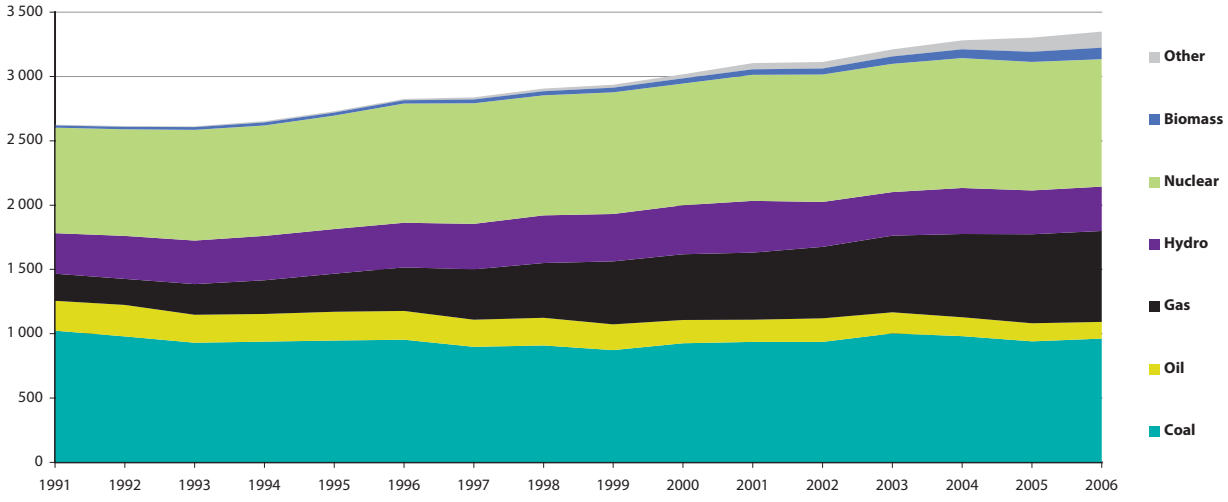


Source: Eurostat

Electric power

The electricity generation mix has become more diverse during the past 15 years; in 1991, coal and nuclear accounted for 70% of power generation, whereas by 2006, these two sources supplied less than 60%. The diversification is due to two main factors: the remarkable rise of natural gas and the push for renewables from the 2001 EU Directive. The share of natural gas in power production increased from 8% to 21% between 1991 and 2006, while the share of coal decreased from 39% to 29%. The 'new' renewables, particularly wind and biomass, increased rapidly, although starting from a small base, whereas hydro (the 'old' renewable) increased slightly but lowered its share, from 12% in 1991 to 10% in 2006 (see Figure 2.6).

Figure 2.6: EU-27 electric power generation, in TWh

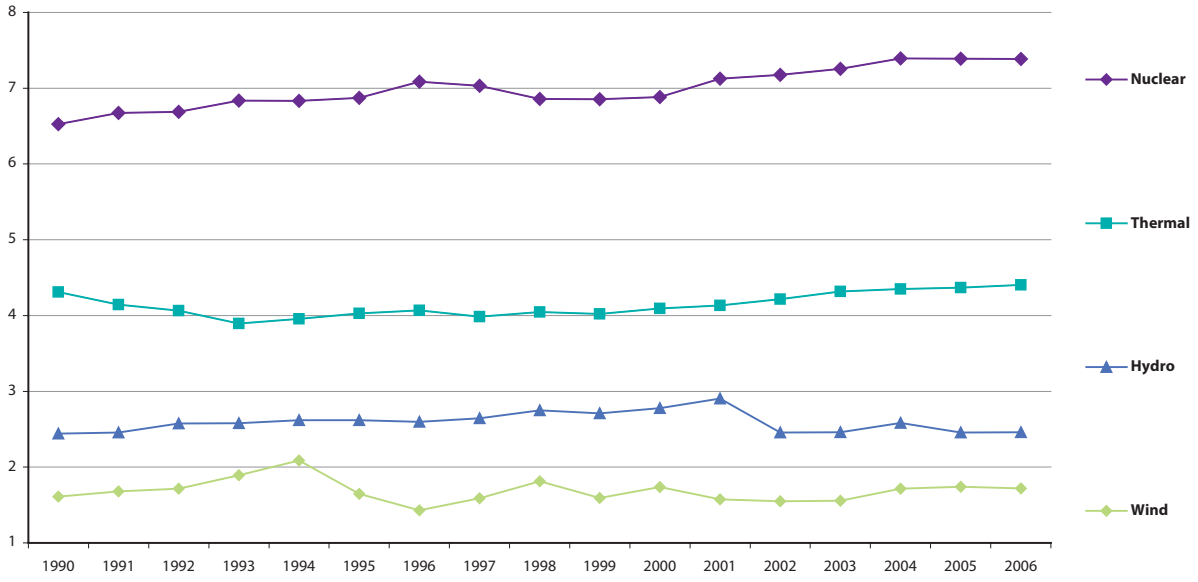


Source: Eurostat

Changes in capacity utilisation provide some rough measure of the overall ability to 'squeeze more' electricity out of the system (see Figure 2.7). In the case of nuclear power, capacity utilisation has exhibited a fairly significant upward trend and may be getting close to its maximum achievable limits. Thermal has shown a slight upward trend after an initial dip in the early 1990s. The lower capacity utilisation of thermal tends to be common in the EU due in part to the increasing amount of gas capacity, since gas is expensive to run and is used for peaking power rather than baseload production. Other reasons for lower capacity utilisation can be that some older plants are not running at full capacity and/or may be shut down for some periods of the year.

Hydro and wind have registered a slightly downward trend, and are more erratic due to seasonal changes and in the case of wind—a result of rapid increases in capacity in recent years. The intermittent nature of wind can result in wide variations in availability, and therefore requires some additional planning when incorporating new capacity into regional interconnections. The seasonal nature of hydro availability leads to some regions or countries exporting electricity in "wet" years and during "wetter" periods within the year. There is also some pumped hydro capacity, which allows for storage to compensate the differences in power load over the course of a day or week as well as over longer periods of time. Capacity utilisation will inevitably become more important within a system that is not only becoming more diverse but will also have an increasing share of intermittent renewables (wind, solar, hydro).

Figure 2.7: EU-27 electric power capacity utilisation (MWh/kW), five-year running averages*



* Capacity utilisation is defined as annual MWh generated divided by kW installed capacity. A five-year running average is used so as to represent the approximate trend over time, due to the fact that capacity may have been added at any time during the year, and also due to annual changes in hydro availability.

Source: Eurostat

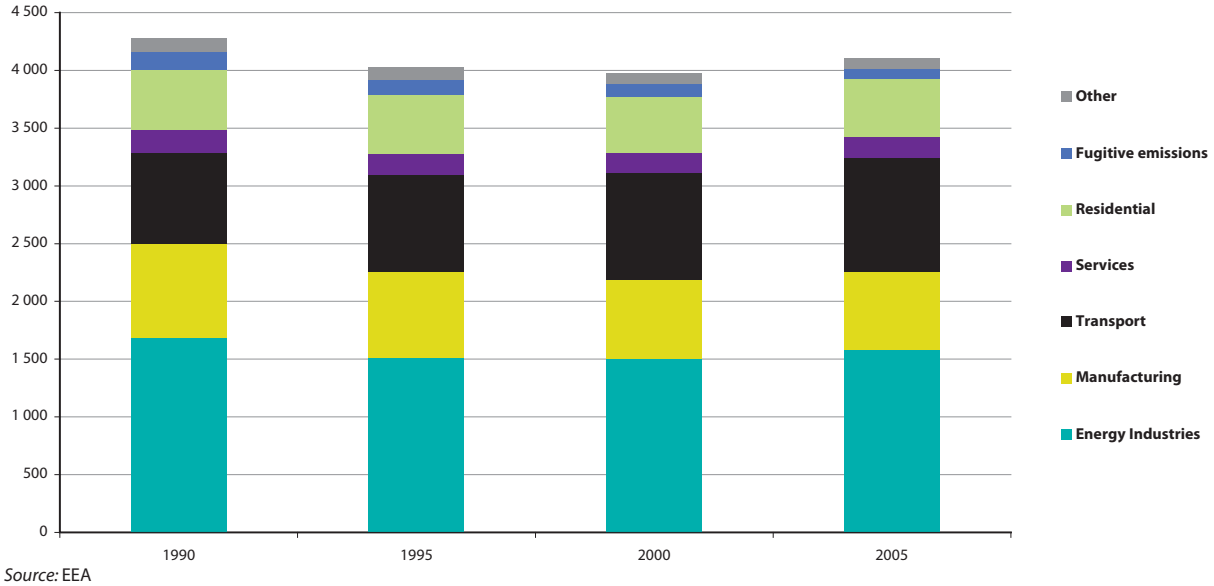
Climate-Energy linkages: greenhouse gas emissions

Climate policy and energy policy have become more and more intertwined within the EU during the past decade; indeed, climate mitigation goals now constitute the core aim of EU energy policy—a low carbon economy is necessary to avoid the costly consequences of climate change and to promote a more competitive European economy. Energy-related greenhouse gas emissions accounted for 80% of all EU27 greenhouse gas emissions in 2006, which is not surprising in a mature service-sector oriented economy. This corresponds closely to the share of CO2 emissions of all greenhouse gas emissions, which was 83% in 2006.

Greenhouse gas emissions can be attributed to various energy-related activities, including the energy industries (heat and power, energy distribution, etc.), transport, manufacturing, services, households, agriculture, and other categories. There are also some non-combustion emissions associated with exploration, processing, transport and production of fuels, which are known as fugitive emissions.

The shares of energy-related greenhouse gas emissions over time are shown in Figure 2.8. The transport sector is the only sector that has registered an absolute increase, about 27% compared to 1990. As a result, transport sector emissions now account for nearly one-quarter of all energy-related emissions.

Figure 2.8: EU-27 greenhouse gas emissions by sector, in Mio tons of CO_2 equivalent



Source: EEA

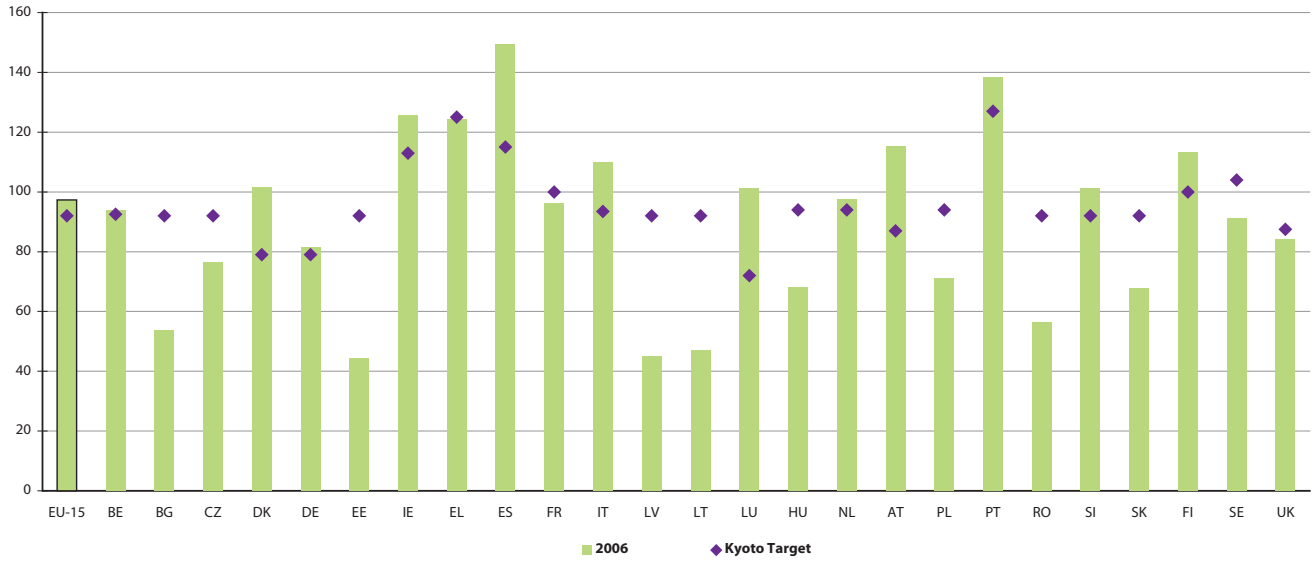
A significant portion of the reductions that have occurred are likely due to the lingering effects of significant economic contractions in the countries of eastern and central Europe during the early 1990s (see Figure 2.9). One can notice that the EU-12 (i.e. the 12 newest Member States of the EU) may now be on an upward track in emissions, which, although it does not affect the Kyoto target achievement for the EU-15, does affect overall progress as well as setting patterns that will impact any eventual successor agreement to Kyoto.

Figure 2.9: Trends in greenhouse gas emissions, index 1990=100

Source: EEA

The burden-sharing arrangement and the contraction in the economies of eastern and central Europe have contributed to considerable diversity in emissions of Member States in relation to their targets. A number of Member States in eastern and central Europe have emission levels that are well below their target, while some of the older Member States remain at levels far exceeding their respective targets (Figure 2.10). Addressing such disparities will therefore be a major element of attempts to harmonise energy-climate policy in the coming year.

Figure 2.10: Total greenhouse gas emissions indexed on actual base year



Source: EEA

References

(1) European Biodiesel Board, http://www.ebb-eu.org/stats.php.

(2) The term 'fuels' as used here excludes those sources that are used exclusively or primarily as inputs for secondary energy production, i.e. for heat and/or electric power (e.g. nuclear, hydro, solar).

(3) Official Journal L 160, 28 June 1988, pp. 46-48 Council Recommendation 88/349/EEC of 9 June 1988 on developing the exploitation of renewable energy sources in the Community

(4) COM(97)599 final (26/11/1997) – Energy for the future: Renewable sources of energy - White Paper for a Community Strategy and Action Plan

(5) COM(97)599 final (26/11/1997) – Energy for the future: Renewable sources of energy - White Paper for a Community Strategy and Action Plan

3

Energy profiles of the EU Member States

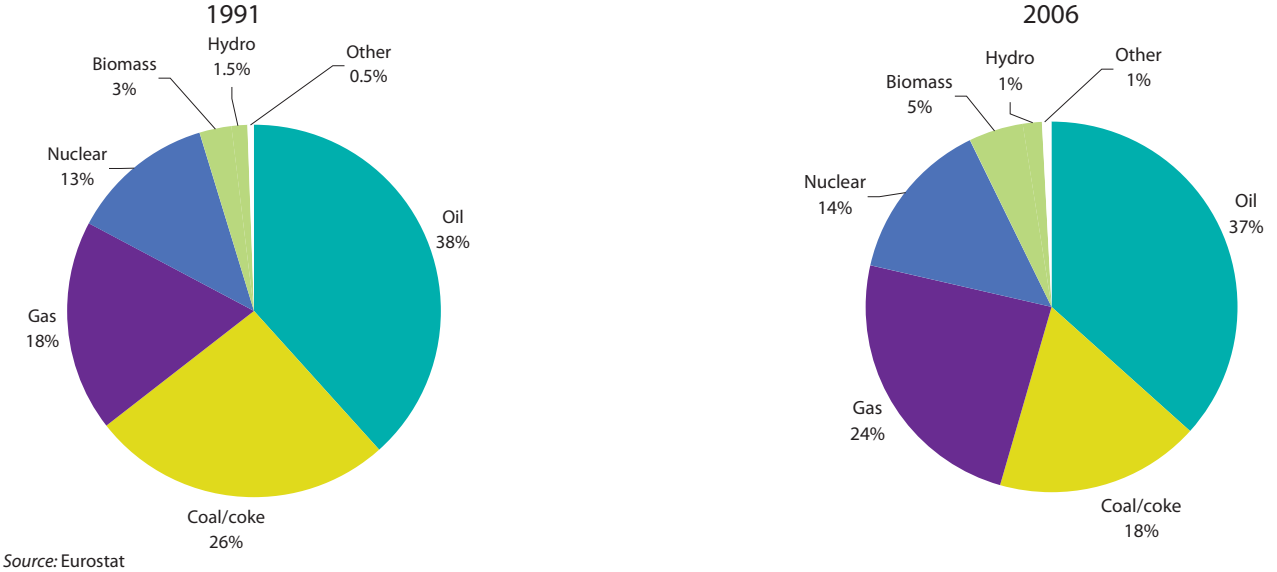
3.1 European Union (EU-27)

Enlargement, liberalisation of energy markets, energy import dependency, the environmental concerns and the push for expanded renewable energy have been major driving forces in the changing energy structure of the EU in recent years. Non-hydro renewable sources for electricity and biomass for heat and power have expanded significantly. At the same time, natural gas consumption has increased significantly for both electricity production and other uses, while coal consumption and oil use outside the transport sector has decreased. The unabated increases in oil for transport along with the increasing popularity of natural gas in recent years are the major contributors to the continuing high energy import dependence of the EU.

Primary energy system

The EU is dependent on fossil fuels for about 79% of its primary energy, nearly half of which is oil or petroleum products (Figure 3.1.1). The share of oil among primary energy sources has changed little since the early 1990s.

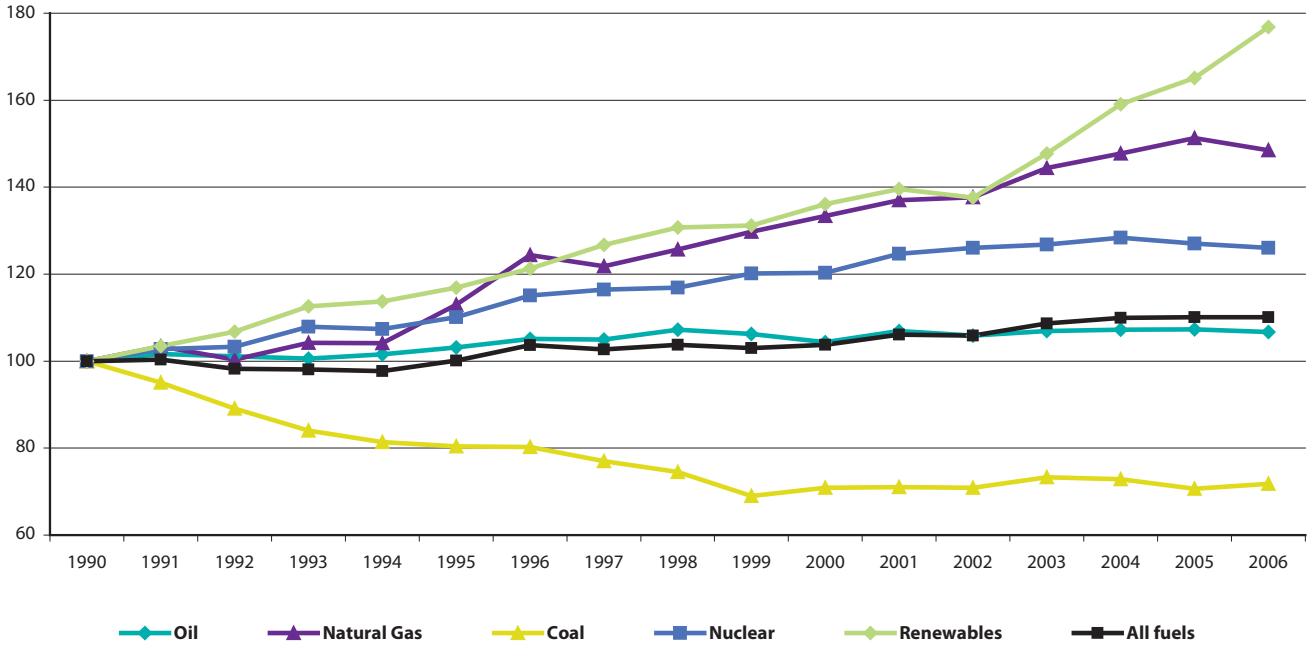
Figure 3.1.1: Gross inland consumption shares in 1991 and 2006 by type of fuel, in the European Union (EU-27)



Source: Eurostat

The major trends since 1990 in the structure of primary energy supply have been the increase in renewables, the decrease in coal, and the increase in natural gas (Figure 3.1.2). The share of natural gas among the three fossil fuels has increased from 21% in 1990 to 31% in 2006, while the share of coal has gone from 33% to 23% over the same period. The fall in coal and the rise of gas coincide with the increasing prominence of climate change policy in the EU; the UN Framework Convention on Climate Change (UNFCCC) dates to 1992 and 1990 serves as the base year for emissions reductions under the Kyoto Protocol. The same timeframe also corresponds with the greater availability of gas and oil imports from Russia after the disintegration of the Soviet Union in 1991.

Figure 3.1.2: EU-27: Development of primary energy supply by type of fuel (1990=100)



Source: Eurostat

The marked increase in renewables during the past five years corresponds with the implementation of the EU Renewables Directive (2001/77/EC), which was passed in 2001 (see also Chapter 5.1). Among renewables, a few sources, notably wind, have grown at very high rates in recent years, although biomass and hydro continue to overwhelmingly dominate the mix, together representing nearly 90% of all renewables in 2006. In the past few years, there has also been a significant increase in the use of renewables in the transport sector in the form of biofuels, although still representing less than 3% of road transport energy consumption.

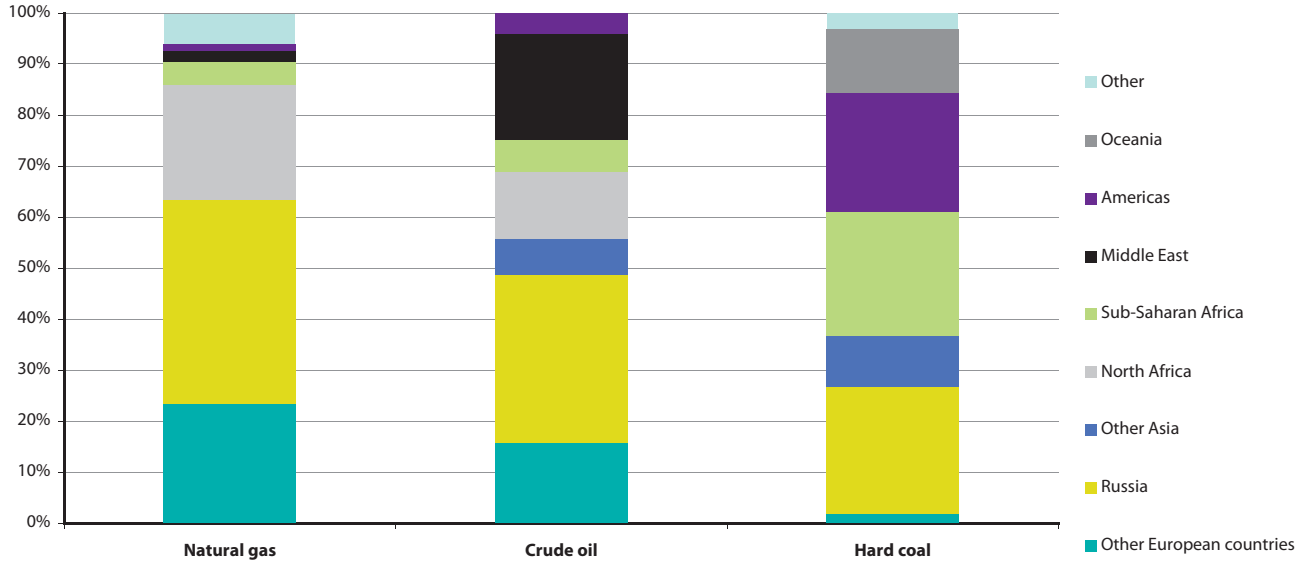
Fossil fuel imports

The EU-27 is dependent on significant levels of fossil fuel imports. In 2006, net imports of oil from outside the EU amounted to 83% of its gross inland consumption, while net imports of natural gas from outside the EU amounted to 55%. Net imports of hard coal from outside the EU amounted to 58% of the total quantity of hard coal consumed. In all three cases, the import dependence has been increasing more or less steadily since the early 1990s.

Whereas oil and gas imports are driven by demand, coal imports are more related to quality, as there is an increasing preference for higher quality hard coal, which has greater energy content and lower emissions. Most coal produced within the EU is lower quality lignite; in 2006, lignite amounted to 74% of total primary production of coal on the basis of weight, but only 51% of the total on an energy basis.

The geographical origin of imports differs by fuel (Figure 3.1.3). Russia is a significant source of imports for all three sources; the Middle East, North Africa and Norway are significant suppliers for oil; North Africa and Norway are other major suppliers for natural gas. Australia, Colombia, and South Africa play a major role for the deliveries of hard coal.

Figure 3.1.3: EU-27 energy imports: shares of major fossil fuel products in 2006, by origin

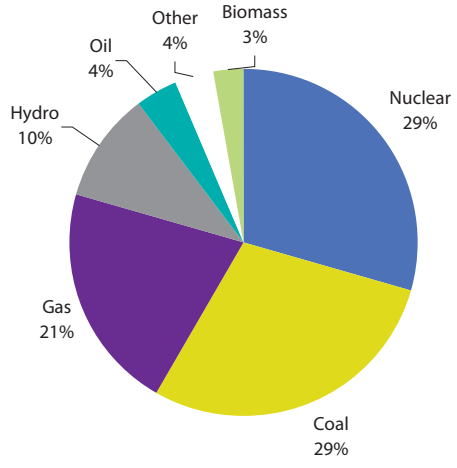


Source: Eurostat

Electric power sector

The electric power sector is mature and well-developed throughout the entire EU. Some segments, such as the Nordic market, have had a very high degree of integration since the mid-1990s, while other regions have more recently improved technical and economic connections. Nearly 90% of power generation in the EU-27 comes from four sources: nuclear, coal, hydro, and gas. The remainder includes oil, biomass and other sources (Figure 3.1.4).

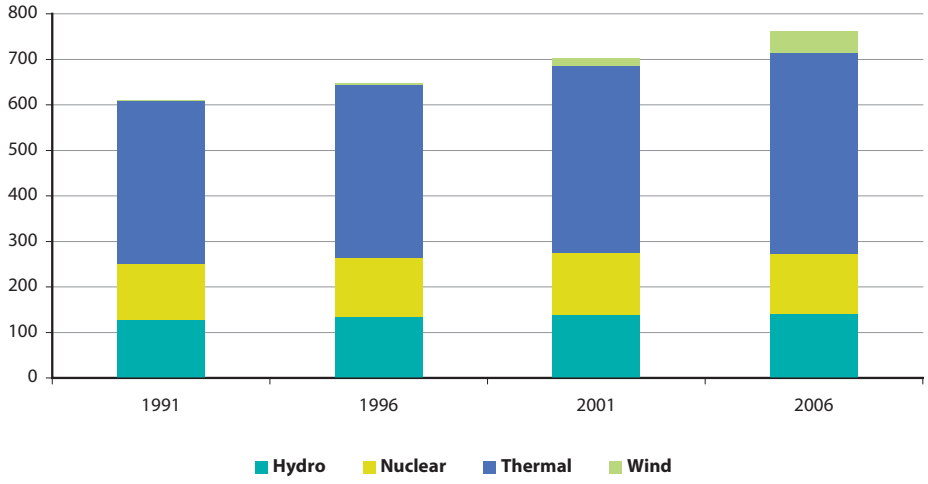
Figure 3.1.4: EU-27: Electricity generation in 2006: share by source



Source: Eurostat

Installed capacity has been stable for hydro and nuclear, which have historically been key pillars of the power supply in many parts of the EU. Thermal capacity has increased, with the rapid rise in natural gas along with the increasing use of biomass for combined heat and power. Overall, wind, biomass and natural gas have been the fastest changing elements in the power system. During 1991-2006, wind capacity increased on average 33% per year, while nuclear and hydro increased by just 0.6% per year. Thermal capacity increased by 1.3% per year, but of course these increases were on top of a very large installed base.

Figure 3.1.5: EU-27 Electricity generation installed capacity by type

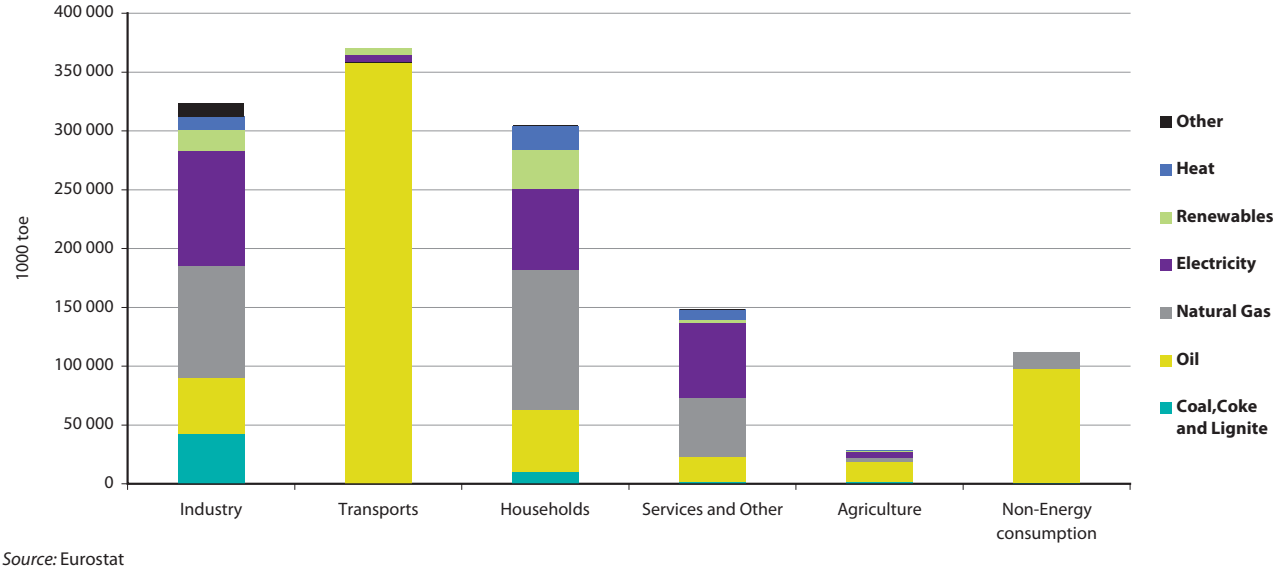


Source: Eurostat

Final energy consumption

The structure of final energy consumption in the EU-27 is shown in Figure 3.1.6, broken down by major end-use sector and fuel. Final energy consumption is dominated by industry, transport, and households, which together accounted for 85% in 2006, with services, agriculture and other sectors accounting for the remainder. Oil for transport is by far the single largest fuel-sector cross-combination, accounting for 30% of all final energy consumption. Within the transport sector, the overwhelming majority—about 82%--of energy use is for road transport. However, aviation, currently at 14%, has been growing rapidly, and has contributed to increased greenhouse gas emissions.

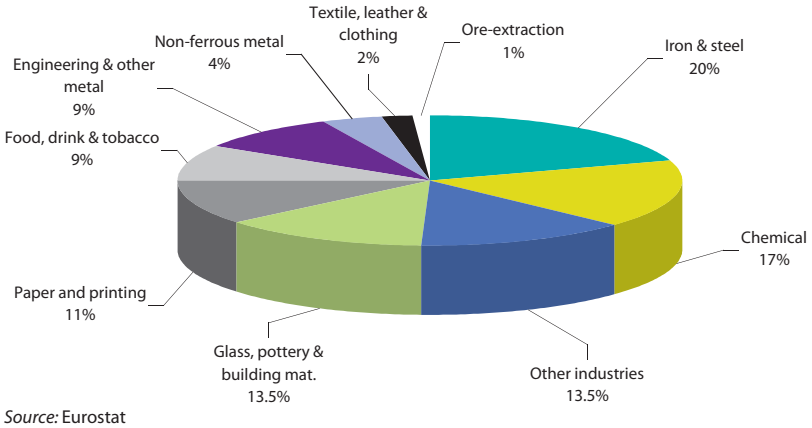
Figure 3.1.6: EU-27: Final energy and non-energy consumption by fuel and end-use sector, 2006



Source: Eurostat

Three industrial sectors (iron & steel, chemicals and glass-pottery-building materials) account for more than half of all industrial sector energy consumption (Figure 3.1.7). Paper and printing is another major energy-consuming industry, although it is able to supply a significant amount of energy from internal sources of waste biomass.

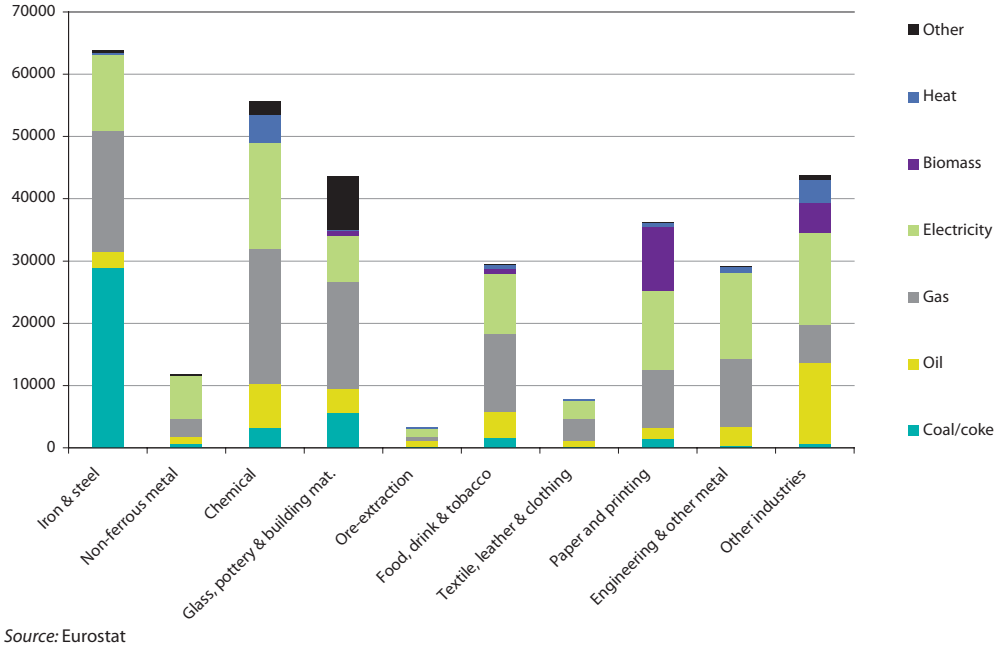
Figure 3.1.7: EU-27: Energy consumption of the industry 2006, breakdown by industrial sector



Source: Eurostat

The chemicals industry also has the highest share of electricity consumption among all industrial sectors. The prominence of the chemicals industry in the EU means that it will continue to play a special role in terms of energy and climate policy and targets. Overall, electricity consumption continues to be dominated by industry, which accounted for 41% of the total in 2006; households accounted for 28% and the service sector accounted for 26%. Gas consumption is significant across all industrial sectors (Figure 3.1.8), suggesting that gas has become a critical element of the EU industrial infrastructure as well as being important for household and service sectors, implying that it is necessary to maintain reliability and alternative sources.

Figure 3.1.8: EU-27: Industrial energy consumption in 2006 by sector and type of fuel (1000 toe)



Source: Eurostat

(1) Hard coal is by far the most significant type of coal in international trade, due to its higher quality and energy content.

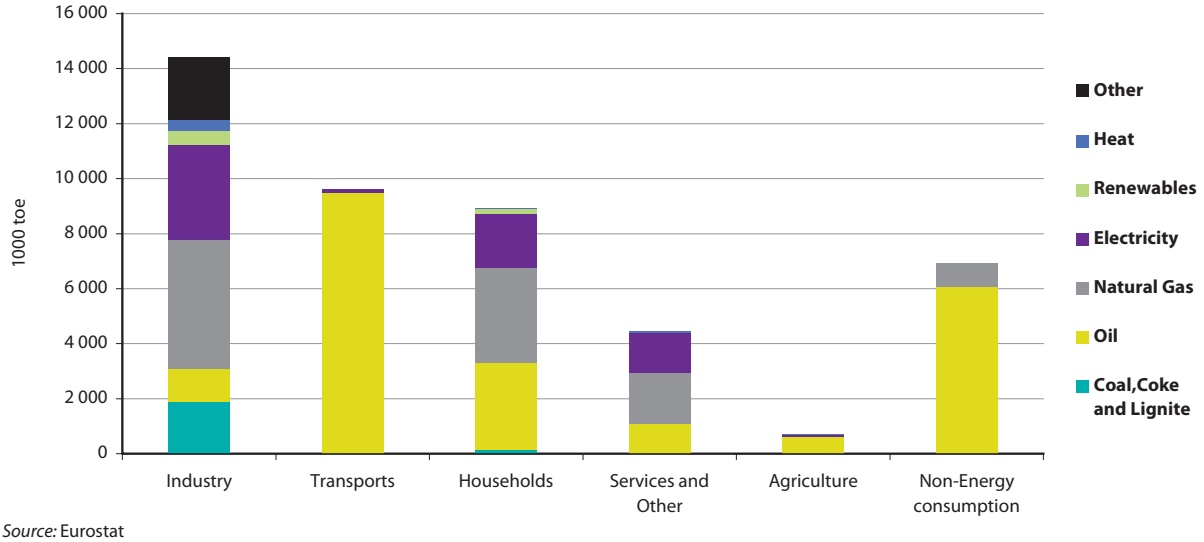
3.2 Belgium

Belgium has strategic international importance as a commercial and political centre; its energy system is well-connected and must fulfil the high demands of its chemical and shipping industries. Following the closure of its coal mines, Belgium has no mineral energy resources; it depends mainly on imported fossil fuels and nuclear power. The potential sources for increasing renewable energy include wind, biomass, and hydropower.

Overall energy structure

Industry takes up a large share of 38% of the final energy consumption. The chemicals industry accounts for 36% of the industrial sector's final energy consumption; since this important industrial branch also consumes a large amount of hydrocarbons for non-energy production purposes, its global share of energy and non-energy consumption amounts to 25% of the overall energy available for consumption at national level. The industry and transport demand is composed mainly of final uses of fossil fuels; the situation is obviously different for electricity, where the residential and service sectors together make up half of the total.

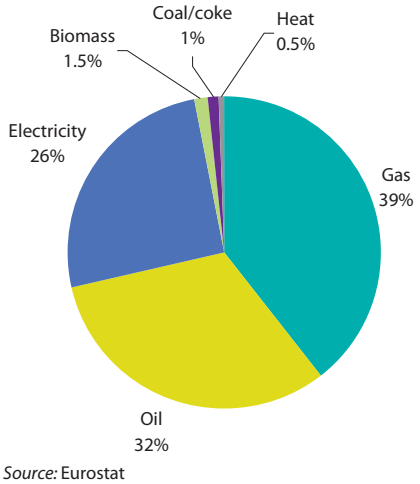
Figure 3.2.1: Final energy and non-energy consumption by sector and type of fuel, 2006



Source: Eurostat

A related issue is the relatively high use of oil even in households and the service sector, where its high cost should provide greater incentives for switching. Households and the services sector rely on oil for 32% of their energy needs, compared to an EU-average of 15%. The aging building stock and the limited availability of central and/or district heating are among the key factors contributing to such a demand structure. Financial support for high-efficiency biomass furnaces and geothermal heat pumps that were initiated in 2006[(1)] could contribute to reducing this oil consumption.

Figure 3.2.2: Consumption by fuel shares in residential and service sectors, 2006

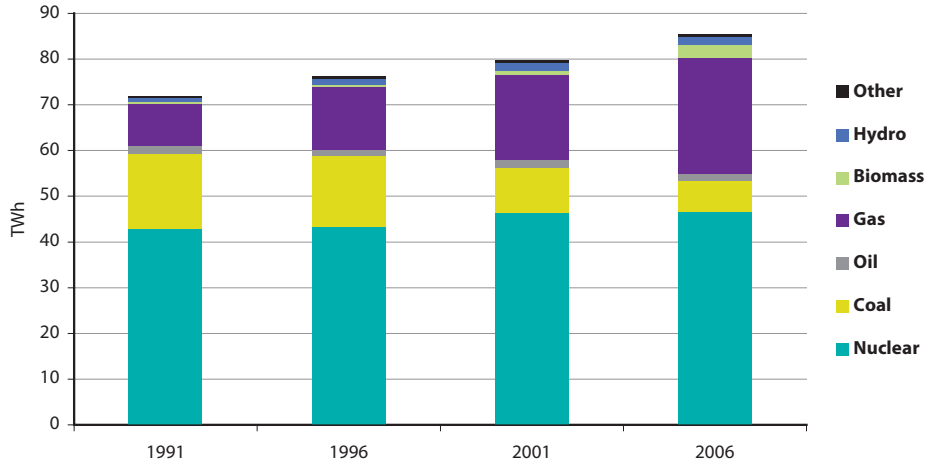


Source: Eurostat

Electric power sector

Nuclear power provided 55% of the electricity supply in 2006 and accounted for 36% of installed capacity. Higher capacity utilisation has increased the amount (although not the share) of nuclear slightly in recent years. The most significant development, however, has been the replacement of coal with natural gas: natural gas has increased from 12% to 30% of gross electricity generation from 1991-2006, while coal's share has decreased from 23% to 8%. Obligatory targets for renewables along with a green certificate market and investment support schemes have been established in all three regions.[2]

Figure 3.2.3: Gross electricity generation by source, TWh



Source: Eurostat

Energy markets

The market opening has proceeded in Belgium. Electricity and gas markets in Flanders opened to competition in July 2003. Brussels and Wallonia liberalised their markets over the past few years, although larger customers have been able to choose their suppliers since July 2004. Power generation is highly concentrated with two companies responsible for 88% of generation as of the end of 2006. Retail supply is provided by 23 companies although just 3 of these accounted for 77% of the retail market[3]. In the gas market, there were 3 companies providing primary supply and 41 natural gas retailers, 5 of which sharing 98% of the market[4].

Energy efficiency

The Belgian economy is more energy-intensive than the EU-average, which is not so surprising in light of the major role of the energy-intensive chemicals sector and the high volume of road traffic. The high level of energy imports in Belgium and the higher-than average dependence on oil have raised energy security concerns and have also caused some economic hardship with recent increases in oil prices. The energy efficiency Action Plan includes measures across all sectors, with some emphasis on housing and service sectors where efficiency improvements can be achieved at fairly cost-effective levels[5]. The Flemish energy efficiency action plan includes details on the estimated savings by 2016 for the various measures and sectors; the transport sector accounts for the highest with 29%, while residential and service sector account for 25% and 22%, respectively[6]. The action plan for the Walloon Region includes many detailed measures across all sectors[7].

Table 3.2.4: Key energy figures, 2006 — in 1000 TOE

	ALL PRODUCTS	of which:								
		Hard coal & equivalents	Lignite & equivalents	Crude oil and feedstocks	Total petroleum products	Natural gas	Nuclear heat	Renewable sources	Derived heat	Electrical energy
Primary production	**13 367**	**-**	**-**	**-**	**-**	**-**	**12 032**	**1 335**	**-**	**-**
Net imports	53 486	4 815	157	32 293	-116	15 030	-	432	-	873
Stock change and bunkers	8 154	177	-2	-51	8 066	-35	-	-	-	-
Gross inland consumption	**60 411**	**5 007**	**156**	**32 242**	**-8 572**	**14 995**	**12 032**	**1 767**	**-**	**873**
Transformation input	60 537	5 022	-	37 407	327	4 032	12 032	1 001	-	-
Transformation output	47 539	1 974	-	-	36 389	-	-	-	699	7 183
Consumpt. of the energy branch	2 358	-	-	-	1 259	56	-	-	206	648
Available for final consumption	**44 908**	**1 959**	**156**	**-245**	**21 543**	**10 907**	**-**	**704**	**473**	**7 112**
Final non-energy consumption	6 910	-	-	-	6 055	855	-	-	-	-
Final energy consumption	**38 165**	**1 877**	**157**	**-**	**15 544**	**10 012**	**-**	**704**	**473**	**7 101**
Industry	14 429	1 737	152	-	1 199	4 707	-	485	399	3 458
Transport	9 626	-	-	-	9 477	12	-	-	-	136
of which: road transport	*8 056*	-	-	-	*8 044*	*12*	-	-	-	-
Services and others	5 179	1	-	-	1 717	1 836	-	6	60	1 553
Households	8 932	140	5	-	3 151	3 457	-	213	14	1 954

Source: Eurostat

References

(1) RES2020, "Monitoring and Evaluation of the RES Directive implementation in EU27 and policy recommendations for 2020", EIE/06/170/SI2.442662, February 2008.

(2) DG-TREN, Belgium Renewable Energy factsheet, 23 January 2008.

(3) Eurostat – Data in focus 6/2008, "European electricity market indicators 2006"

(4) Eurostat – Data in focus 7/2008, "European gas market indicators 2006"

(5) Federal Government of Belgium, Energy Efficiency Action Plan (2008-2010), July 2007.

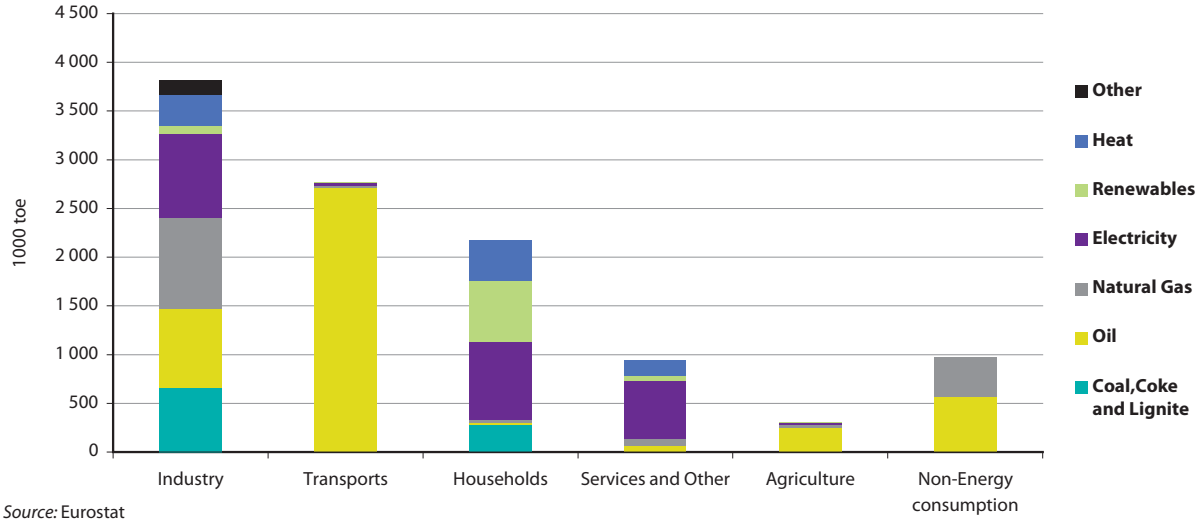
(6) Flemish Energy Efficiency Action Plan, 2007.

(7) Contribution from the Walloon Region to the first Energy Efficiency Action Plan of Belgium within the context of European Directive 2006/32/EC, Revised version, 10 December 2007

3.3 Bulgaria

The Bulgarian energy system is characterised by the needs of its industrial sector, which accounts for 38% of final energy consumption and 37% of electricity consumption. A major domestic resource is lignite used for power generation, while Bulgaria also has a small amount of natural gas. Renewable energy includes hydro and biomass and a small amount of wind. The reliance on domestic lignite and nuclear power result in an energy import dependency that is slightly below the EU average. The Bulgarian economy has the highest energy intensity in the EU, due in part to the continuing importance of some energy-intensive industries.

Figure 3.3.1: Final energy and non-energy consumption by sector and type of fuel, 2006

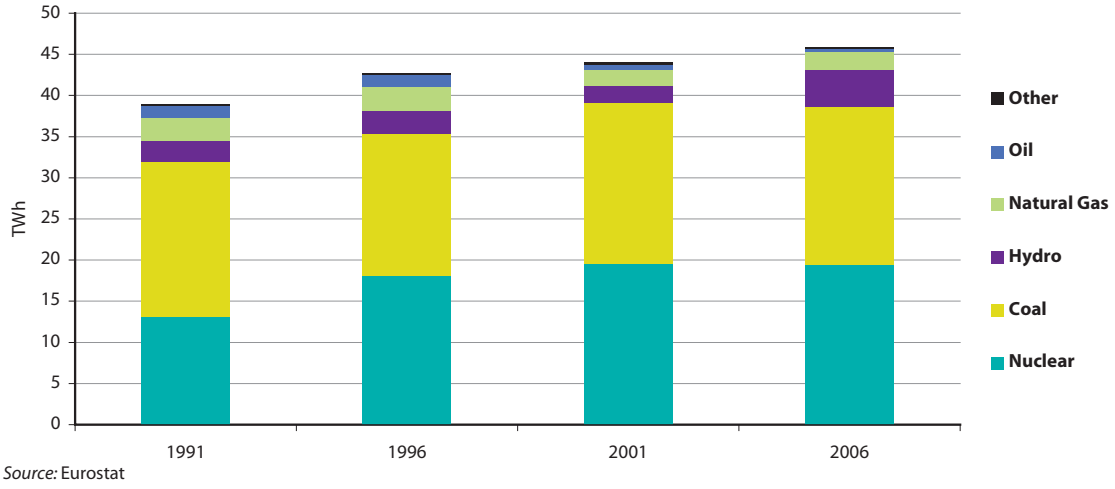


Source: Eurostat

Electric power sector

Electricity production has increased by 18% since 1991, due to the growth of the service sector along with other structural changes in the economy after the fall of the Soviet Union in 1991. A considerable amount of the electricity is exported—19% in 2006. Much of the growth in power production has come from better capacity utilisation of nuclear and hydro. It is planned to complete new nuclear power plant capacity by 2013 in order to replace what will be decommissioned according to its terms of accession.

Figure 3.3.2: Gross electricity generation by source



Source: Eurostat

Energy markets

The electricity market was gradually opened to competition during 2003 to 2007, while the gas market has been structured through a tendering process for regional distribution licenses[1]. The gas market includes a vertically-integrated company, while the power sector is affected by its former large firm. Five companies accounted for 76% of power generation while 9 companies accounted for 90% of power supplied as of the end of 2006[2]. There were 3 wholesale suppliers covering the gas market, while 2 retail suppliers accounted for 94% of the market[3].

Energy efficiency

With the highest energy intensity in the EU, energy efficiency should be a top priority for Bulgaria. The National Energy Efficiency Action Plan included a long and detailed list of measures. The transport and residential sectors are expected to account for 30% each of the savings to be achieved[4]. The actions cover a wide range of measures, from efficiency standards to information campaigns and speed limits.

Renewable energy

The largest single use of renewables is household use of biomass, which accounted for 56% of all renewable energy in 2006. Hydropower accounts for nearly all of the remaining renewable energy. A new set of feed-in tariffs was introduced in 2007 that are valid for 12 years, with heavy fines for non-compliance[5]. There are investment subsidies for renewable heat and there are quotas for biofuels, which are exempt from excise taxes unless blended with other fuels[6] . The proposed target for renewables is 16% of final consumption in 2020[7].

Table 3.3.3: Key energy figures, 2006 — in 1000 TOE

	ALL PRODUCTS	of which:								
		Hard coal & equivalents	Lignite & equivalents	Crude oil and feedstocks	Total petroleum products	Natural gas	Nuclear heat	Renewable sources	Derived heat	Electrical energy
Primary production	**10 911**	**13**	**4 295**	**28**	**-**	**374**	**5 028**	**1 173**	**-**	**-**
Net imports	9 545	2 459	-1	7 267	-2 091	2 609	-	-32	-	-666
Stock change and bunkers	244	179	24	-15	139	-82	-	-1	-	-
Gross inland consumption	**20 547**	**2 651**	**4 318**	**7 281**	**-2 164**	**2 901**	**5 028**	**1 140**	**-**	**-666**
Transformation input	21 223	2 372	5 246	7 418	118	1 009	5 028	1	-	-
Transformation output	13 349	497	533	-	7 252	-	-	-	1 238	3 546
Consumpt. of the energy branch	1 432	2	2	-	257	298	-	0	202	510
Available for final consumption	**10 695**	**774**	**-397**	**133**	**4 502**	**1 554**	**-**	**773**	**891**	**2 315**
Final non-energy consumption	972	-	-	-	569	403	-	-	-	-
Final energy consumption	**10 028**	**796**	**168**	**1**	**3 854**	**1 077**	**-**	**773**	**899**	**2 310**
Industry	3 833	655	19	1	816	933	-	79	318	863
Transport	2 772	-	-	-	2 707	25	-	5	-	34
of which: road transport	*2 504*	-	-	-	*2 473*	*25*	-	*5*	-	-
Services and others	1 244	8	5	-	306	95	-	54	162	613
Households	2 180	133	143	-	25	24	-	635	420	800

Source: Eurostat

References

[1] Bulgaria – Internal Market fact sheet, January 2007. http://europa.ec.eu/energy.

[2] Eurostat – Data in focus 6/2008, "European electricity market indicators 2006"

[3] Eurostat – Data in focus 7/2008, "European gas market indicators 2006"

[4] Government of Bulgaria, "First National Energy Efficient action Plan," June 2007.

[5] Government of Bulgaria, Ministry of Economy and Energy, Renewable and Alternative Energy Sources and Biofuels Act, Prom. SG. 49/19.06.2007, amended SG. 98/14.11.2008, into force since 14.11.2008

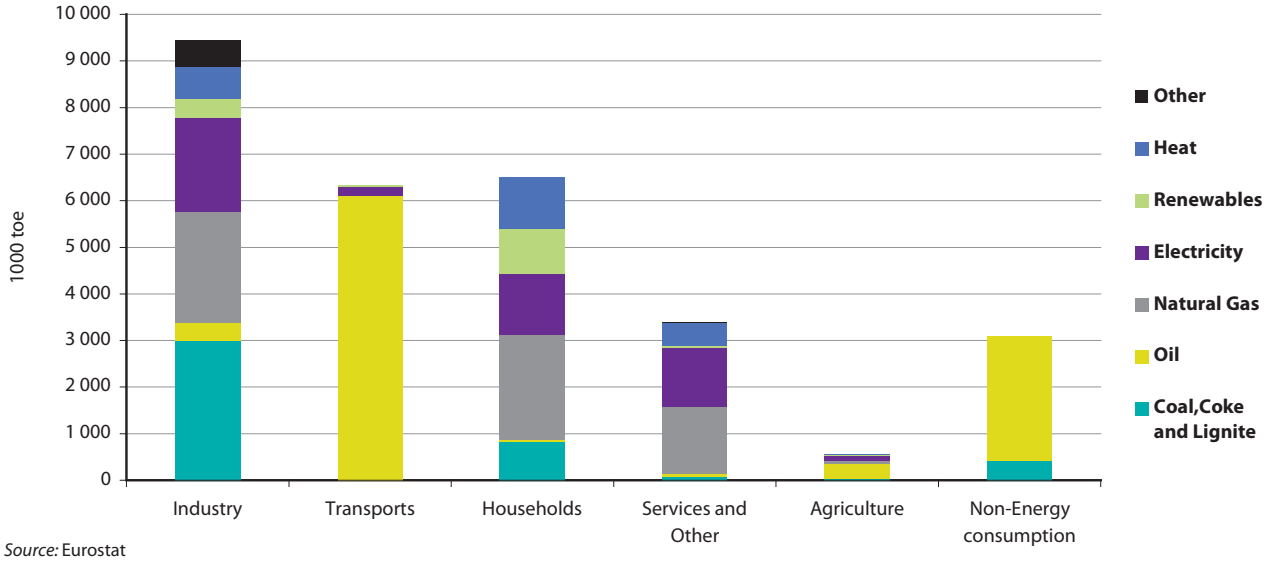
[6] RES2020,"Monitoring and Evaluation of the RES Directive implementation in EU27 and policy recommendations for 2020," EIE/06/170/SI2.442662, February 2008.

[7] COM (2008) 19 final, 2008/0016 (COD) Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources, Brussels, 23.1.2008.

3.4 Czech Republic

The energy system of the Czech Republic is characterised to a great extent by coal production, reliance on nuclear power for a significant share of electricity production, and high energy intensity compared to the EU-average. The electric power system is based mostly on coal and nuclear, supplemented by increases in renewables in recent years, mainly hydro but also a small amount of wind and biomass. Demand is dominated by industry followed by household consumption. Industry is the largest consuming end-use sector for both gas and electricity. The domestic availability of coal has resulted in a much lower dependence on imports compared to most EU Member States.

Figure 3.4.1: Final energy and non-energy consumption by sector and type of fuel, 2006

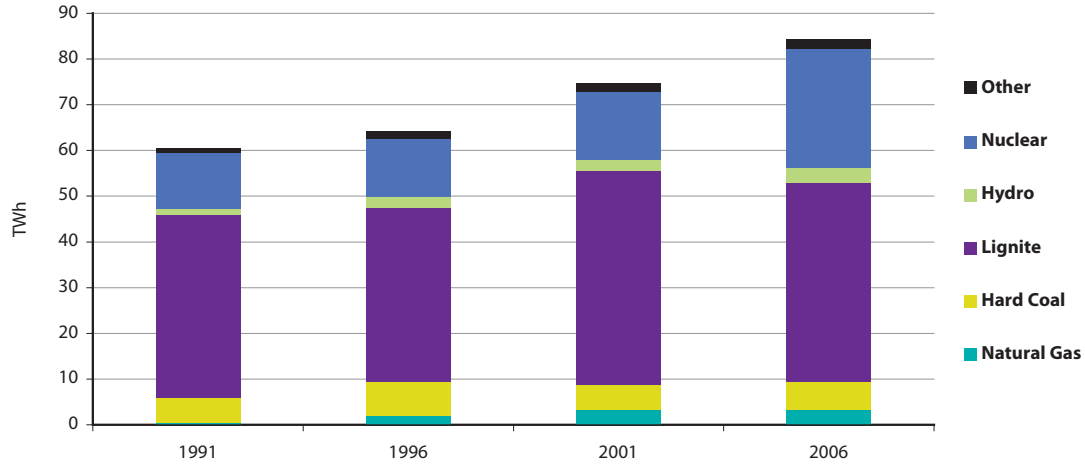


Source: Eurostat

Electric power sector

The electric power mix consists primarily of domestically available lignite and hard coal along with nuclear, which together accounted for 90% of gross electricity generation in 2006. Unlike other surrounding countries, electric power generation has increased fairly significantly since the 1990s; total gross electricity generation has increased by 40% since 1991. Much of the increase has come from nuclear, which accounted for 31% of the total in 2006 compared to 20% in 1991. Since 1991, generation has become slightly more diversified, with increases in hydro, biomass and a small amount of wind.

Figure 3.4.2: Gross electricity generation by source (TWh)



Source: Eurostat

Energy markets

The Czech electricity market was fully liberalised as of January 2006 while the gas market opening was completed one year later. Although there were 20 market actors involved in power generation as of the end of 2006, the main company, CEZ, accounted for 74% of generation during 2006 and none of the others had more than a 5% share. The retail side is also highly concentrated, with 3 companies accounting for 95% of the market and an unusually large number (285) of very small operators as of the end of 2006[1]. The gas market is dominated by one wholesale supplier, which also has majority ownership in the distribution companies, 7 of which cover 95% of the market[2].

Energy security

The Czech Republic has a much lower reliance on imported energy than most EU Member States, due to the domestic availability of coal and the role of nuclear power. Its lignite is used domestically, while it exports a significant share of its hard coal; in 2006, net exports of hard coal amounted to 33% of total primary production. The Czech Republic also has a fairly significant excess of electricity production over demand; net exports of electricity amounted to 16% of total production in 2006. As with nearly all Member States, it relies almost completely on imported oil, having only a small amount of domestic production amounting to just 3% of consumption. It relies similarly on imported natural gas, however less so than other Member States because it does not rely significantly on gas for electricity generation.

Energy efficiency

The energy intensity of the Czech economy has decreased by 32% between 1991 and 2006, similar to the magnitude of the decreases in other eastern European countries. The presence of some energy-intensive industrial sectors—chemicals and iron/steel—contributes to an energy structure in which industry and households still dominate the growing service sector. The energy savings plan therefore emphasises these two sectors; households and industry account for 31% and 25% of the expected savings by 2016[3].

Renewable energy

Renewable energy amounted to 4% of gross inland consumption in 2006, 90% of which was biomass. According to the Directive proposed by the European Commission, the Czech indicative target may become 13% of final consumption in 2020[4]. Support for renewable energy includes a system in which market actors can receive a feed-in tariff and/or a "green bonus" depending on whether the supply is to a distributor or to a trader or supplier[5]. There are also tax exemptions for the first five years of the operation of renewable-based power plants and a system of reduced interest rates.

Table 3.4.3: Key energy figures, 2006 — in 1000 TOE

	ALL PRODUCTS	of which:								
		Hard coal & equivalents	Lignite & equivalents	Crude oil and feedstocks	Total petroleum products	Natural gas	Nuclear heat	Renewable sources	Derived heat	Electrical energy
Primary production	**33 074**	**8 507**	**15 212**	**269**	**20**	**147**	**6 719**	**2 200**	**-**	**-**
Net imports	12 930	-2 772	-600	7 937	1 766	7 913	-	-225	-3	-1 086
Stock change and bunkers	-75	604	-48	-134	-11	-485	-	-2	-	-
Gross inland consumption	**46 240**	**6 340**	**14 564**	**8 255**	**1 786**	**7 576**	**6 719**	**1 972**	**-3**	**-1 086**
Transformation input	35 973	5 768	12 847	8 350	172	1 155	6 719	296	-	-
Transformation output	22 694	2 520	195	-	8 294	-	-	-	3 136	6 969
Consumpt. of the energy branch	2 015	6	10	-	288	152	-	-	369	789
Available for final consumption	**29 923**	**3 085**	**1 901**	**-**	**9 536**	**6 167**	**-**	**1 453**	**2 315**	**4 898**
Final non-energy consumption	3 090	413	-	-	2 677	-	-	-	-	-
Final energy consumption	**26 251**	**2 127**	**1 829**	**-**	**6 895**	**6 167**	**-**	**1 452**	**2 315**	**4 898**
Industry	9 477	2 003	1 019	-	383	2 375	-	398	705	2 030
Transport	6 318	-	-	-	6 102	12	-	19	-	185
of which: road transport	*5 692*	-	-	-	*5 661*	*12*	-	*19*	-	-
Services and others	3 946	35	80	-	376	1 504	-	74	497	1 376
Households	6 509	89	731	-	33	2 275	-	961	1 113	1 307

Source: Eurostat

References

(1) Eurostat – Data in focus 6/2008, "European electricity market indicators 2006"

(2) Eurostat – Data in focus 7/2008, "European gas market indicators 2006"

(3) Czech Republic, Energy Efficiency Action Plan in accordance with the Directive on Energy end-use Efficieny and Energy services (2006/32/EC) July 2007.

(4) COM(2008) 19 final, 2008/0016 (COD) Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources, Brussels, 23.1.2008.

(5) RES2020, "Monitoring and Evaluation of the RES Directive implementation in EU27 and policy recommendations for 2020," EIE/06/170/SI2.442662, February 2008

3.5 Denmark

The Danish energy system has a number of special characteristics based on its resource endowments, the longstanding relation with energy markets in the other Nordic countries, and its efforts to promote renewable energy and energy efficiency. Its oil and gas deposits in the North Sea make it the only net energy exporter in the EU. It has developed a world-class wind turbine industry and has had one of the most aggressive energy efficiency programmes in the EU, contributing to an economy that has low energy intensity and low carbon intensity. Power generation and gas distribution remain concentrated. Energy efficiency has been stimulated in part by pricing, as Denmark has some of the highest energy and environmental taxes and levies in the EU.

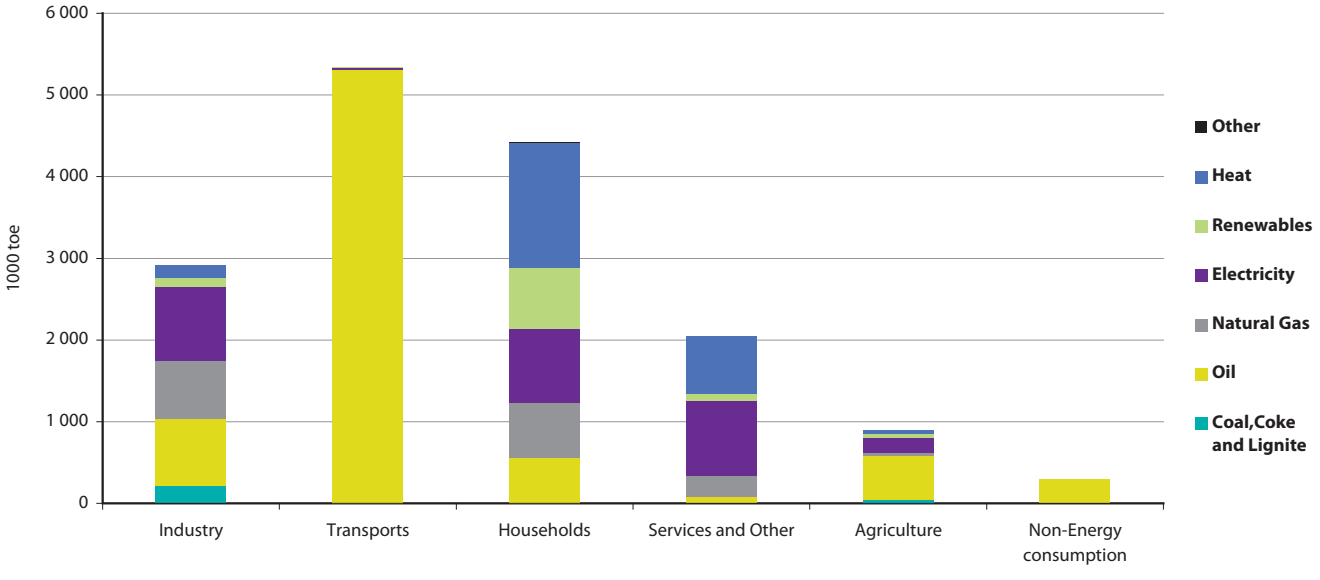
Overall energy structure

The energy structure in Denmark derives from the physical requirements and opportunities of a small resource-endowed country that is geographically spread out along various coastal areas. Its infrastructure requirements are higher, and transport accounts for 34% of final energy consumption, compared to an EU-average of 32%. Natural gas has become an important part of the energy infrastructure, with significant usage in industry, households, and the service sector. Combined heat and power has played an increasingly important role, although heat demand is concentrated in the households and service sectors rather than in industry.

Energy security

Based on its production of oil and gas from the North Sea, Denmark is the only net energy exporter in the EU; its total primary production was 41% in excess of its gross inland consumption and its energy dependence rate was -37% in 2006[(1)]. It is the second largest oil producer in the EU, after the UK. The integration of the power sector with the other Nordic countries has also contributed to energy security by taking advantage of differences in the seasonal availability of hydro in the region as well as contributing to greater stability in the power market. During "wet" years, excess hydro from Norway and Sweden is exported to Denmark, whereas during "dry" years, thermal power is exported from Denmark and Finland. In 2006, Denmark's net exports amounted to 16% of electricity generation.

Figure 3.5.1: Final energy and non-energy consumption by sector and type of fuel, 2006



Source: Eurostat

Energy efficiency

Energy efficiency and conservation have been at the core of Danish energy policy for over two decades. Denmark now represents one of the world's best examples of de-coupling, i.e. consistent economic growth with little or no increase in energy consumption relative to economic output. Since the early 1980s, the economy has grown by over 50% while energy consumption has barely grown at all; as a result, Danish energy consumption relative to GDP (Energy intensity of the economy) is the lowest in the entire EU, at 118 kgoe/1 000 EUR. The emphasis on energy efficiency will continue in the future; there will be a considerable emphasis on buildings, through strict building codes that should bring the heat loss (energy consumption) down to 3 litres of oil equivalent per square meter of floor space (l/m2). The existing building stock has an average heating requirement of 14 l/m2, while the current regulation (since 2006) stipulates 5.5 l/m2 for new buildings[2].

Electricity Market

The electricity market in Denmark is divided into East and West Denmark, which are not connected with each other; the western part is connected with continental Europe while the eastern part is connected to the Nordic markets through Nordpool. The physical management, balancing, and trading in the system therefore differs depending on the capacity and reliability of interconnections. Power generation is concentrated while the retail market is characterised by competitive pricing and contracts for large and medium-size customers. Two companies were responsible for 72% of power generation and there were 65 suppliers as of the end of 2006; the number of suppliers has decreased significantly since the market opening in 2003, when there were113[3].

Gas Market

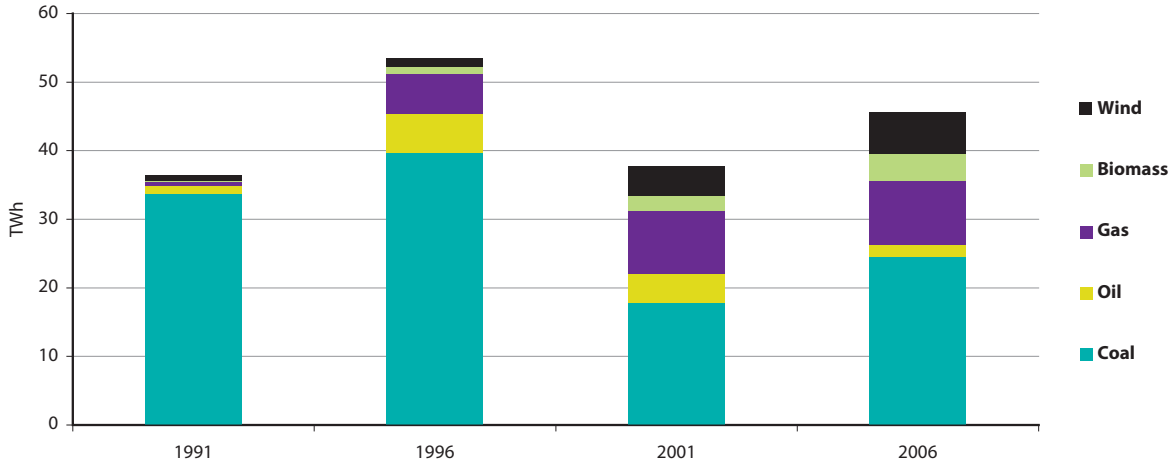
The gas market in Denmark was liberalised in January 2004 but has been dominated by one major state-owned entity (DONG Energy) that owns pipeline capacity, gas storage capacity and gas power generation plants, as well as having long-term contracts for gas delivery. There were a total of 10 retail suppliers as of the end of 2006, 6 of which accounted for 84% of the supply[4]. The recent establishment of a gas exchange, Nordpool gas, is expected to open up the wholesale market for greater competition in the future. The exchange offers anonymous trading on two types—for delivery the following day or the following month—and is designed for a moderate number of players with limited liquidity[5].

Electric power sources

The The electric power mix has become more diversified during the past 10-15 years, as wind and gas have entered the system fairly quickly (See Figure 3.5.2). In 1991, 92% of power generated came from coal, whereas by 2006, the share of coal had declined to 54%. The absolute amount of electricity has been reduced in comparison to 1996, due to a combination of energy efficiency efforts, a significant increase in cogeneration from biomass and the expanded availability of district heating. The use of oil for power generation has nearly been eliminated whereas the use of biomass for heat and power generation has more than tripled since 2001. Denmark became a world leader in wind power in the 1990s, and together with Germany, has led the major expansion of installed wind capacity in the EU.

The strong variations of the total gross electricity generation in Figure 3.5.2 are the consequence of the availability (and thus imports) of hydro power in the Nordic countries, which can strongly vary year by year.

Figure 3.5.2: Gross electric power generation by source



Source: Eurostat

Table 3.5.3: Key energy figures, 2006 — in 1000 TOE

	ALL PRODUCTS	of which:								
		Hard coal & equivalents	Lignite & equivalents	Crude oil and feedstocks	Total petroleum products	Natural gas	Nuclear heat	Renewable sources	Derived heat	Electrical energy
Primary production	**29 511**	**-**	**-**	**17 231**	**-**	**9 323**	**-**	**2 957**	**-**	**-**
Net imports	-8 082	5 126	-	-9 152	925	-4 688	-	299	4	-596
Stock change and bunkers	1 589	350	-	17	1 320	-99	-	-	-	-
Gross inland consumption	**20 912**	**5 476**	**-**	**8 096**	**139**	**4 537**	**-**	**3 257**	**4**	**-596**
Transformation input	17 730	5 297	-	8 095	419	2 194	-	1 725	-	-
Transformation output	14 542	-	-	-	8 036	-	-	-	3 090	3 404
Consumpt. of the energy branch	1 344	-	-	-	341	681	-	-	44	279
Available for final consumption	**15 640**	**179**	**-**	**0**	**7 417**	**1 659**	**-**	**1 005**	**2 438**	**2 930**
Final non-energy consumption	291	-	-	-	291	-	-	-	-	-
Final energy consumption	**15 627**	**264**	**-**	**-**	**7 293**	**1 688**	**-**	**1 003**	**2 438**	**2 930**
Industry	2 925	219	-	-	814	715	-	123	159	896
Transport	5 339	-	-	-	5 303	-	-	4	-	32
of which: road transport	*4 195*	-	-	-	*4 191*	-	-	*4*	-	-
Services and others	2 944	45	-	-	617	302	-	134	753	1 092
Households	4 419	-	-	-	558	672	-	743	1 526	910

Source: Eurostat

References

(1) Eurostat News Release 98/2008, "Energy consumption and production: EU27 energy dependence rate at 54% in 2006," 10 July 2008.

(2) Danish Ministry of Transport and Energy, "Action plan for renewed energy-conservation: Energy conservation and the market," September 2005. online available

(3) Eurostat – Data in focus 6/2008, "European electricity market indicators 2006"

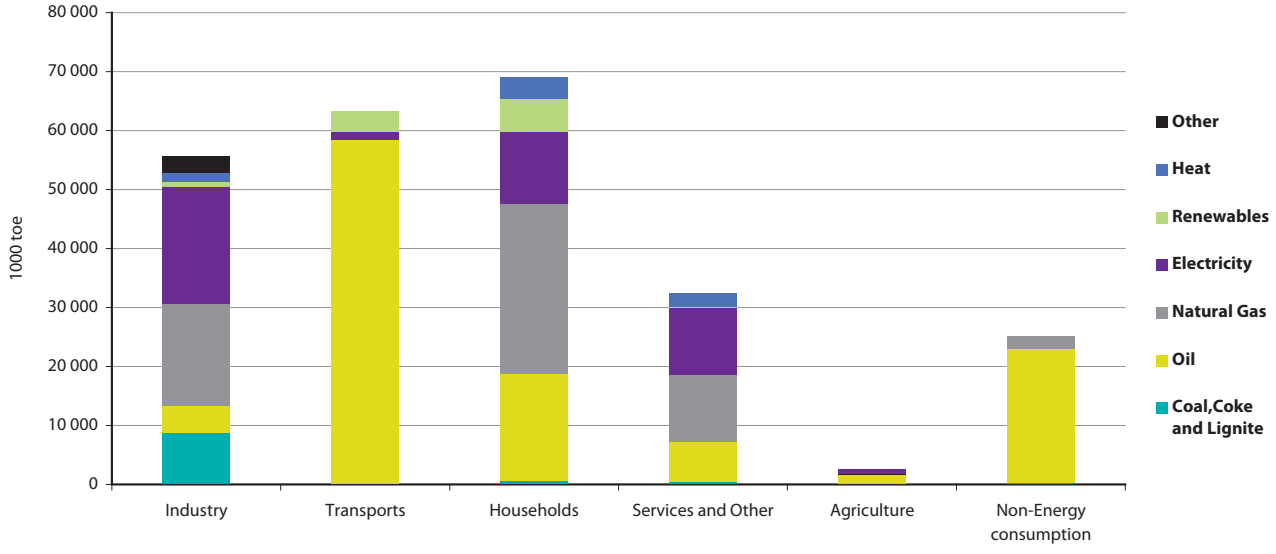
(4) Eurostat – Data in focus 7/2008, "European gas market indicators 2006"

(5) Energidnet.dk, "Nordpool gas," 3 March 2008, online available at: http://www.energinet.dk.

3.6 Germany

The German energy system is based mainly on fossil fuels, which accounted for 82% of gross inland consumption in 2006. A key overall transition during the past 15-20 years has been a decreasing dependence on coal for power generation, in favour of natural gas, wind and biomass. There was also a substitution of lignite for imported hard coal in the 1990s; after German reunification, there was an increased availability of lignite from eastern Germany, which thus provided a domestic low cost energy source, albeit also a low quality source. The need to reduce GHG emissions has been the main driving factor in reducing coal consumption. Although only 6% of energy comes from renewable sources, Germany has emerged as a market leader in some areas—namely wind power and biodiesel. Germany is also considered a world leader in energy efficiency; it has reduced its energy intensity by 19% since 1991 and has long had the lowest energy intensity among the five large economies in the EU-15 (France, Germany, Italy, Spain, UK).

Figure 3.6.1: Final energy and non-energy consumption by sector and type of fuel, 2006



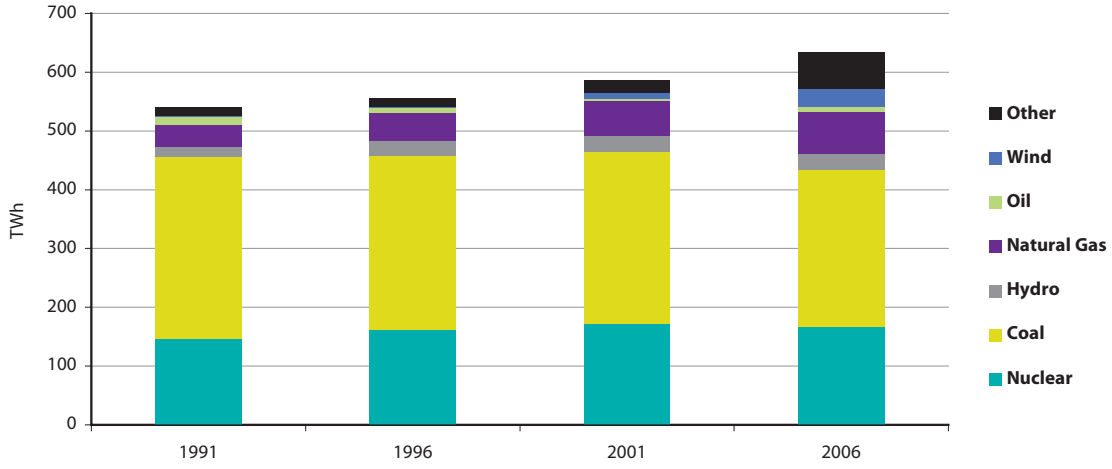
Source: Eurostat

Electric power sector

The German power sector is based mainly on coal/lignite and nuclear, with 42% and 26%, respectively, of gross electricity generation. Electricity demand increased 21% from 1991 to 2006, a lower rate than many other EU countries. The low rate of growth was due in part to the industrial restructuring and the accompanying contraction in demand in eastern Germany; demand was decreasing until it started on an upward track again in 1995. The main shift in the energy mix has been the decrease in the share of coal and lignite which went from 57% in 1991 to 42% in 2006. The shares of hydro and nuclear were largely stable over this period, and the difference has been made up of wind, biomass and natural gas along with smaller amounts of photovoltaic and biogas.

The 26% of power in 2006 that was produced in nuclear plants is almost exactly the same share as in 1991. An agreement reached in 1999-2000 resulted in legislation aimed at phasing out the 17 existing nuclear power plants by 2020. As climate change has ascended the policy agenda during the past 5 years or so, there has been mounting concern about the nuclear phase-out decision and its impact on future carbon emissions.

Figure 3.6.2: Gross electricity generation by source



Source: Eurostat

Energy markets

The German electricity and gas markets were fully liberalised by 1998. Although there were initially many market entrants in the power sector, especially on the retail side, concentration has increased and competition is also constrained by congestion at several international grid interconnections. The gas market is also characterised by concentration and vertical supply chains[1]. There were four companies supplying 77% of power generation and 3 companies providing 43% of retail supply, although it is interesting to note that there were altogether 1042 retailers or distributors as of the end of 2006[2]. There were 7 major (more than 5% share) gas companies and 4 companies that provided 36% of the market, and again there are a very large number of distributors and retailers — 700 — although the existence of long-term contracts between the wholesale suppliers and the distributors or retailers reduces the opportunities for new entrants[3].

Energy security

Germany's energy import dependence was 62% in 2006, which is slightly above the EU average of 54%[4]. Imported oil and gas accounted for 87% of net imports in 2006, while most of the remainder consisted of hard coal imports. Efforts on renewable energy and energy efficiency are designed to address the import dependence while also reducing emissions and promoting new economic opportunities. The German government has also passed legislation[5] making it easier to feed biogas into the natural gas grid, thereby reducing natural gas imports. For geographical and political reasons, Germany is also a major transit country for oil, gas and electricity within the EU and consequently its decisions and policies on energy infrastructure reverberate around the entire EU.

Renewable energy

Germany has emerged in the past decade as a world leader on renewable energy, particularly in the case of wind power and biodiesel. Germany had nearly 21 GW of installed wind capacity by the end of 2006, the highest of any country in the world. Germany is also the world leader in production of biodiesel, with 3.6 million tonnes produced in 2006, representing an estimated 30% of the global market[6]. Germany is expected to easily surpass its target under the existing Directive (2001/77/EC) for renewable electricity of 12.5% in 2010, since the renewable share reached 12% already in 2006. Germany was also the only EU member country to exceed the 2% target for biofuels in 2005. Its proposed renewables target for 2020 is 18% of final consumption[7]. The government has made a commitment to produce 25-30% of its electricity from renewable sources by 2020, and to increase the share of heat from renewable sources from the current level of 6% to 14%[5]. The rapidly expanding renewable electricity markets in Germany have been facilitated by feed-in tariffs that have been in place (and updated several times) since 1990. Biofuels have benefited from tax exemptions that will gradually be phased out in favour of a quota system, which mandates a 6.75% share in 2010 and 8% in 2015[5].

Table 3.6.3: Key energy figures, 2006 — in 1000 TOE

	ALL PRODUCTS	of which:								
		Hard coal & equivalents	Lignite & equivalents	Crude oil and feedstocks	Total petroleum products	Natural gas	Nuclear heat	Renewable sources	Derived heat	Electrical energy
Primary production	**136 850**	**15 332**	**37 977**	**3 453**	**1 720**	**14 052**	**43 148**	**21 169**	**-**	**-**
Net imports	215 548	29 447	-333	111 352	10 163	66 434	-	-55	-	-1 460
Stock change and bunkers	1 355	-174	-13	-936	3 468	-991	-	-	-	-
Gross inland consumption	**349 026**	**44 605**	**37 630**	**113 869**	**10 606**	**79 495**	**43 148**	**21 113**	**-**	**-1 460**
Transformation input	280 084	42 986	39 221	125 721	2 212	18 505	43 148	6 262	-	-
Transformation output	195 960	5 771	2 687	-	123 055	-	-	-	8 722	49 749
Consumpt. of the energy branch	14 339	-	223	-	7 736	405	-	75	138	4 970
Available for final consumption	**246 355**	**7 391**	**872**	**-616**	**112 508**	**60 369**	**-**	**10 231**	**7 428**	**45 388**
Final non-energy consumption	25 153	72	181	-	22 750	2 150	-	-	-	-
Final energy consumption	**223 062**	**7 824**	**1 967**	**-**	**89 742**	**57 689**	**-**	**10 225**	**7 428**	**45 402**
Industry	55 648	7 408	1 394	-	4 586	17 254	-	1 027	1 481	19 725
Transport	63 311	-	-	-	58 443	-	-	3 467	-	1 402
of which: road transport	*52 444*	-	-	-	*48 977*	-	-	*3 467*	-	-
Services and others	34 978	236	145	-	8 528	11 629	-	11	2 317	12 109
Households	69 124	180	428	-	18 187	28 805	-	5 720	3 630	12 167

Source: Eurostat

References

(1) Germany – Internal Market fact sheet, January 2007. http://europa.ec.eu/energy.

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(5) Gesetz über die Elektrizitäts- und Gasversorgung (Energiewirtschaftsgesetz - EnWG)
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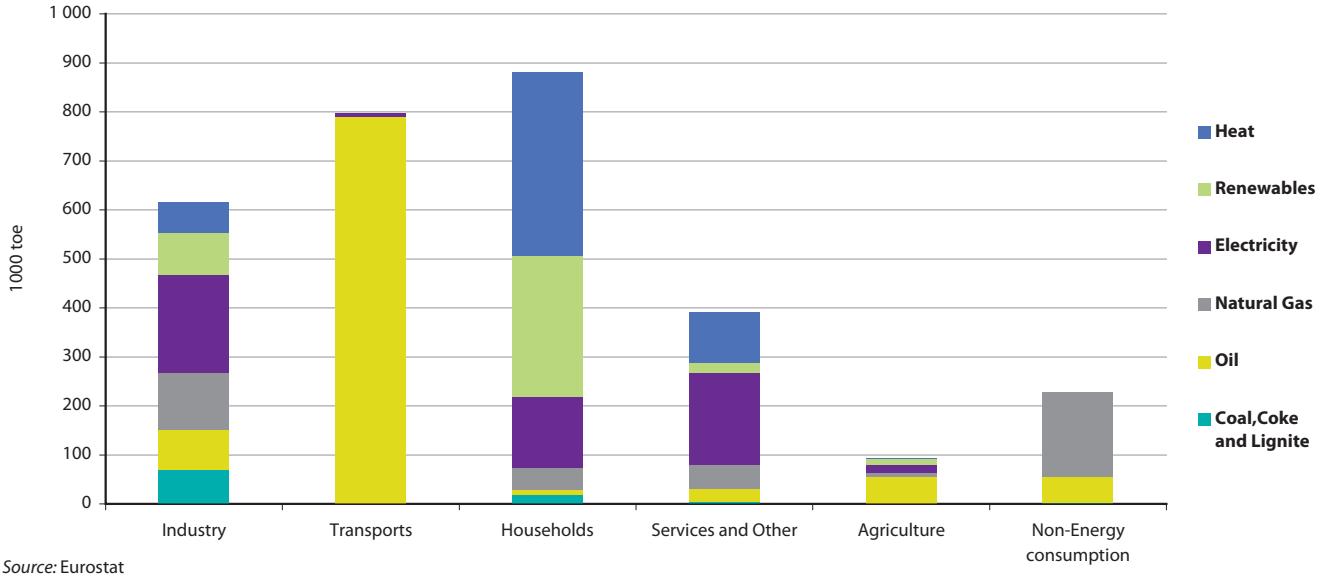
3.7 Estonia

As with other former member states of the Soviet Union, Estonia has undergone a significant economic transformation since 1991, as industrial sectors contracted and service sectors grew. In addition to the structural changes in energy use in industry, the refurbishment and renovation of buildings has also contributed to lower the energy intensity of the economy. The major energy resource in Estonia is oil shale, which is mainly burned in power plants, and also used to make refined petroleum products.

Overall energy structure

The energy system is characterised by a high use of solid fuels (oil shale or lignite) in the heat and power transformation sector (78% of the transformation input). The household sector constitutes a fairly high proportion of the final energy consumption (32% in 2006, as compared to the EU average of 26%). Gas is used predominantly in the transformation sector, the industry and in non-energy applications. District heating is now widespread and is based on natural gas and biomass; 69% of heat consumption was in the residential sector in 2006. Industry and the service sector accounted for 70% of electricity consumption in 2006. The consumption of renewable energy (exclusively biomass) is highest in the residential sector, which accounted for 73% followed by industry with 21%, and the small remainder used in services, agriculture and other sectors.

Figure 3.7.1: Final energy and non-energy consumption by sector and type of fuel, 2006



Source: Eurostat

Oil shale and power generation

Estonia has developed a considerable industry in oil shale exploitation, and this fuel provides 80-90% of Estonia's electric power needs, as well as generating some surplus for export. A small amount of power is produced from natural gas, amounting to an 8% share in 2006, along with a very small amount of hydro and wind. Wind power along with biomass is expected to provide the majority of renewable energy expansion that is planned in order to meet the EU targets. Power generation underwent a major contraction during 1990-95 followed by a period of stability from 1996-2001 and then a period of moderate expansion from 2002-2006.

Energy markets

The electricity market is dominated in both generation and retail supply by the state-owned electric utility, which accounted for 96% of power supplied in 2006[(1)]. The system is well-integrated with the other Baltic countries and has a link to Finland. The gas network is connected to Latvia and to Russia, which is the sole supplying country. Just as with the power system, a single state-owned entity dominates gas production and retail supply, accounting for 97% of the market[(2)].

Energy efficiency

The energy intensity of the Estonian economy is more than four times higher than the EU average (848 kgoe/1000 EUR compared to 202 kgoe/1000 EUR) although the energy intensity in 2006 was nevertheless 46% of what it was in 1996. One factor cited for the continued high energy intensity is the low energy prices in Estonia, which have consistently been among the lowest in the EU for both households and industry[3]. The continued high overall energy intensity is also due to increasing intensity in the transport sector, while the improved energy efficiency in industry was driven mainly by restructuring in the oil shale sector and by improvements in the non-metallic and food sectors[4]. The national energy efficiency plan calls for behavioural changes linked to energy pricing/taxation policy alongside targeted information campaigns and technical database development to identify facilities and products that have low energy efficiency[5].

Energy security

Estonia's energy import dependency, at 34% in 2006, is below the EU average, but energy security is nevertheless a concern because of the country's geographical position at the edge of the EU and its small size. Thus it is expected that oil shale will continue to be a major component of the Estonian energy system for many years to come, and the emphasis is consequently on reducing its environmental impacts and gradually introducing alternatives. The dependency on Russian energy supplies are thought to pose risks that need to be addressed through measures such as a greater integration with other EU Member States, greater investment in energy efficiency, the establishment of multiple transit routes and the creation of reserve storage[6].

Table 3.7.2: Key energy figures, 2006 — in 1000 TOE

	ALL PRODUCTS	of which:								
		Hard coal & equivalents	Lignite & equivalents	Crude oil and feedstocks	Total petroleum products	Natural gas	Nuclear heat	Renewable sources	Derived heat	Electrical energy
Primary production	**3 858**	**-**	**3 099**	**-**	**135**	**-**	**-**	**624**	**-**	**-**
Net imports	1 885	40	-42	-	1 246	808	-	-104	-	-64
Stock change and bunkers	98	-16	-38	-	142	-	-	11	-	-
Gross inland consumption	**5 420**	**24**	**3 019**	**-**	**1 103**	**808**	**-**	**531**	**-**	**-64**
Transformation input	3 120	3	2 422	1	71	413	-	118	-	-
Transformation output	1 644	22	39	-	1	-	-	-	645	829
Consumpt. of the energy branch	182	-	13	-	13	5	-	1	11	123
Available for final consumption	**3 575**	**44**	**622**	**-1**	**1 020**	**390**	**-**	**404**	**539**	**557**
Final non-energy consumption	228	-	1	-	54	172	-	-	-	-
Final energy consumption	**2 775**	**43**	**50**	**-**	**964**	**218**	**-**	**404**	**539**	**557**
Industry	615	24	46	-	82	116	-	84	63	201
Transport	797	-	-	-	790	-	-	-	-	7
of which: road transport	*707*	-	-	-	*707*	-	-	-	-	-
Services and others	481	4	1	-	82	56	-	31	103	205
Households	881	15	3	-	10	46	-	289	374	144

Source: Eurostat

References

(1) Eurostat – Data in focus 6/2008, "European electricity market indicators 2006"

(2) Eurostat – Data in focus 7/2008, "European gas market indicators 2006"

(3) DG-TREN, Energy Mix Fact Sheet – Estonia, January 2007

(4) MURE/Odyssee, Energy Efficiency Profile-Estonia, October 2008, www.mure2.com

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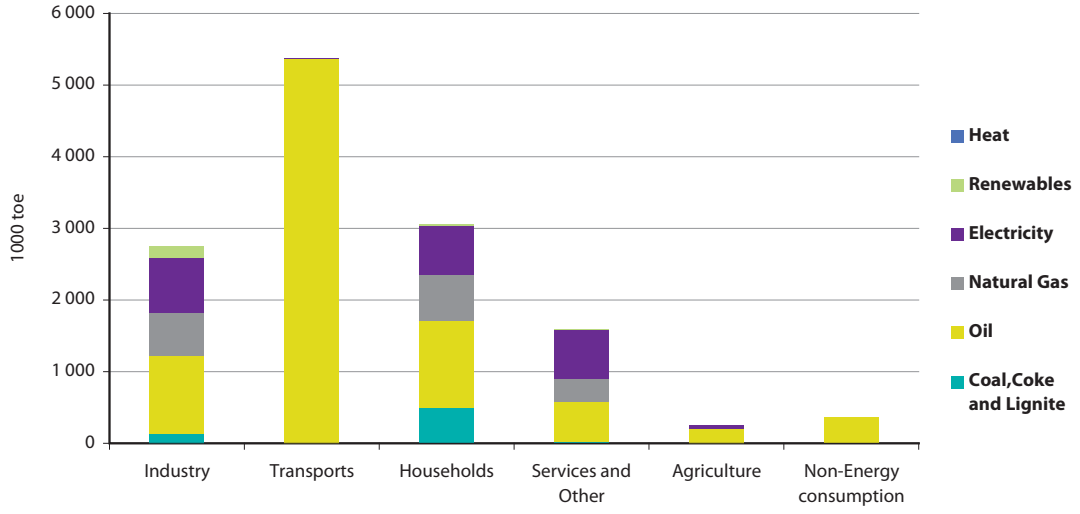
3.8 Ireland

Substantial economic growth in Ireland in the past 15-20 years was accompanied by commensurate growth in energy demand, especially in transport. The transport sector now accounts for 41% of final energy consumption compared to 27% in 1991; the absolute level of consumption growth in energy for transport over this time was an impressive 163%.

The rapid growth in final energy consumption (74% from 1991 to 2006) has magnified some of the existing characteristics of the Irish energy system—high energy import dependence (92% of gross inland consumption) and growing GHG emissions.

Figure 3.8.1: Final energy and non-energy consumption by sector and type of fuel, 2006

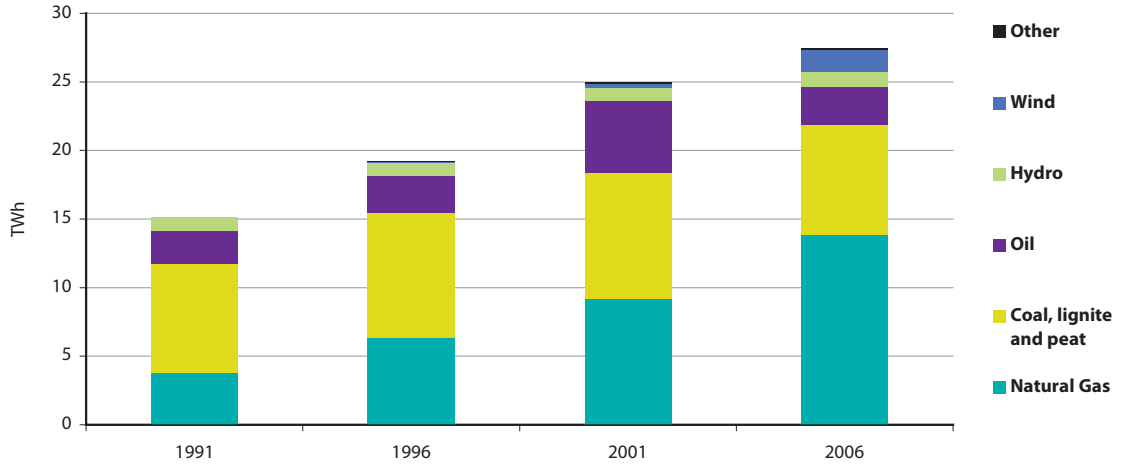


Source: Eurostat

Electric power sector

Total gross electricity generation increased by 82% from 1991 to 2006. There has been important investments in new electric power generation capacity; installed capacity increased by 69% during 1991-2006. Nearly all of this electricity has come from natural gas along with some wind power; hydro capacity is unchanged while coal and oil have changed very little. The service sector now accounts for 31% of electricity demand compared to 24% in 1991. Increased use of the power connection to Northern Ireland and the planned Ireland-Wales inter-connector will help to reduce the isolation of the system and further transform the Irish power market.

Figure 3.8.2: Gross electricity generation by source



Source: Eurostat

Energy markets

The market opening was carried out in stages between 1997 and 2005. In the power market, the vertically-integrated incumbent Electricity Supply Board (ESB) still dominates the market, which is split into regulated and unregulated tariff segments[1]. Four market actors covered 79% of generation, while 4 retail companies accounted for 94% of the power supplied in 2006[2]. The gas market is fairly competitive for larger customers, with 6 companies supplying 96% of the wholesale market and 3 companies supplying 99% of the retail market[3].

Energy security

The expansion in the use of imported coal in the 1970s was intended to reduce oil dependence, but the expansion policy for coal was abandoned in the late 1980s in favour of natural gas. With the very substantial rise in transport demand, oil remains the main source of energy import concerns; 62% of imports consisted of oil and petroleum products. Ireland has some natural gas, although domestic production accounted for just 10% of total natural gas consumption in 2006. Another domestic resource is peat, which accounted for 5% of gross inland consumption. There is also a small amount of hydro and biomass, and a growing market in wind power. Import dependence reached 91% in 2006, one of the highest in the EU[4]. Thus, one result of high energy and economic growth has been that an already high energy import dependence has become even higher.

Energy efficiency

The Irish economy has an energy intensity that is below the EU average, due in part to its lack of heavy industries and the considerable importance of high-tech and service companies in the economy. The energy efficiency action plan focuses on households and transport, which together account for 65% of final energy consumption. Transport savings by 2016 are estimated to account for 30% of the total while households should account for 56%. Sustainable Energy Ireland is responsible for a wide range of programmes, such as agreements with businesses and a Buildings energy Rating system[5].

Renewable energy

The share of renewable energy amounted to just 3% of gross inland consumption in 2006, mainly consisting of biomass, hydro and wind. There is not yet significant biomass use outside the industrial sectors that have their own sources (e.g. food and drinks sector), nor has the biofuels market yet taken off; the share of biomass overall is 1.4% of gross inland consumption, 75% of which is in the industry sector. There has been a doubling of wind capacity in just two years, since 2004. Ireland does have significant unexploited potential for wind power and biomass, while its hydro resources have neared their limits in economic and/or environmental terms. The proposed target for 2020 is 16%[6]. Feed-in tariffs are now the main instrument for renewable electricity, while the ReHeat scheme supports renewable heating and the Greener Homes scheme provides household-level support for renewables and efficiency[7].

Table 3.8.3: Key energy figures, 2006 — in 1000 TOE

	ALL PRODUCTS	of which:								
		Hard coal & equivalents	Lignite & equivalents	Crude oil and feedstocks	Total petroleum products	Natural gas	Nuclear heat	Renewable sources	Derived heat	Electrical energy
Primary production	**1 597**	**-**	**766**	**-**	**-**	**411**	**-**	**420**	**-**	**-**
Net imports	14 217	1 716	-4	3 222	5 527	3 602	-	-	-	153
Stock change and bunkers	-50	3	-50	-51	49	-	-	-	-	-
Gross inland consumption	**15 518**	**1 719**	**713**	**3 171**	**5 329**	**4 013**	**-**	**420**	**-**	**153**
Transformation input	8 288	1 294	544	3 168	840	2 412	-	30	-	-
Transformation output	5 529	38	98	-	3 263	-	-	-	-	2 130
Consumpt. of the energy branch	245	-	11	-	86	-	-	-	-	149
Available for final consumption	**12 259**	**462**	**257**	**3**	**7 666**	**1 534**	**-**	**188**	**-**	**2 148**
Final non-energy consumption	359	-	-	-	359	-	-	-	-	-
Final energy consumption	**13 037**	**370**	**288**	**-**	**8 434**	**1 532**	**-**	**188**	**-**	**2 225**
Industry	2 754	134	-	-	1 089	596	-	164	-	772
Transport	5 373	-	-	-	5 363	-	-	2	-	8
of which: road transport	*4 427*	-	-	-	*4 424*	-	-	*2*	-	-
Services and others	1 850	26	1	-	764	305	-	4	-	751
Households	3 060	210	288	-	1 218	631	-	18	-	695

Source: Eurostat

References

(1) Ireland – Internal Market fact sheet, January 2007. http://europa.ec.eu/energy.

(2) Eurostat – Data in focus 6/2008, "European electricity market indicators 2006"

(3) Eurostat – Data in focus 7/2008, "European gas market indicators 2006"

(4) Eurostat News Release 98/2008, "Energy consumption and production: EU27 energy dependence rate at 54% in 2006," 10 July 2008.

(5) Republic of Ireland, September 2007, Department of Communications, Energy, and Natural Resources, Action Plan under Article 14(2) of Directive 2006/32/EC.

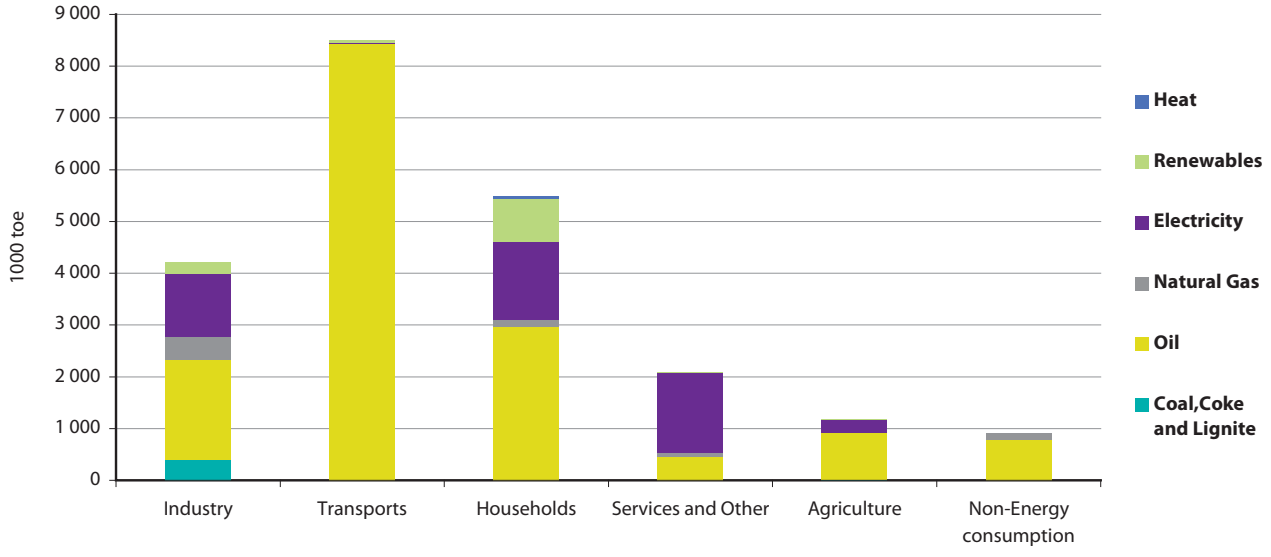
(5) COM (2008) 19 final, 2008/0016 (COD) Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the promotion of the use of energy from renewable sources, Brussels, 23.1.2008.

(5) RES2020,"Monitoring and Evaluation of the RES Directive implementation in EU27 and policy recommendations for 2020," EIE/06/170/SI2.442662, February 2008.

3.9 Greece

With a Mediterranean climate, a large tourist industry and a somewhat complicated geography, the Greek energy system has evolved along rather different dimensions compared to other Member states. The lack of electricity grid connections in islands and some outlying areas has presented technical challenges in the power sector. The main domestic resource utilised is lignite for electricity generation. Final energy consumption is dominated by electricity and oil, which together accounted for 90% of the total in 2006. Transport and households accounted for 65% of final energy consumption. Gas has been entering the market in recent years and is thus far directed mainly to the power sector.

Figure 3.9.1: Final energy and non-energy consumption by sector and type of fuel, 2006

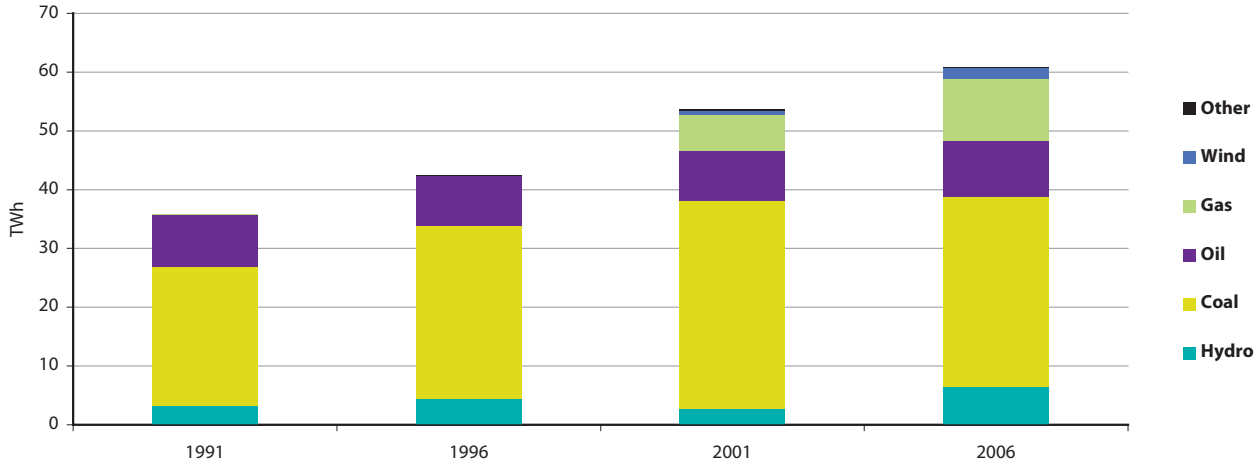


Source: Eurostat

Electric power sector

The Greek power sector has been growing rapidly; gross electric power generation increased by 70% during 1991-2006, compared to an average increase in the EU of 28%. Much of the increased electricity generated came from gas; in just ten years (1996-2006), the share of natural gas in power generation increased from nil to 17%. Wind has started to make inroads in the supply mix in the last five years or so, now accounting for 3%; the installed capacity was 749 MW in 2006 compared to just 27 MW in 1996. Coal (essentially domestic lignite) decreased in share from 66% to 53% from 1991-2006, in spite of having increased in absolute terms by 36%. Hydro has contributed as much as 11% annually, with installed capacity now at 3135 MW.

Figure 3.9.2: Gross electricity generation by source



Source: Eurostat

Energy markets

The spatial extent of power and gas markets are complicated by the geography of Greece, with many outlying areas not connected to the grid. Transmission operators were legally unbundled as of 2006-2007. Competition remains minimal in both the power and gas markets due to the incumbent vertically-integrated utilities. In the case of power sector, the prospects for competition are expected to improve as the market becomes integrated with the regional south eastern European markets[(1)]. There are only a few small independent power generators, and as of the end of 2006 the state-owned utility supplied 95% of the market[(2)]. The gas market is divided up into regional monopolies, and the main retail supplier covers 93% of the market[(3)].

Energy efficiency

Industry is dominated by the construction sector and food industries, which support the large tourism sector; with few heavy industries, the energy intensity of the economy lies at the EU-average. The expected savings in the action plan are greatest for the transport sector, which is estimated to account for 36% of savings by 2016. Not far behind are the household and tertiary (service) sector with 30 and 31%, respectively[(4)]. Due to the dominance of the EU Emissions Trading System in industry sectors, its share in expected savings is only 4%. Because of the relatively high level (by EU standards) of oil consumption in the household sector, the energy efficiency programmes will make an even larger major contribution towards improved energy security as well as contributing to better household economy and lower environmental impacts.

Energy security

Greece had an energy import dependency of 72% in 2006, which is well above the EU-average of 54%[(5)]. Crude oil and petroleum products accounted for 81% of imports, while natural gas accounted for just 11%. Overall the Greek energy system relies on fossil fuels for 93% of its gross energy consumption. The considerable expansion in use of lignite for power generation starting in the 1970s was itself a response to growing energy import dependence.

Renewable energy

Renewable energy in Greece can help to reduce energy import dependency while also contributing to environmental goals. Greece is already a leader, along with Cyprus and Austria, in the number of solar thermal installations on a per capita basis[6]. The potential for wind is quite high, but again the special geography of Greece creates technical complications in terms of bringing wind power to the grid; in many cases the optimal locations for wind power are in remote areas away from the grid. The proposed target for 2010 was 20.1% renewables for electricity generation, and the technology roadmap indicates that 3648 MW of wind were planned for installation by 2010, and were expected to account for over half of electricity generation from renewables[7]. The proposed target for 2020 is 18% in final energy consumption[8]. Policy support mechanisms include feed-in tariffs, investment subsidies, and in the case of biofuels for transport, an exemption from the fossil fuels tax.

Table 3.9.3: Key energy figures, 2006 — in 1000 TOE

	ALL PRODUCTS	of which:								
		Hard coal & equivalents	Lignite & equivalents	Crude oil and feedstocks	Total petroleum products	Natural gas	Nuclear heat	Renewable sources	Derived heat	Electrical energy
Primary production	**10 050**	**-**	**8 137**	**95**	**-**	**26**	**-**	**1 793**	**-**	**-**
Net imports	24 853	230	-8	21 547	-3	2 721	-	4	-	361
Stock change and bunkers	2 736	56	-23	-29	2 733	0	-	-	-	-
Gross inland consumption	**31 509**	**286**	**8 106**	**21 613**	**-3 406**	**2 747**	**-**	**1 796**	**-**	**361**
Transformation input	34 635	-	8 034	22 600	2 080	1 889	-	27	-	-
Transformation output	27 061	-	41	-	22 440	-	-	-	56	4 524
Consumpt. of the energy branch	1 984	-	-	-	1 371	32	-	-	-	581
Available for final consumption	**21 527**	**286**	**113**	**-147**	**14 766**	**818**	**-**	**1 103**	**56**	**4 532**
Final non-energy consumption	907	-	-	-	777	130	-	-	-	-
Final energy consumption	**21 454**	**286**	**116**	**-**	**14 691**	**686**	**-**	**1 103**	**56**	**4 516**
Industry	4 213	285	109	-	1 938	445	-	219	-	1 217
Transport	8 502	-	-	-	8 425	13	-	46	-	19
of which: road transport	*6 439*	-	-	-	*6 381*	*13*	-	*46*	-	-
Services and others	3 248	-	7	-	1 370	90	-	21	-	1 761
Households	5 491	1	0	-	2 958	139	-	817	56	1 520

Source: Eurostat

References

(1) Greece – Internal Market fact sheet, January 2007. http://europa.ec.eu/energy.

(2) Eurostat – Data in focus 6/2008, "European electricity market indicators 2006"

(3) Eurostat – Data in focus 7/2008, "European gas market indicators 2006"

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(6) European Solar Thermal Industry Federation, "Solar Thermal Markets in Europe," June 2008, www.estif.org.

(7) RES2020, "Monitoring and Evaluation of the RES Directive implementation in EU27 and policy recommendations for 2020," EIE/06/170/SI2.442662, February 2008.

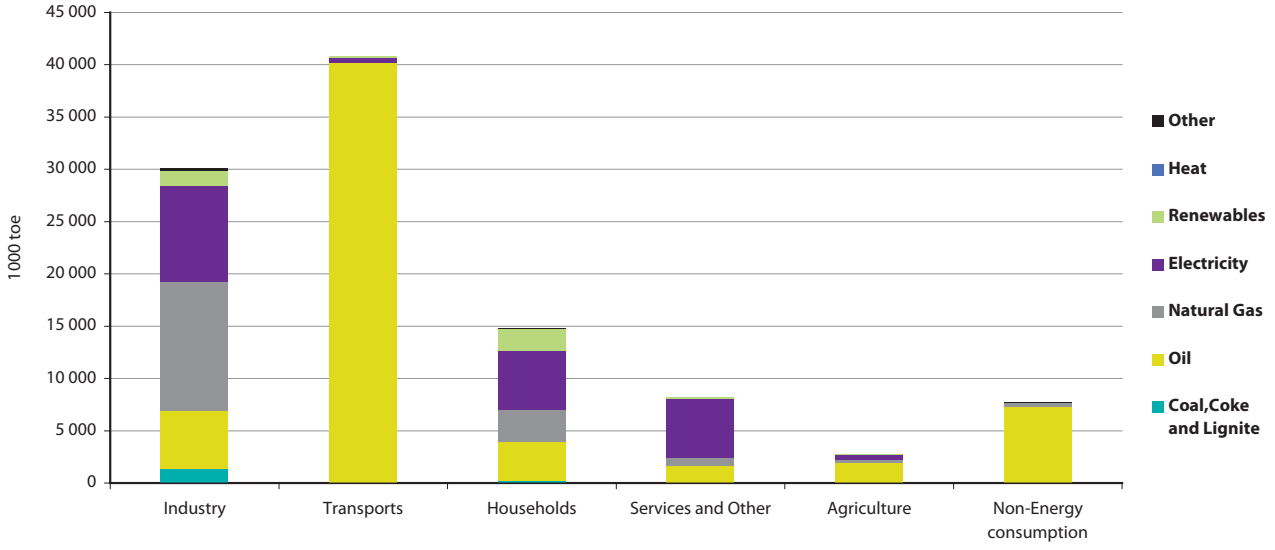
(8) COM(2008) 19 final, 2008/0016 (COD) Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources, Brussels, 23.1.2008.

3.10 Spain

Since joining the EU in 1986, Spain has experienced a high rate of economic growth that has been accompanied by fairly rapid growth in energy consumption and a need to invest in energy infrastructure. The energy intensity of the economy has essentially been unchanged during the past 15 years and remains above the EU average. The energy system is highly dependent on imported oil and petroleum products, although the power sector is quite diversified in the mix of sources.

Final energy demand is dominated by transport, which accounted for 42% of final energy consumption in 2006. Industry accounted for 31% of energy demand of which one-fourth came from the construction (Glass, pottery & building materials) sector. Renewable energy development has accelerated substantially during the past 10-15 years, with a particular emphasis on biofuels for transport and wind.

Figure 3.10.1: Final energy and non-energy consumption by sector and type of fuel, 2006

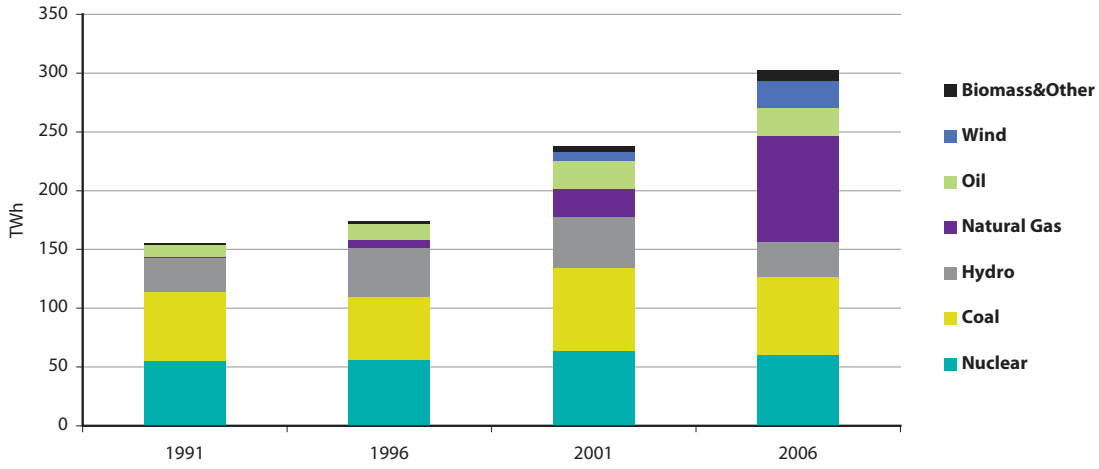


Source: Eurostat

Electric power sector

Electricity consumption has nearly doubled since 1991, while installed capacity has increased by 80%. The electric power system is quite diversified compared to other EU countries, with nuclear, hydro, gas, coal and wind all having significant shares. The growth of natural gas for power generation in the past 10-15 years has been rather remarkable; the absolute amount increased by a factor of 67 during that period, while its share increased from 1% to 31%, making it the largest contributor. The hydro contribution fluctuates, which impacts not only the other sources but also the share of imports and exports; in 2006, Spain was a net exporter of 3274 GWh (1.1% of its net electricity generation). Renewables accounted for 19% of power generation in 2004.

Figure 3.10.2: Gross electricity generation by source



Source: Eurostat

Energy markets

The power and gas markets have been fully opened since 2003 and there are several companies that sell both electricity and gas, with a number of large foreign companies entering the gas market since that time. A large share of customers in the power sector have remained on the lower regulated tariff, while competition in the gas sector, especially for the larger customers, has contributed to the deregulated market accounting for 84% of total gas consumption as of 2006[1]. The 4 largest generating companies accounted for 81% of wholesale power supplied in 2006, while there were also 4 major companies that accounted for a large share (75%) of the retail market[2]. There were 5 natural gas upstream suppliers in 2006 that accounted for 85% of the market, while the retail side included 37 small (less than 5% market share) actors that accounted for 52% of the market and 5 large companies that covered an estimated 48% of the market[3].

Energy security

Spain's dependence on imported oil and gas for 70% of its energy needs, as well as some imported coal resulted in a net energy import of 86% of its gross inland consumption in 2006, which was one of the highest levels among the larger EU countries. Consequently, the emphasis on renewables has been motivated as much by energy security concerns as by environmental concerns. Although Spain has promoted biofuels for transport, the share of biofuels in the total gross inland consumption was still below 1% in 2006. Another energy security issue has been that the rapidly rising electricity consumption has strained Spain's electricity infrastructure. The recent integration of the Spanish grid with Portugal's grid as well as interconnections to other EU countries should help to alleviate future problems.

Renewable energy

Spain has become in recent years the world's second largest producer of wind energy, behind Germany, and ahead of the United States. As in Portugal, there are also ambitious targets for emerging technologies like concentrated solar power. There is already one 10-MW solar tower power plant in operation. Biomass and renewable heat have not developed as fast as expected, especially given the large potential from agro-industrial sources such as the residues from Spain's large food processing and related industries. It will be challenging to reach the original target of 30.3% by 2010 under the existing Renewable Electricity Directive (2001/71/EC)[4]. The proposed renewables target for 2020 for Spain is 20% of final consumption, based on 42% renewables in the power sector, 6% renewables for heating and cooling, and 10% biofuels for transport[5].

Table 3.10.3: Key energy figures, 2006 — in 1000 TOE

	ALL PRODUCTS	of which:								
		Hard coal & equivalents	Lignite & equivalents	Crude oil and feedstocks	Total petroleum products	Natural gas	Nuclear heat	Renewable sources	Derived heat	Electrical energy
Primary production	**31 195**	**4 703**	**1 346**	**140**	**-**	**55**	**15 510**	**9 442**	**-**	**-**
Net imports	123 811	13 507	-	61 860	17 298	31 427	-	-	-	-282
Stock change and bunkers	5 248	-1 690	9	-294	7 685	-462	-	-	-	-
Gross inland consumption	**143 881**	**16 520**	**1 355**	**61 706**	**8 610**	**31 020**	**15 510**	**9 442**	**-**	**-282**
Transformation input	116 261	17 243	1 357	62 591	4 551	13 207	15 510	1 480	-	-
Transformation output	86 368	1 933	-	-	61 996	-	-	-	0	21 542
Consumpt. of the energy branch	6 757	118	-	-	4 663	-	-	4	-	1 731
Available for final consumption	**104 667**	**1 092**	**-2**	**12**	**60 369**	**17 609**	**-**	**3 770**	**0**	**21 484**
Final non-energy consumption	7 753	-	-	-	7 289	441	-	-	-	-
Final energy consumption	**96 642**	**1 573**	**-**	**12**	**53 048**	**16 446**	**-**	**3 770**	**0**	**21 484**
Industry	30 111	1 332	-	12	5 511	12 422	-	1 379	0	9 185
Transport	40 822	-	-	-	40 189	-	-	172	-	461
of which: road transport	*32 473*	-	-	-	*32 301*	-	-	*172*	-	-
Services and others	10 956	46	-	-	3 563	1 006	-	139	-	6 188
Households	14 753	195	-	-	3 785	3 018	-	2 080	-	5 650

Source: Eurostat

References

(1) Spain – Internal Market fact sheet, January 2007. http://europa.ec.eu/energy.

(2) Eurostat – Data in focus 6/2008, "European electricity market indicators 2006"

(3) Eurostat – Data in focus 7/2008, "European gas market indicators 2006"

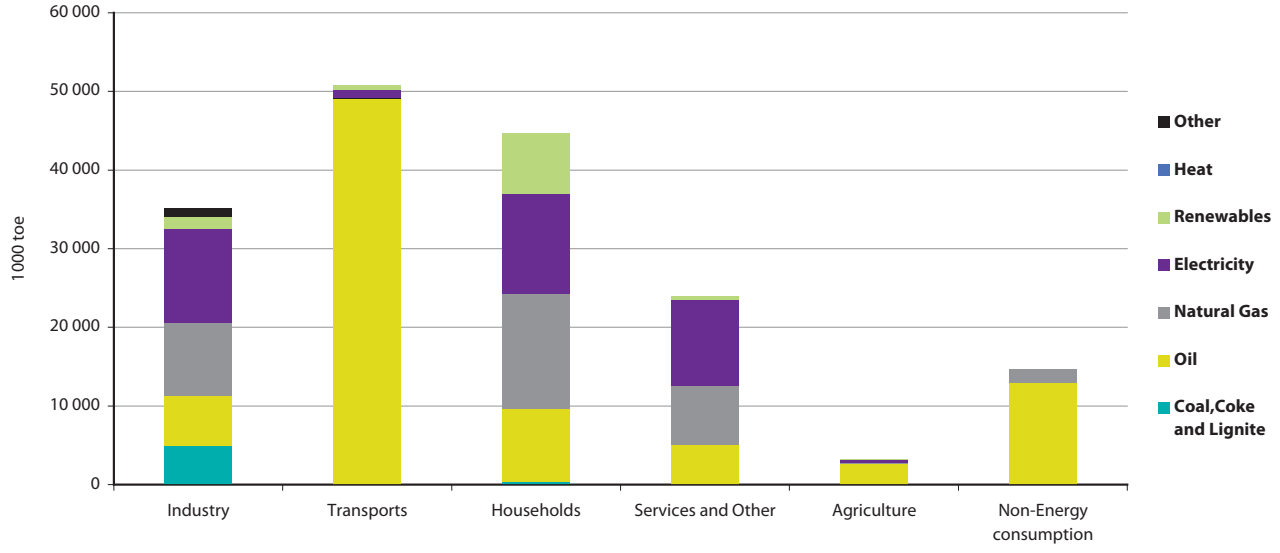
(4) RES2020,"Monitoring and Evaluation of the RES Directive implementation in EU27 and policy recommendations for 2020," EIE/06/170/SI2.442662, February 2008.

(5) COM (2008) 19 final, 2008/0016 (COD) Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the promotion of the use of energy from renewable sources, Brussels, 23.1.2008.

3.11 France

The French energy system has nuclear power as a key pillar, providing domestic energy that is also a low-carbon source. Energy efficiency has become another pillar; energy intensity has been reduced by 15% since 1991, is among the lowest in the EU, and is the lowest among the five largest EU economies (France, Germany, Italy, Spain and the United Kingdom). Biomass could eventually be another key pillar, as France is one of the largest producers of biofuels for transport as well as making considerable effort on bioenergy for heat and power. As with most EU countries, the current situation is one in which France is heavily dependent on imported oil; transport accounts for 68% of the final energy consumption of petroleum products. Households are the main consumers of electricity (34%) and also the main consumers of gas (46%); consequently, energy efficiency efforts are aimed especially at households.

Figure 3.11.1: Final energy and non-energy consumption by sector and type of fuel, 2006

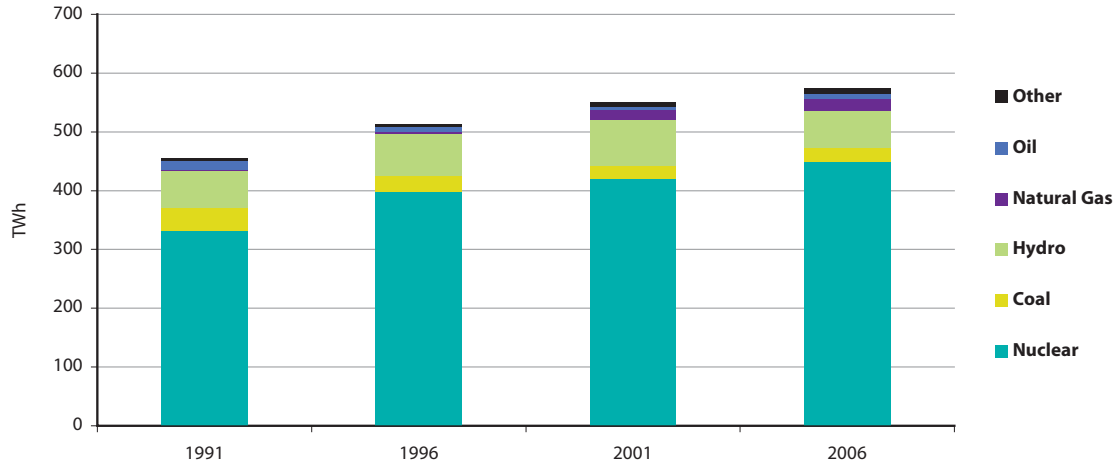


Source: Eurostat

Electric power sector

Nuclear power accounted for 78% of electricity production in France, and this share has been unchanged during the past 5 years. Hydro and coal have historically also played a role in the energy mix. In recent years, however, coal has been replaced by natural gas; the electricity production from natural gas increased during 1991-2006 from 3 to 22 TWh whereas the electricity production from coal and lignite decreased from 40 to 23 TWh. Electricity production from biomass and wind has been added but together this accounted for just 1.2% of the total in 2006; this is the same share as the one produced from oil. Overall installed capacity increased by 11% from 1991 to 2006 while generation increased by 26%; the main underlying reason for the divergence appears to be the increased capacity utilisation for nuclear power, which was 7117 kWh/kW in 2006 compared to 5634 kWh/kW in 1991[(1)].

Figure 3.11.2: Gross electricity generation by source



Source: Eurostat

Energy markets

Both the electricity and gas markets in France are highly concentrated, with large incumbent suppliers continuing to dominate after liberalisation. Switching among large industrial customers has been fairly significant, while residential customers have been on the regulated tariffs, which are lower than the EU average in the case of electricity and higher in the case of gas[2]. The primary power company, EDF, was responsible for 89% of generation in 2006 and an even higher share of the retail market, while there were 160 minor suppliers[3]. The gas market has 3 major wholesale suppliers covering 98% of the market, 3 retailers that accounted for 89% of the market, and 33 small retailers or distributors that covered 11% of the market[4].

Energy security

France's import dependence is due mainly to oil; net imports of oil and petroleum products accounted for 66% of all energy imports. Because of the large role of nuclear in the power sector, France's energy import dependence was 51.4% in 2006, just slightly below the EU average of 53.8%[5]. Furthermore, France is a net exporter of electricity; in 2006, it exported 64 TWh or 12% of its gross electricity production; this is a quite considerable amount of electricity, representing more than the entire electricity consumption of a number of EU Member States. Energy security issues will therefore be centred on reducing oil consumption and diversifying the overall energy mix.

Renewable energy

The share of renewables in gross inland consumption was 6.3% in 2006, while the share of renewables in electricity generation was 12%. The existing target for renewable electricity (2001/71/EC) in 2010 is 23% while the proposed target for 2020 is 21%[6]. There are quotas and excise tax exemptions for biofuels blending and feed-in tariffs for renewable electricity, which were just revised in 2006-2007[7].

Table 3.11.3: Key energy figures, 2006 — in 1000 TOE

	ALL PRODUCTS	of which:								
		Hard coal & equivalents	Lignite & equivalents	Crude oil and feedstocks	Total petroleum products	Natural gas	Nuclear heat	Renewable sources	Derived heat	Electrical energy
Primary production	**135 567**	**-**	**-**	**1 119**	**-**	**1 059**	**116 128**	**17 261**	**-**	**-**
Net imports	141 728	13 864	15	83 435	10 379	39 469	-	13	-	-5 446
Stock change and bunkers	1 074	-917	-	169	2 725	-904	-	-	-	-
Gross inland consumption	**273 070**	**13 228**	**15**	**84 723**	**7 525**	**39 624**	**116 128**	**17 273**	**-**	**-5 446**
Transformation input	226 198	11 212	-	88 967	1 705	5 531	116 128	1 773	-	-
Transformation output	137 731	3 211	-	-	88 335	-	-	-	-	43 912
Consumpt. of the energy branc	9 244	47	-	-	4 814	173	-	-	-	3 795
Available for final consumpti	**172 173**	**5 180**	**15**	**164**	**85 070**	**33 334**	**-**	**10 468**	**-**	**36 968**
Final non-energy consumption	14 586	-	-	-	12 961	1 625	-	-	-	-
Final energy consumption	**157 779**	**5 345**	**15**	**-**	**72 274**	**31 709**	**-**	**10 468**	**-**	**36 968**
Industry	35 078	4 989	15	-	6 295	9 268	-	1 569	-	11 943
Transport	50 859	-	-	-	49 072	62	-	665	-	1 060
of which: road transport	*42 212*	-	-	-	*41 485*	*62*	-	*665*	-	-
Services and others	27 184	-	-	-	7 585	7 765	-	504	-	11 328
Households	44 658	356	-	-	9 321	14 614	-	7 731	-	12 636

Source: Eurostat

References

(1) Calculated using EUROSTAT data for installed capacity and electricity generation.

(2) France – Internal Market fact sheet, January 2007. http://europa.ec.eu/energy.

(3) Eurostat – Data in focus 6/2008, "European electricity market indicators 2006"

(4) Eurostat – Data in focus 7/2008, "European gas market indicators 2006"

(5) Eurostat News Release 98/2008, "Energy consumption and production: EU27 energy dependence rate at 54% in 2006," 10 July 2008.

(6) COM (2008) 19 final, 2008/0016 (COD) Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources, Brussels, 23.1.2008.

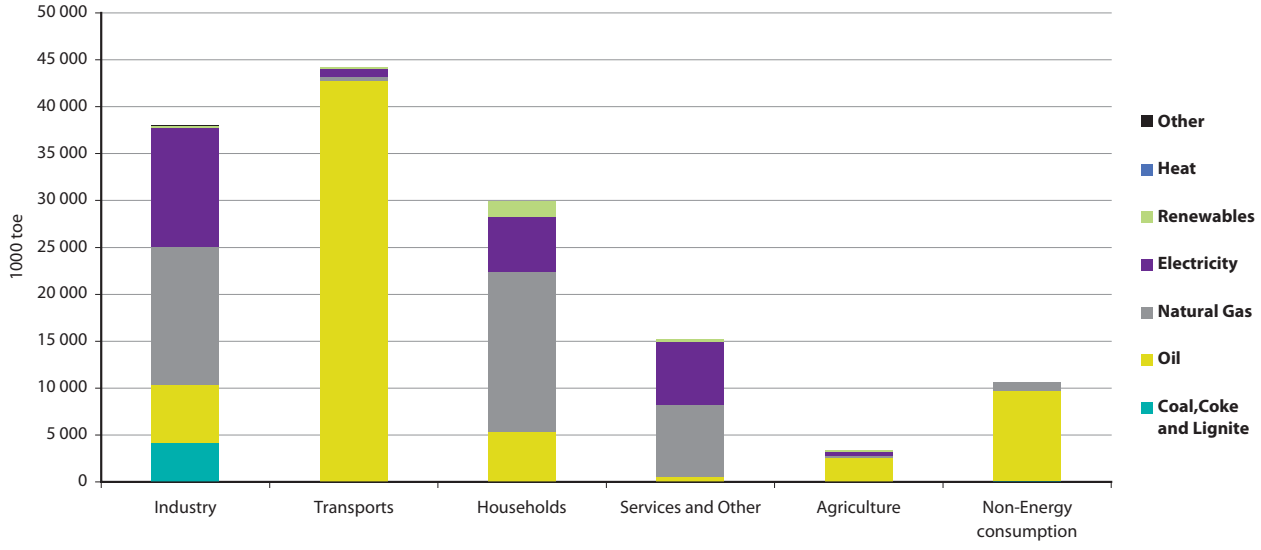
(7) RES2020,"Monitoring and Evaluation of the RES Directive implementation in EU27 and policy recommendations for 2020," EIE/06/170/SI2.442662, February 2008.

3.12 Italy

The Italian energy sector is highly dependent on imported oil and gas, and consequently the energy security dimensions are strong and influence the strategic direction of investments and geopolitical institutions. Oil and petroleum products accounted for 45% of gross inland consumption in 2006, while natural gas accounted for 37%. Italy has also emerged as a Euro-Mediterranean trading hub for natural gas coming from North Africa, the Middle East, Russia and elsewhere, with considerable investments in recent years on infrastructure, including LNG terminals. Renewable energy comes mainly from hydropower, while biomass, geothermal, and biodiesel for transport have been making increasing contributions in recent years.

Energy intensity has decreased slightly since 1991 and is below the EU average. However, fossil fuels accounted for 91% of gross inland consumption in 2006, so that carbon intensity remains above the EU-average[(1)]. Demand for electricity and demand for energy in the transport sector have been increasing fairly steadily over this time frame. Final demand is dominated by transport, with 34%, followed by industry and households, with 29% and 23%, respectively. Electricity demand has long been dominated by industry, which accounted for 48% in 2006.

Figure 3.12.1: Final energy and non-energy consumption by sector and type of fuel, 2006

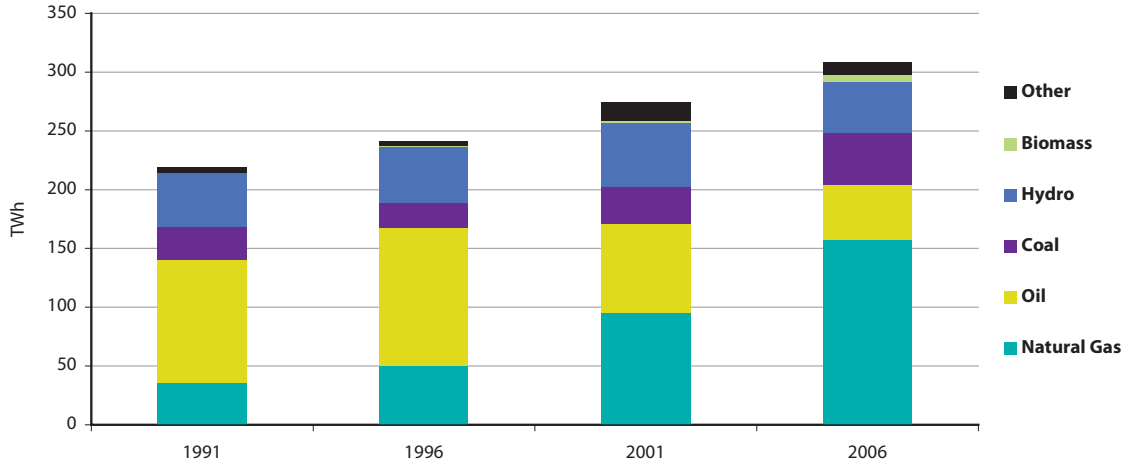


Source: Eurostat

Electric power sector

The energy mix in the electric power sector has become slightly more diversified in recent years, due to the addition of biomass, wind and geothermal. However, the main shift has been from oil to natural gas, which have essentially traded places; the share of oil in electricity production decreased from 47% in 1991 to 15% in 2006, while the share of natural gas increased from 16% in 1991 to 50% in 2006. Installed capacity increased by 54% from 1991 to 2006. Electricity imports have also been used to address the rapid increase in electricity demand; in 2006, about 15% of its final energy consumption was imported.

Figure 3.12.2: Gross electricity generation by source



Source: Eurostat

Energy markets

Italy has significant interconnection capacity for both the power and gas markets, and acts as a transit route as well as requiring it for it own high internal demands. The power grid is connected with France, Switzerland, Austria, Slovenia and Greece, but growing demand has continued to cause serious congestion problems[2]. The gas market was opened as of 2003 while the power market opening was completed in 2007 when households became eligible to choose their supplier. There were 92 major generators as of the end of 2006, with just 5 of those supplying 69% of the market, while there were 3 major (more than 5% market share) retailers, which provided 52% of the market[3]. There were 3 companies supplying gas at the wholesale level that accounted for 87% of the market, while at the retail level there were just two companies that accounted for 65% of retail supply[4]. In both the power and gas markets, there are many small retailers (less than 5%) as a result of the market liberalisation; as of the end of 2006, there were 377 small electricity retailers and 321 small gas retailers.

Energy security

The security of energy supplies is a major issue in Italy due to its high dependence on imported fossil fuels. The energy import dependence underwent some structural shifts during the past three decades since the oil crises of the 1970s. One shift occurred in 1988, when the country's nuclear power plants were shut down after a moratorium on nuclear power was passed; the closing of the nuclear option led to a greater challenge both for energy security and for CO2 emission reduction goals. A second shift occurred during the 1990s, when the era of natural gas was ushered in rapidly in Italy, replacing the use of oil for power generation. Although this second shift mainly replaced imports with imports, it did create more diversification, reduced emissions, and created new market dynamics. The energy dependence rate in 2006 was 88%.

Renewable energy

Renewable energy accounted for 7% of gross inland consumption in 2006. The target for electricity under the Res-E Directive (2001/71/EC) is proposed to be 25% renewables by 2010; the proposed target for 2020 is 17% of final energy consumption[5]. Small producers (< 1 MW) will have a choice between feed-in tariffs and Green certificates starting in 2007, while the Green Certificates legislation has been modified in 2008 so as to improve the accounting, create equivalence across different sources and the lifetime of the scheme extended to 15 years[6]. The renewables with the most potential in Italy include geothermal, biomass, solar thermal and solar PV, whereas the hydro potential is nearly fully utilised.

Table 3.12.3: Key energy figures, 2006 — in 1000 TOE

	ALL PRODUCTS	of which:								
		Hard coal & equivalents	Lignite & equivalents	Crude oil and feedstocks	Total petroleum products	Natural gas	Nuclear heat	Renewable sources	Derived heat	Electrical energy
Primary production	**27 053**	**13**	**-**	**5 850**	**-**	**8 992**	**-**	**12 198**	**-**	**-**
Net imports	164 570	16 608	2	93 176	-13 071	63 088	-	899	-	3 868
Stock change and bunkers	490	35	-	316	3 027	-2 888	-	-	-	-
Gross inland consumption	**186 113**	**16 656**	**2**	**100 091**	**-16 918**	**69 192**	**-**	**13 097**	**-**	**3 868**
Transformation input	163 074	15 488	-	102 203	9 263	27 499	-	7 183	-	-
Transformation output	128 242	3 191	-	-	100 623	-	-	-	-	23 020
Consumpt. of the energy branch	7 727	40	-	-	5 226	328	-	-	-	2 105
Available for final consumption	**141 326**	**4 319**	**2**	**-**	**67 056**	**40 899**	**-**	**2 475**	**-**	**26 509**
Final non-energy consumption	10 683	168	-	-	9 569	946	-	-	-	-
Final energy consumption	**130 654**	**4 161**	**2**	**-**	**57 487**	**39 953**	**-**	**2 475**	**-**	**26 509**
Industry	38 007	4 154	2	-	6 178	14 737	-	198	-	12 671
Transport	44 194	-	-	-	42 785	413	-	161	-	835
of which: road transport	*39 022*	-	-	-	*38 448*	*413*	-	*161*	-	-
Services and others	18 534	-	-	-	3 182	7 756	-	409	-	7 188
Households	29 919	7	-	-	5 342	17 047	-	1 707	-	5 816

Source: Eurostat

References

(1) Italy – Energy mix fact sheet, January 2007. http://europa.ec.eu/energy.

(2) Italy – Internal Market fact sheet, January 2007. http://europa.ec.eu/energy.

(3) Eurostat – Data in focus 6/2008, "European electricity market indicators 2006"

(4) Eurostat – Data in focus 7/2008, "European gas market indicators 2006"

(5) COM (2008) 19 final, 2008/0016 (COD) Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the promotion of the use of energy from renewable sources, Brussels, 23.1.2008.

6) RES2020,"Monitoring and Evaluation of the RES Directive implementation in EU27 and policy recommendations for 2020," EIE/06/170/SI2.442662, February 2008.

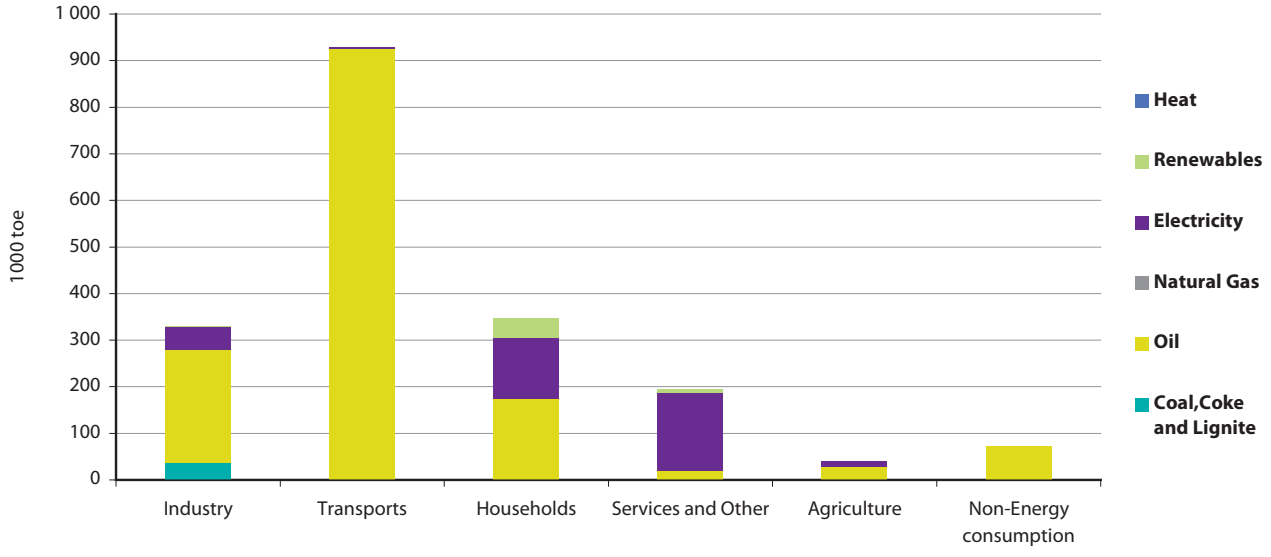
3.13 Cyprus

The energy system in Cyprus is based almost exclusively on oil and imported petroleum products, which account for 96% of gross inland consumption. Solar water heating is widely used and there is a small amount of biomass, which together make up the remainder. Energy and electricity demand have been increasing continuously, due in part to the growing tourism sector. Energy strategies are therefore focused on improving energy efficiency, diversifying the sources of supply and developing renewable energy sources.

Energy demand

In 2006, the transport sector accounted for 50% of final energy consumption, while residential and industry accounted for 19% and 18% respectively. The remainder includes the service sector, agriculture and miscellaneous uses. Electricity demand is dominated by the services sector, which in 2006 accounted for 50% of the electricity consumption. For the households, the proportion reached 36%. The construction sector (glass, pottery and materials) accounts for 56% of the total energy consumed in the industrial sector, including 40% of the total electricity consumed in the industry.

Figure 3.13.1: Final energy and non-energy consumption by sector and fuel, 2006



Source: Eurostat

Electric power mix

Cyprus has only thermal power plants that run on residual fuel oil. Installed capacity has increased by 141% since 1991, reaching 1 134 MW in 2006. In 2006, demand was 4 396 GWh, compared to 1 978 GWh in 1991 (an increase of 122%). A new support scheme was introduced in 2006, which provides supports to renewables based on feed-in tariffs and investment subsidies; wind, hydro, biomass, biogas, biofuels, solar thermal, geothermal (heat pumps) and photovoltaic are included in the scheme[(1)].

Renewable energy development

Cyprus has a significant solar thermal industry, with the largest number of solar thermal collectors per capita[2]. In the southernmost country of the EU, solar water heaters are found in 90% of homes and over 50% of hotels. There are good opportunities to expand wind and biomass as well; renewables will help to diversify the energy mix and the national target for 2010 is for 9% of total energy consumption to be from renewable sources. In the newly proposed EU Directive, the target for 2020 would be 13%.

Energy efficiency

The energy intensity of the economy is above the EU-average, in spite of being dominated by fairly low energy-using service sector activities. The National Energy Efficiency Action Plan identifies a wide variety of measures in all sectors amounting to 385 thousand toe in final energy savings by 2016, which is more than twice the indicative target for 2016[3]. Buildings sector measures dominate, accounting for over half of the expected savings.

Table 3.13.2: Key energy figures, 2006 — in 1000 TOE

	ALL PRODUCTS	of which:								
		Hard coal & equivalents	Lignite & equivalents	Crude oil and feedstocks	Total petroleum products	Natural gas	Nuclear heat	Renewable sources	Derived heat	Electrical energy
Primary production	**50**	**-**	**-**	**-**	**-**	**-**	**-**	**50**	**-**	**-**
Net imports	2 971	43	-	-	2 928	-	-	0	-	-
Stock change and bunkers	167	-6	-	-	173	-	-	-	-	-
Gross inland consumption	**2 609**	**37**	**-**	**-**	**2 520**	**-**	**-**	**50**	**-**	**-**
Transformation input	1 100	-	-	0	1 100	-	-	-	-	-
Transformation output	400	-	-	-	0	-	-	-	-	400
Consumpt. of the energy branch	23	-	-	-	-	-	-	-	-	23
Available for final consumption	**1 867**	**37**	**-**	**0**	**1 420**	**-**	**-**	**50**	**-**	**358**
Final non-energy consumption	71	-	-	-	71	-	-	-	-	-
Final energy consumption	**1 840**	**37**	**-**	**-**	**1 393**	**-**	**-**	**50**	**-**	**358**
Industry	331	37	-	-	243	-	-	1	-	48
Transport	929	-	-	-	926	-	-	-	-	3
of which: road transport	*618*	-	-	-	*618*	-	-	-	-	-
Services and others	233	-	-	-	49	-	-	6	-	178
Households	347	-	-	-	175	-	-	42	-	129

Source: Eurostat

References

(1) www.cie.org.cy

(2) European Solar Thermal Industry Federation, "Solar Thermal Markets in Europe," June 2008, www.estif.org.

(3) Republic Of Cyprus, "National Energy Efficiency Action Plan," Ministry of Commerce, Industry and Tourism, Cyprus Institute of Energy, Nicosia, 3 July 2007.

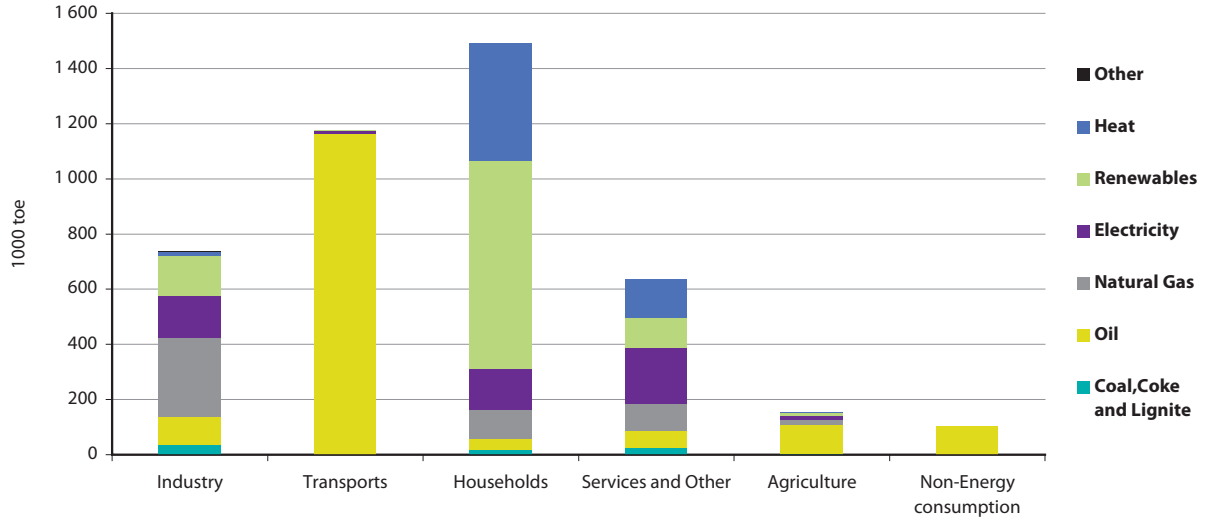
3.14 Latvia

Latvia has the highest share of renewable energy in the EU, due mainly to the significant role of hydropower and the large amount of biomass used in the residential sector. It has significant forest resources, which contribute to it being a net exporter of biomass for energy. Lacking fossil resources, it has a high level of import dependency, with oil and gas imported mainly from Russia. Hydro and gas provide nearly all of the domestic supply of electricity, with wind and biomass added to the mix in recent years. It also imports a significant amount of electricity in some years due to fluctuations in domestic supply and increasing prices.

Overall energy structure

The structure of energy demand is rather different from the many countries in the EU, in the sense that the residential sector energy consumption constitutes the largest share. Residential sector consumption includes mainly heat and direct use of biomass. Natural gas is used mainly in industry and for heat and power production, which together constitute 84% of the total. The growing service sector is now the largest consumer of electricity, although there is also a significant amount of heat and direct use of gas and biomass.

Figure 3.14.1: Final energy consumption by fuel and sector, 2006



Source: Eurostat

Energy efficiency

As with the other Baltic States, the energy intensity of the Latvian economy has decreased significantly since the early 1990s, although it remains more than twice the EU average, The timber and wood products industry in Latvia is both a major source of energy and a major consumer; it is therefore part of the energy savings programmes that are now being implemented. However, the major target of energy efficiency efforts in meeting EU goals is the residential sector; 75% of the expected annual savings, in reaching the 9% energy consumption reduction target by 2016, will be in housing, and the majority of the efforts involved improving energy efficiency in blocks of flats[1].

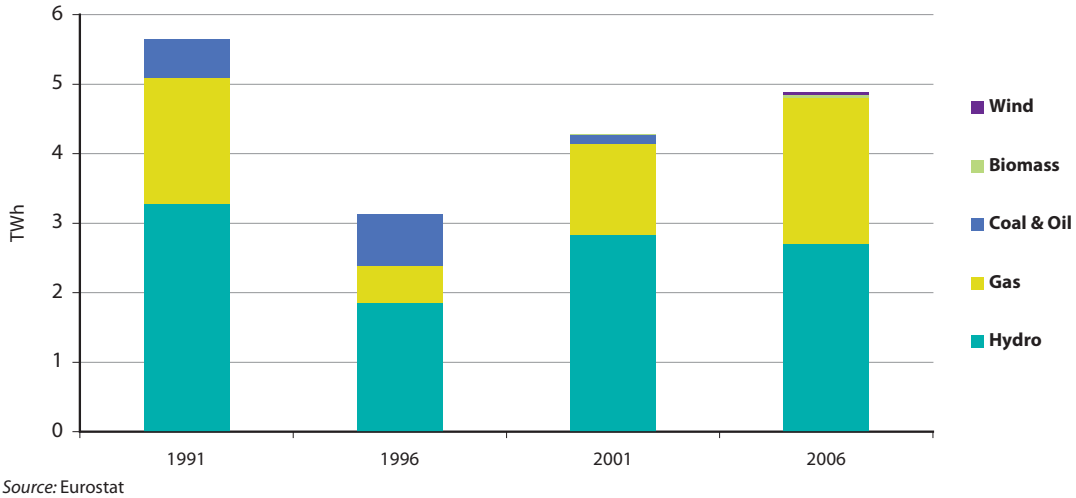
Energy markets

Although the Latvian electricity market was subjected to EU unbundling requirements as of July 2007, in effect the state-owned actor still accounts for 95% of generation and retail supply[2]. There are a number of small suppliers that make up the remainder but the retail market has not developed and opportunities for switching remain scarce, nor are there major incentives since prices remain comparatively low. Latvia depends on Russian gas supply and the networks are not integrated beyond the Baltic region; Latvia received an exemption from the Gas Directive (2003/55/EC) until 2010, and the gas market remains dependent on a single supplier[3].

Electric power sector

The Latvian electricity grid is connected with those of the other Baltic countries, and a link to the Nordic countries was completed in January 2007[4]. The power mix is now based primarily on gas and hydro; the coal and oil generation that was still used in the 1990s has largely been phased out, while biomass and wind are slowly being phased in as of the past several years. Reliability of power generation and of grid operation have been improved by increased transmission capacity during 2006-2007[5]. A deficit in domestic supply is made up through imports; net electricity imports amounted to 34% of total generation in 2006. Combined heat and power plants are expected to play a significant role in the future domestic power supply.

Figure 3.14.2: Gross electric power generation by source



Source: Eurostat

Table 3.14.3: Key energy figures, 2006 — in 1000 TOE

	ALL PRODUCTS	of which:								
		Hard coal & equivalents	Lignite & equivalents	Crude oil and feedstocks	Total petroleum products	Natural gas	Nuclear heat	Renewable sources	Derived heat	Electrical energy
Primary production	**1 842**	**-**	**3**	**-**	**-**	**-**	**-**	**1 839**	**-**	**-**
Net imports	3 169	104	-	22	1 692	1 530	-	-394	-	216
Stock change and bunkers	-6	-19	-2	-2	152	-123	-	-12	-	-
Gross inland consumption	**4 625**	**85**	**2**	**20**	**1 460**	**1 407**	**-**	**1 433**	**-**	**216**
Transformation input	1 073	5	1	2	30	864	-	170	-	-
Transformation output	904	-	-	-	1	-	-	-	718	185
Consumpt. of the energy branch	96	-	0	-	6	22	-	3	23	42
Available for final consumption	**4 170**	**80**	**-**	**1**	**1 441**	**513**	**-**	**1 024**	**582**	**524**
Final non-energy consumption	104	-	-	-	104	-	-	-	-	-
Final energy consumption	**4 201**	**80**	**-**	**2**	**1 471**	**513**	**-**	**1 024**	**582**	**524**
Industry	741	36	-	2	100	290	-	144	15	151
Transport	1 177	-	-	-	1 163	2	-	2	-	10
of which: road transport	*1 027*	-	-	-	*1 023*	*2*	-	*2*	-	-
Services and others	791	25	-	-	170	119	-	122	142	214
Households	1 492	19	-	-	39	103	-	756	426	149

Source: Eurostat

References

(1) Latvian Cabinet of Ministers, Latvia's First National Energy Efficiency Action Plan 2008-2010.

(2) Eurostat – Data in focus 6/2008, "European electricity market indicators 2006"

(3) Eurostat – Data in focus 7/2008, "European gas market indicators 2006"

(4) LATVENERGO, 2008, Annual report 2007, www.latvenergo.lv.

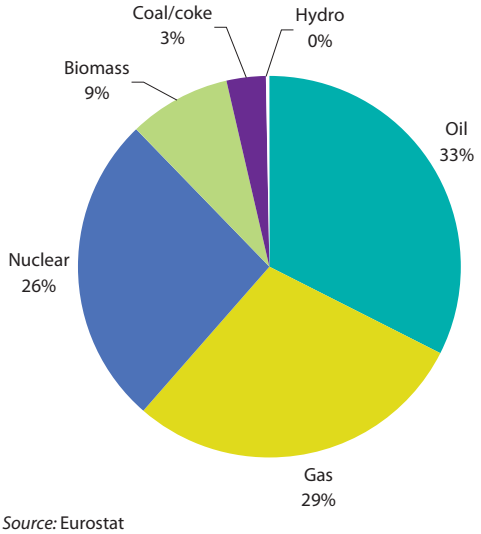
(5) ibid.

3.15 Lithuania

Overall energy structure

Lithuania is the largest of the Baltic countries and provides some industrial infrastructure that is lacking elsewhere in the region, such as oil refining and chemicals. Like its Baltic neighbours, it has a high level of import dependency, based on oil and gas from Russia. In other respects, the energy supply in Lithuania is different — it has nuclear power and some domestic oil production, and has traditionally been a net electricity exporter. It is more dependent on fossil fuels that Latvia but less dependent than Estonia.

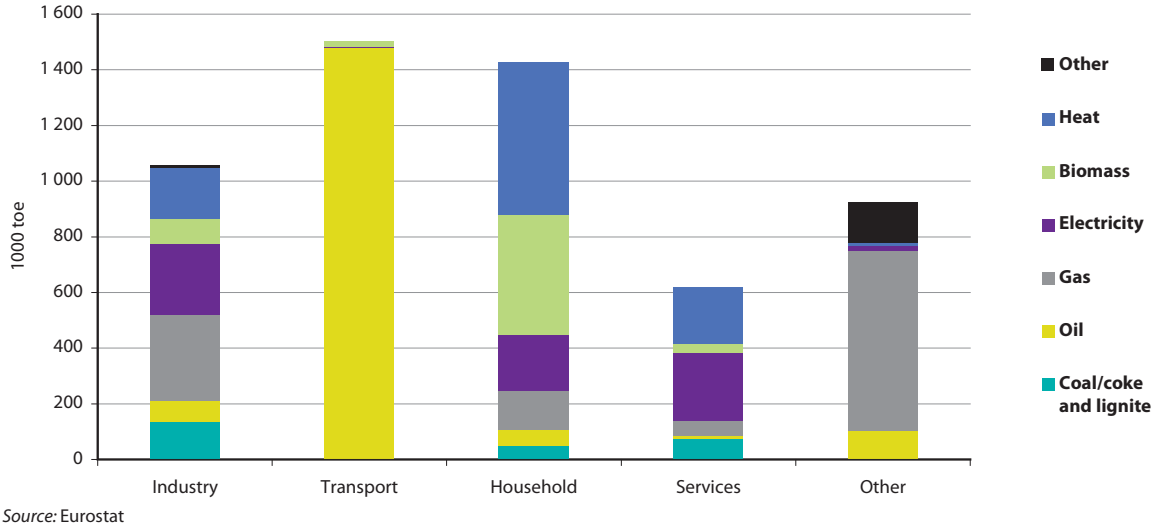
Figure 3.15.1: Primary energy consumption by fuel, 2006



Source: Eurostat

The structure of energy demand is similar to the other Baltic countries in some respects, such as the fact that there is a significant amount of biomass used for domestic heating and that the residential sector accounts for the largest share of energy consumption. A difference from the other Baltic countries is its large chemicals industry, which creates a unusually high demand for gas in addition to what is used in other sectors; the use of natural gas as a feedstock in the chemical industry accounts for 52% of final uses of natural gas and 24% of its gross inland consumption (i.e. including gas for heat and power production). Residential sector consumption includes mainly heat and direct use of biomass. The growing service sector is now nearly as large a consumer of electricity as industry, together accounting for 72% of total electricity consumption.

Figure 3.15.2: Final energy and non-energy consumption by fuel and sector, 2006



Source: Eurostat

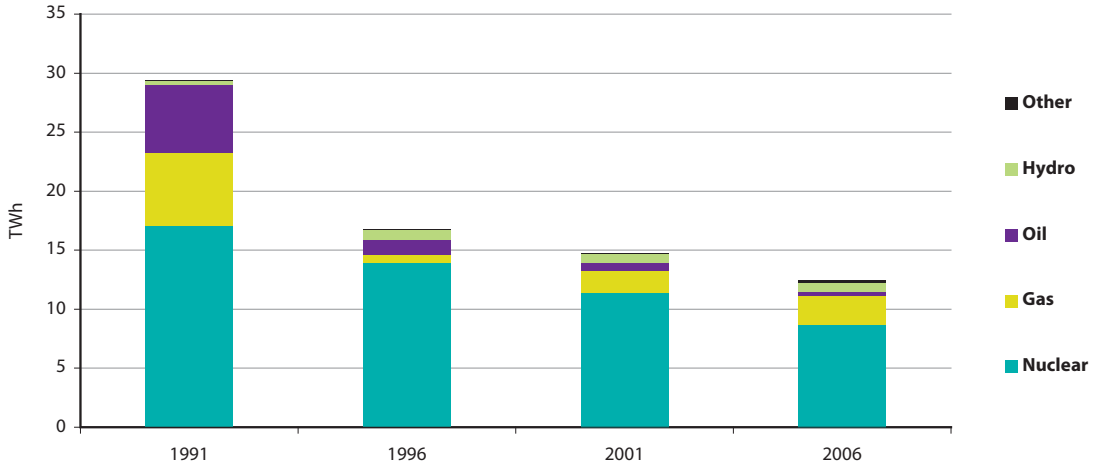
Energy efficiency

As with the other Baltic States, the energy intensity of the Lithuanian economy has decreased significantly since the early 1990s and is now less than half its value in 1991-92, but it remains several times the current EU average. The energy intensity is explained in part by its large chemicals industry and in part by other factors such as the housing stock and infrastructure it inherited from the Soviet Union era. The refurbishment and retrofitting of residential and commercial buildings will be a major component of the expected energy savings resulting from the current action plan for 2008-2016[1].

Electric power sector

The Lithuanian electricity grid is well-integrated with its Baltic neighbours. The energy mix for electricity generation is now based primarily on nuclear and gas, which accounted for a 89% share in 2006. The major change in the power sector has been the remarkable reduction in total generation and capacity; as of 2006, gross electricity generation was at 43% of its level in 1991. Until the closure of one of the units of the *Ignalina* nuclear plant in 2004, Lithuania was a major exporter. The second unit of *Ignalina* is scheduled for closure at the end of 2009.

Figure 3.15.3: Gross electric power generation by source



Source: Eurostat

Energy markets

The Lithuanian electricity market was fully liberalised as of July 2007, when residential customers were first given the option of changing suppliers. The market remains highly concentrated, however; the four largest power generators account for 75% of capacity and two retail suppliers account for 94% of the total[2]. In the gas market, there is even greater concentration, with one retail supplier covering 95% of the market[3]. Since Lithuania depends on Russian gas supply and the networks are not integrated beyond the Baltic region, Lithuania received an exemption from the Gas Directive (2003/55/EC) until 2010.

Table 3.15.4: Key energy figures, 2006 — in 1000 TOE

	ALL PRODUCTS	of which:								
		Hard coal & equivalents	Lignite & equivalents	Crude oil and feedstocks	Total petroleum products	Natural gas	Nuclear heat	Renewable sources	Derived heat	Electrical energy
Primary production	**3 244**	**-**	**15**	**184**	**-**	**-**	**2 232**	**813**	**-**	**-**
Net imports	5 481	253	6	8 607	-5 815	2 480	-	-12	-	-37
Stock change and bunkers	-39	1	-1	-291	291	-26	-	-14	-	-
Gross inland consumption	**8 430**	**254**	**20**	**8 512**	**-5 793**	**2 454**	**2 232**	**787**	**-**	**-37**
Transformation input	12 378	7	8	8 467	214	1 273	2 232	177	-	-
Transformation output	10 647	-	5	-	8 390	-	-	-	1 249	1 003
Consumpt. of the energy branch	886	-	0	-	536	28	-	0	134	187
Available for final consumption	**5 533**	**248**	**16**	**-**	**1 877**	**1 151**	**-**	**575**	**944**	**722**
Final non-energy consumption	806	-	-	-	208	598	-	-	-	-
Final energy consumption	**4 722**	**247**	**15**	**-**	**1 669**	**544**	**-**	**580**	**944**	**722**
Industry	1 055	134	0	-	83	312	-	92	182	252
Transport	1 503	-	-	-	1 479	-	-	19	-	5
of which: road transport	*1 367*	-	-	-	*1 348*	-	-	*19*	-	-
Services and others	734	74	2	-	52	92	-	37	214	263
Households	1 429	38	13	-	55	140	-	432	549	202

Source: Eurostat

References

(1) Lithuanian Ministry of Economy, 2 July 2007, "Order regarding approval of Energy Efficiency Action Plan."

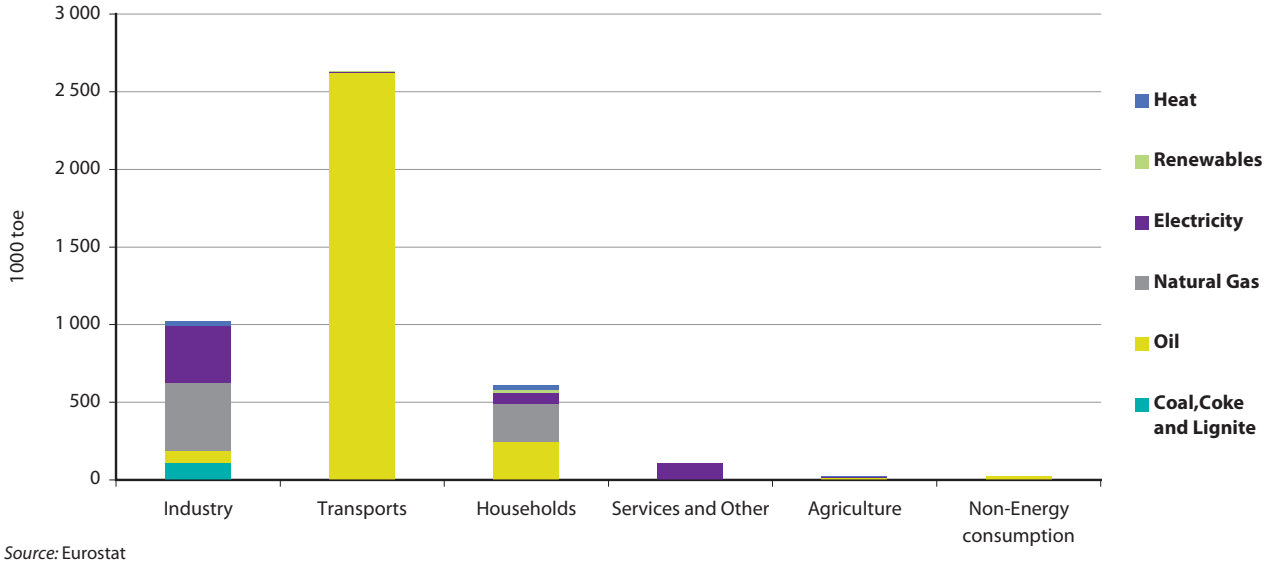
(2) Eurostat – Data in focus 6/2008, "European electricity market indicators 2006"

(3) Eurostat – Data in focus 7/2008, "European gas market indicators 2006"

3.16 Luxembourg

As a small country with strong regional commercial linkages, Luxembourg depends significantly on road transport for commerce and in the household sector. It also has traditionally had lower taxes on automotive fuels than neighbouring countries; the average price for automotive diesel fuel is among the lowest in the EU (see Chapter 4 of this publication). Further influenced by a large number of cross-border workers commuting by car, the consumption of oil is far above the EU average, accounting for 67% of final energy consumption. Luxembourg is therefore 99% dependent on imported fuels, with a small amount of biomass accounting for the remainder, and was also a net importer of electricity in 2006.

Figure 3.16.1: Final energy and non-energy consumption by sector and type of fuel, 2006



Source: Eurostat

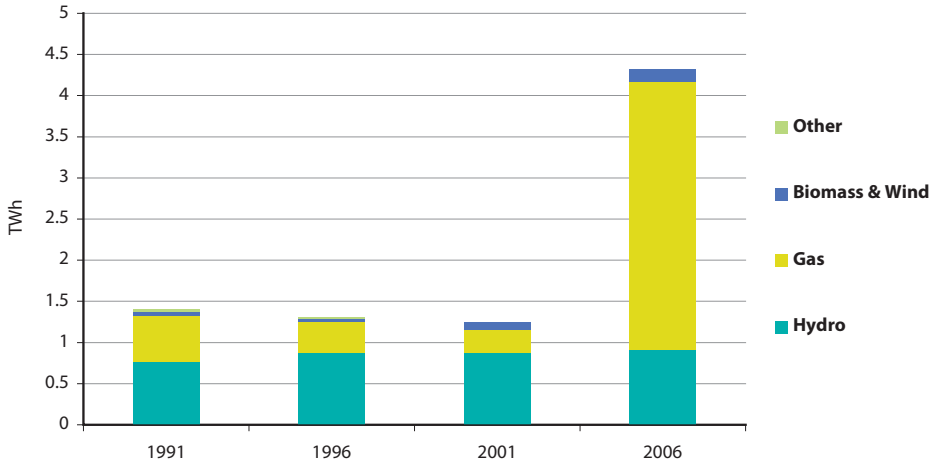
Renewable energy

Renewable energy is being promoted through investment subsidies and feed-in tariffs, some of which took effect in 2007 and 2008 and will apply to biogas, wind, solar thermal, biomass boilers, sewage treatment plants and geothermal heat pumps and heat exchangers. Producers obtain a "heat premium" so as to encourage expansion of combined heat and power. Biofuels for transport are being supported through legislation introduced in 2006, based on certain blending shares and reduced excise taxes. Pure vegetable oil is tax-free starting in 2007[(1)].

Electric power sector

Hydro and natural gas provided 96% of the power produced in 2006. The main development has been a significant increase in capacity from natural gas; electricity production from natural gas expanded by a factor of 12 between 2001 and 2006. Hydro has remained stable, while a small amount of biomass and wind have been added to the mix. Heat production from combined heat and power plants has increased by a factor of five since 1996, and households account for 50% of heat consumption. Electricity demand has been increasing steadily since 1991 with demand in 2006 reaching a level that is 55% higher than in 1991; the significant increase in capacity during 2001-2002 has reduced net electricity imports.

Figure 3.16.2: Gross electricity power generation by source



Source: Eurostat

Energy markets

Luxembourg has two electricity transmission networks that are not interconnected, but are integrated with the power networks of neighbouring Germany and Belgium. There are separate Transmission System Operators (TSOs) for each network, which are legally unbundled from their parent companies, and which also operate distribution systems. There is a significant amount of electricity trade, and Luxembourg has generally been a major net importer. There are two main generating companies and two main retail suppliers that cover the market[2]. There is no gas wholesale market, as it is supplied by foreign contracts[3]. The distributors all have less than 100.000 customers and are thus exempt from unbundling requirements. Four of these retail suppliers account for 94% of the market[4].

Energy efficiency

The energy intensity of the Luxembourg economy was below the EU-27 average and just slightly below the EU-15 average in 2006, at 174 kgoe/1 000 EUR . The energy intensity is significantly lower than it was in the early 1990s when the steel sector was in the last stages of restructuring and coal use was higher. The planned energy efficiency programs are expected to reduce consumption by 10.4% by 2016, which would exceed the 9% indicative target. The savings will come primarily from households (48% of total), service sector (17% of total) and cross-cutting measures (17%)[5].

Table 3.16.3: Key energy figures, 2006 — in 1000 TOE

	ALL PRODUCTS	of which:								
		Hard coal & equivalents	Lignite & equivalents	Crude oil and feedstocks	Total petroleum products	Natural gas	Nuclear heat	Renewable sources	Derived heat	Electrical energy
Primary production	**79**	**-**	**-**	**-**	**-**	**-**	**-**	**79**	**-**	**-**
Net imports	4 662	107	3	-	3 012	1 234	-	-	-	306
Stock change and bunkers	-29	-	-	-	-29	-	-	-	-	-
Gross inland consumption	**4 712**	**107**	**3**	**-**	**2 983**	**1 234**	**-**	**79**	**-**	**306**
Transformation input	597	-	-	-	-	550	-	47	-	-
Transformation output	353	-	-	-	-	-	-	-	64	289
Consumpt. of the energy branch	31	-	-	-	-	-	-	-	-	31
Available for final consumption	**4 427**	**107**	**3**	**-**	**2 983**	**684**	**-**	**17**	**64**	**568**
Final non-energy consumption	21	-	-	-	21	-	-	-	-	-
Final energy consumption	**4 398**	**107**	**3**	**-**	**2 961**	**684**	**-**	**17**	**64**	**561**
Industry	1 019	107	3	-	79	436	-	-	28	366
Transport	2 631	-	-	-	2 621	-	-	1	-	10
of which: road transport	*2 217*	-	-	-	*2 216*	-	-	*1*	-	-
Services and others	137	-	-	-	18	-	-	-	4	114
Households	610	-	0	-	243	247	-	16	32	71

Source: Eurostat

References

(1) RES2020, "Monitoring and Evaluation of the RES Directive implementation in EU-27 and policy recommendations for 2020," EIE/06/170/SI2.442662, February 2008.

(2) Eurostat – Data in focus 6/2008, "European electricity market indicators 2006"

(3) Luxembourg – Internal Market fact sheet, January 2007. http://europa.ec.eu/energy.

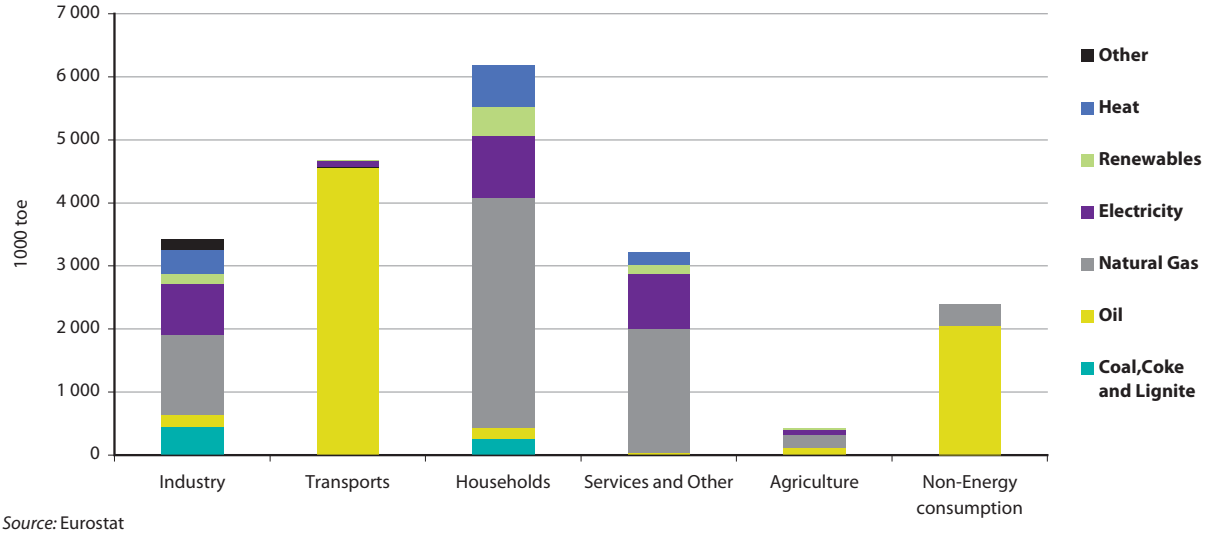
(4) Eurostat – Data in focus 7/2008, "European gas market indicators 2006"

(5) National Energy Efficiency Action Plan, 2007,Organisation: Le Gouvernement du Grand-Duché de Luxembourg, Ministère de l'Économie et du Commerce extérieur – Direction de l'Énergie.

3.17 Hungary

The Hungarian energy system has evolved somewhat differently compared to its neighbours in the region. Although it faced economic restructuring issues that were similar to other eastern European countries, it underwent a number of shifts earlier, namely the shift towards natural gas and the shift of energy demand away from the industry sector. Industry accounted for just 19% of final demand in 2006, compared to 30% in 1991. The transport sector has seen continuous increase, as the penetration of private automobiles has trended steadily upward; in 1991 transport accounted for 15% of final demand whereas now it accounts for 26%. Natural gas is widespread across all sectors, in particular in households and in services.

Figure 3.17.1: Final energy and non-energy consumption by sector and type of fuel, 2006

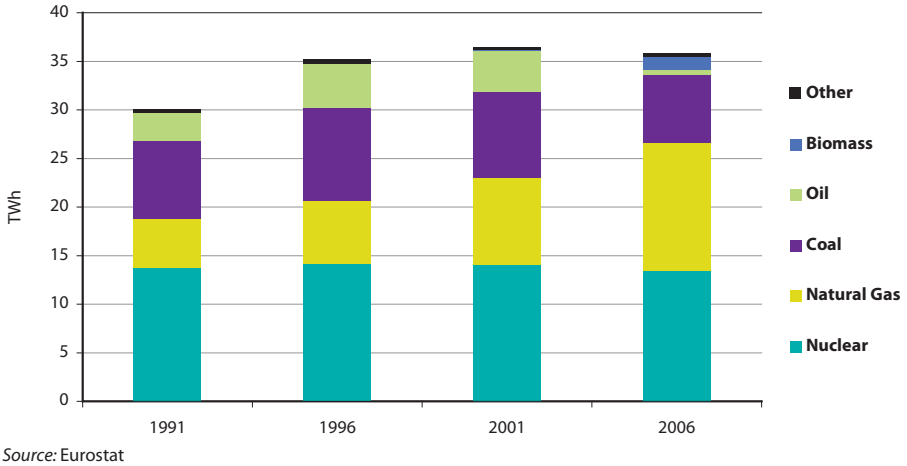


Source: Eurostat

Electric power sector

Power generation comes from two main sources, nuclear and natural gas, each of which supplied 37% of gross electricity generation in 2006. The main transitions in the power supply during the past fifteen years have been the substitution of natural gas for coal and oil, and the small but rapidly increasing contribution of renewables in the power sector, mainly biomass for heat and power. Oil has nearly been eliminated in power production, amounting to 1% in 2006 compared to as much as 9% in the early 1990s.

Figure 3.17.2: Gross electricity generation by source (TWh)



Source: Eurostat

Energy markets

The Hungarian electricity and gas markets include some publicly-owned components, and until recently a hybrid model of regulated and competitive segments was in operation. As of January 2008, the electricity market is fully competitive and the gas market will follow. Household prices have generally been subsidised, resulting in the case of gas to some of the lowest prices in the EU[1]. In the power sector, four suppliers accounted for 74% of generation and 92% of retail supply in 2006[2]. In the gas market, 3 wholesale suppliers accounted for 97% of the market while for retail supply, there were 7 suppliers covering 84% of the market as of the end of 2006[3].

Energy efficiency

The energy intensity of Hungary has decreased considerably since 1991. There have also been structural shifts away from energy-intensive industries. To some extent the energy savings as a result of these structural shifts have been offset by the increasing demand in the household and transport sectors. Consequently, the Energy Efficiency Action Plan puts special emphasis on these sectors: 40% of the expected savings by 2016 are in the household sector while 28% are in the transport sector[4]. Energy efficiency is seen as an important contributor to energy security, given the steadily rising demand for imported natural gas and oil.

Renewable energy

Hungary has already reached its 2010 target of 3.6% under the existing Res-E Directive (2001/71/EC). Its Renewables target for 2020 is proposed to become 13%, which is expected to be met from hydro, wind, biomass and geothermal, each of which has a feed-in tariff[5]. Investment subsidies are provided for renewable heating and cooling, and tax exemptions are given for biofuels. A new legal framework is under preparation during 2008, under which new instruments such as green certificates are under consideration[6].

Table 3.17.3: Key energy figures, 2006 — in 1000 TOE

	ALL PRODUCTS	of which:								
		Hard coal & equivalents	Lignite & equivalents	Crude oil and feedstocks	Total petroleum products	Natural gas	Nuclear heat	Renewable sources	Derived heat	Electrical energy
Primary production	**10 344**	**-**	**1 818**	**1 356**	**-**	**2 382**	**3 472**	**1 282**	**-**	**-**
Net imports	17 347	1 311	-95	6 335	-229	9 417	-	-10	-	620
Stock change and bunkers	-87	66	0	108	81	-342	-	-	-	-
Gross inland consumption	**27 771**	**1 377**	**1 722**	**7 890**	**-66**	**11 457**	**3 472**	**1 272**	**-**	**620**
Transformation input	19 718	1 464	1 707	8 736	171	3 560	3 472	462	-	-
Transformation output	14 276	693	11	-	8 679	-	-	-	1 467	3 064
Consumpt. of the energy branc	1 457	-	1	-	400	206	-	-	227	504
Available for final consumpti	**20 274**	**604**	**24**	**-**	**7 140**	**7 415**	**-**	**785**	**1 240**	**2 858**
Final non-energy consumption	2 385	-	-	-	2 046	339	-	-	-	-
Final energy consumption	**17 920**	**656**	**53**	**-**	**5 091**	**7 066**	**-**	**785**	**1 240**	**2 858**
Industry	3 430	441	1	-	201	1 260	-	167	380	808
Transport	4 680	-	-	-	4 563	3	-	11	-	103
of which: road transport	*4 303*	-	-	-	*4 290*	*3*	-	*11*	-	-
Services and others	3 629	2	6	-	146	2 159	-	157	197	963
Households	6 182	213	46	-	181	3 644	-	450	664	985

Source: Eurostat

References

(1) Hungary – Internal Market fact sheet, January 2007. http://europa.ec.eu/energy.

(2) Eurostat – Data in focus 6/2008, "European electricity market indicators 2006"

(3) Eurostat – Data in focus 7/2008, "European gas market indicators 2006"

(4) Ministry of Energy and Transport, Hungary's National Energy Efficiency Action Plan (approved by the Government on 13 February 2008).

(5) COM (2008) 19 final, 2008/0016 (COD) Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the promotion of the use of energy from renewable sources, Brussels, 23.1.2008.

(6) RES2020,"Monitoring and Evaluation of the RES Directive implementation in EU27 and policy recommendations for 2020," EIE/06/170/SI2.442662, February 2008.

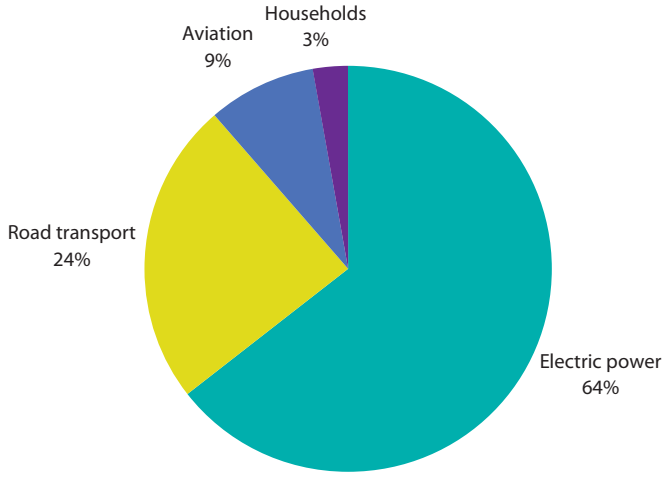
3.18 Malta

Malta has four islands, three of which are inhabited. The energy supply is currently based almost entirely on petroleum products. Energy demand is mainly for electricity production and the transport sector, which account together for 85% of oil consumption. Coal production for electricity was phased out already by 1996. Electricity demand has been increasing steadily and prices have risen in recent years due to high oil prices, thus creating greater incentives for renewable energy and energy efficiency, which have been addressed in recent legislation[1]. With its sunny Mediterranean climate, there are opportunities for wind power, solar thermal, and photovoltaic power.

Electricity sector

The three inhabited islands are interconnected by a single electricity grid; power is supplied by two fossil-fuelled plants with a total installed capacity of 571 MW. Electricity customers are supplied by the vertically integrated company, Enemalta Corporation. The two power stations on the islands of Malta and Gozo are interconnected by means of the distribution grid – there is no long-distance transmission system. Due to the small size of the grid and its lack of any further interconnections, Malta requested and received a derogation in meeting the conditions required by the Directive for the internal electricity market (2003/54/EC)[2].

Figure 3.18.1: Oil consumption by sector, 2006



Source: Eurostat

Renewable energy

The main options for renewable energy are wind, solar thermal and solar photovoltaic systems. The government has introduced support mechanisms in its efforts to increase renewables in accordance with the EU Directives. Grants are provided to reduce the investment cost for renewable technologies, including electric vehicles, solar photovoltaic system, wind turbines, and solar water heaters[3].

Energy efficiency

The energy intensity of Malta is above the EU-average and a number of initiatives have been included in legislation on energy efficiency. In 2007, framework legislation was enacted to carry out the eco-design Directive (2005/32/EC) by providing overall guidelines[4]. According to the Energy Efficiency Action Plan, the residential and industry sector will account for most of the savings in the planned initiatives and support schemes, together amounting to over 90% of the expected annual savings of 189-225 GWh in 2016.

Table 3.18.2: Key energy figures, 2006 — in 1000 TOE

	ALL PRODUCTS	of which:								
		Hard coal & equivalents	Lignite & equivalents	Crude oil and feedstocks	Total petroleum products	Natural gas	Nuclear heat	Renewable sources	Derived heat	Electrical energy
Primary production	-	-	-	-	-	-	-	-	-	-
Net imports	897	-	-	-	897	-	-	-	-	-
Stock change and bunkers	-	-	-	-	-	-	-	-	-	-
Gross inland consumption	**897**	**-**	**-**	**-**	**897**	**-**	**-**	**-**	**-**	**-**
Transformation input	579	-	-	-	579	-	-	-	-	-
Transformation output	197	-	-	-	-	-	-	-	-	197
Consumpt. of the energy branch	14	-	-	-	-	-	-	-	-	14
Available for final consumption	**478**	**-**	**-**	**-**	**318**	**-**	**-**	**-**	**-**	**159**
Final non-energy consumption	-	-	-	-	-	-	-	-	-	-
Final energy consumption	**478**	**-**	**-**	**-**	**318**	**-**	**-**	**-**	**-**	**159**
Industry	46	-	-	-	-	-	-	-	-	46
Transport	294	-	-	-	294	-	-	-	-	-
of which: road transport	*217*	-	-	-	*217*	-	-	-	-	-
Services and others	57	-	-	-	-	-	-	-	-	57
Households	81	-	-	-	24	-	-	-	-	57

Source: Eurostat

References

(1) Malta Resources Authority, Subsidiary Legislation 423.19 Promotion of Electricity Produced From Renewable Energy Sources Regulations 30th April, 2004 LEGAL NOTICE 186 of 2004, as amended by Legal Notice 426 of 2007.

(2) Decision 2006/859/EC of 28 November 2006.

(3) http://www.mra.org.mt/grants.shtml

(4) Government of Malta, Framework for the Setting of Ecodesign requirements for Energy-Using Products [S.L.427.64 1 Subsidiary Legislation 427.64 Framework for the Setting of Ecodesign Requirements For Energyusing Products Regulations, 11th August, 2007, LEGAL NOTICE 347 of 2007.

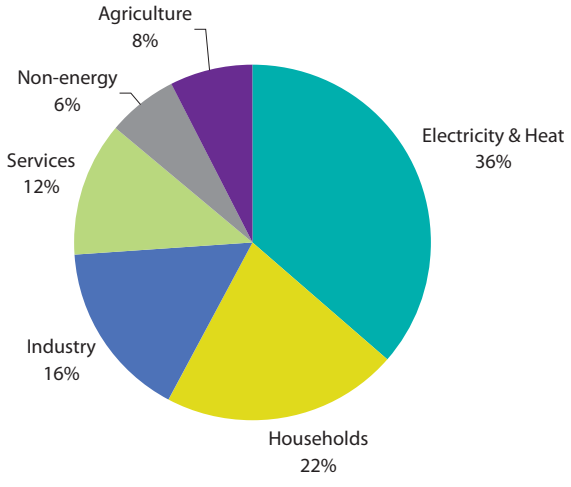
3.19 Netherlands

With a low-lying geography, a dense population, and major fossil reserves in the form of natural gas, energy systems in the Netherlands have evolved into a highly developed and widely accessible infrastructure. The gas grid is well-connected with international grids to facilitate international trade. The infrastructure is more fossil-based than in most European countries, and therefore the Netherlands faces some special challenges in the coming decades in converting towards a system based on renewable energy and energy efficiency.

Overall energy structure

The energy system of the Netherlands is dominated by several key features at present. One is that the widespread availability of gas has resulted in a high penetration in all sectors except transport. A related significant element is the relatively high consumption of energy in the agriculture sector, due to the use of greenhouse horticulture. Agriculture accounts for 8% of final energy consumption, which is considerably higher than the EU-average of 2%. Natural gas also has a share of 58% of the gross electricity generation. Another feature is that the prominence of the chemicals sector results in high industrial sector energy-intensity as well as significant use of fossil fuels in non-energy applications.

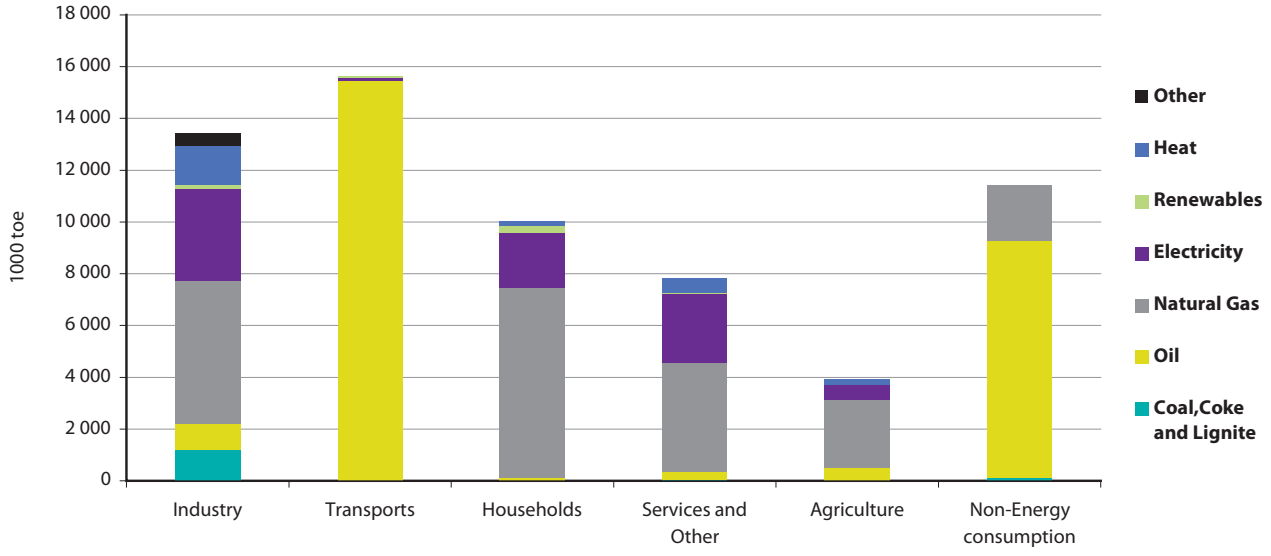
Figure 3.19.1: Natural gas consumption by sector, 2006



Source: Eurostat

Heat consumption goes primarily to the industrial sector, which accounted for 62% of final energy consumption of heat in 2006. The share of heat consumption in households and services was 29%, compared to the EU average of 63%.

Figure 3.19.2: Final energy and non-energy consumption by sector and type of fuel, 2006

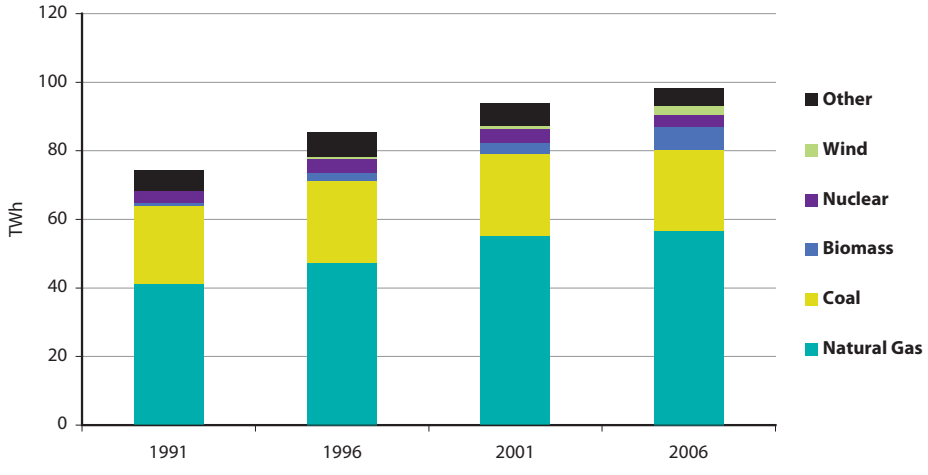


Source: Eurostat

Electric power sector

The energy mix for electricity generation has long been dominated by natural gas, due to the plentiful domestic supply. Coal consumption for power has remained roughly stable, and due to rising electricity supply and demand, amounts to a reduction in share from 30% to 24% between 1991 and 2006. Biomass and wind have increased considerably in recent years, now accounting for 7% and 3%, respectively; ten years ago, they accounted for just 3% and 1%, respectively. The Dutch government established premiums for renewable energy (gas and power), including wind, photovoltaic, biomass, and gas, heat and/or power from sewage and landfills[(1)].

Figure 3.19.3: Gross electricity generation by type



Source: Eurostat

Energy markets

The Dutch power and gas markets have been fully open to competition since July 2004. With a fairly high level of international trade, the Netherlands is a net importer; net imports amounted to 46% of the gross inland consumption in 2006. There are many small electricity generators and retail suppliers, although 5 companies accounted for 67% of the generation and 80% of retail supply in 2006[2]. Many new gas wholesalers entered the market in recent years, while there were 24 active retailers as of the end of 2006, 6 of which controlled 85% of the market[3].

Energy efficiency

The energy intensity of the Dutch economy, at 188 kgoe/1000 EUR is slightly below the EU-27 average (202 kgoe/1000 EUR) but slightly above the EU-15 average (180 kgoe/1000 EUR). The widespread use of energy-efficient equipment and appliances along with high penetration of efficient end-uses of natural gas helps to balance the energy-intensive chemicals and transport sectors. It should also be noted that the Netherlands has very high consumption of bunker fuels for international shipping; however, such consumption is not reflected since it is not included in gross inland consumption.

According to the national energy efficiency action plan, expected savings from planned measures and programmes are concentrated in the residential sector (41-44% of total) and in transport (32-33%)[4]. Savings in industry are expected to account for a very small share (1-2%) because many of the savings are expected to occur through the EU Emissions Trading Scheme (EU-ETS). A special program entitled "Greenhouse as an energy source" has been developed by the Ministry of Agriculture, Nature and Food Quality, and aims to make greenhouse horticulture energy neutral by 2020.

Table 3.19.4: Key energy figures, 2006 — in 1000 TOE

	ALL PRODUCTS	of which:								
		Hard coal & equivalents	Lignite & equivalents	Crude oil and feedstocks	Total petroleum products	Natural gas	Nuclear heat	Renewable sources	Derived heat	Electrical energy
Primary production	**60 763**	**-**	**-**	**2 084**	**-**	**55 395**	**895**	**2 389**	**-**	**-**
Net imports	37 227	8 091	19	60 334	-12 450	-21 131	-	520	-	1 845
Stock change and bunkers	17 263	-183	-2	486	16 966	-4	-	-	-	-
Gross inland consumption	**80 548**	**7 908**	**17**	**62 904**	**-30 230**	**34 300**	**895**	**2 909**	**-**	**1 845**
Transformation input	107 101	7 919	-	84 002	578	10 997	895	2 191	-	-
Transformation output	97 378	1 571	-	-	83 010	-	-	-	3 382	8 216
Consumpt. of the energy branch	6 950	-	-	-	4 339	1 444	-	-	187	802
Available for final consumption	**62 638**	**1 559**	**17**	**-**	**26 424**	**21 859**	**-**	**471**	**2 687**	**9 117**
Final non-energy consumption	11 534	236	-	-	9 160	2 138	-	-	-	-
Final energy consumption	**50 835**	**1 219**	**17**	**-**	**17 346**	**19 722**	**-**	**486**	**2 425**	**9 117**
Industry	13 434	1 201	7	-	987	5 534	-	133	1 497	3 573
Transport	15 620	-	-	-	15 434	1	-	46	-	138
of which: road transport	*11 482*	-	-	-	*11 435*	*1*	-	*46*	-	-
Services and others	11 768	13	10	-	837	6 816	-	58	764	3 270
Households	10 013	6	-	-	88	7 371	-	248	164	2 135

Source: Eurostat

References

(1) RES2020, "Monitoring and Evaluation of the RES Directive implementation in EU27 and policy recommendations for 2020," EIE/06/170/SI2.442662, February 2008.

(2) Eurostat – Data in focus 6/2008, "European electricity market indicators 2006"

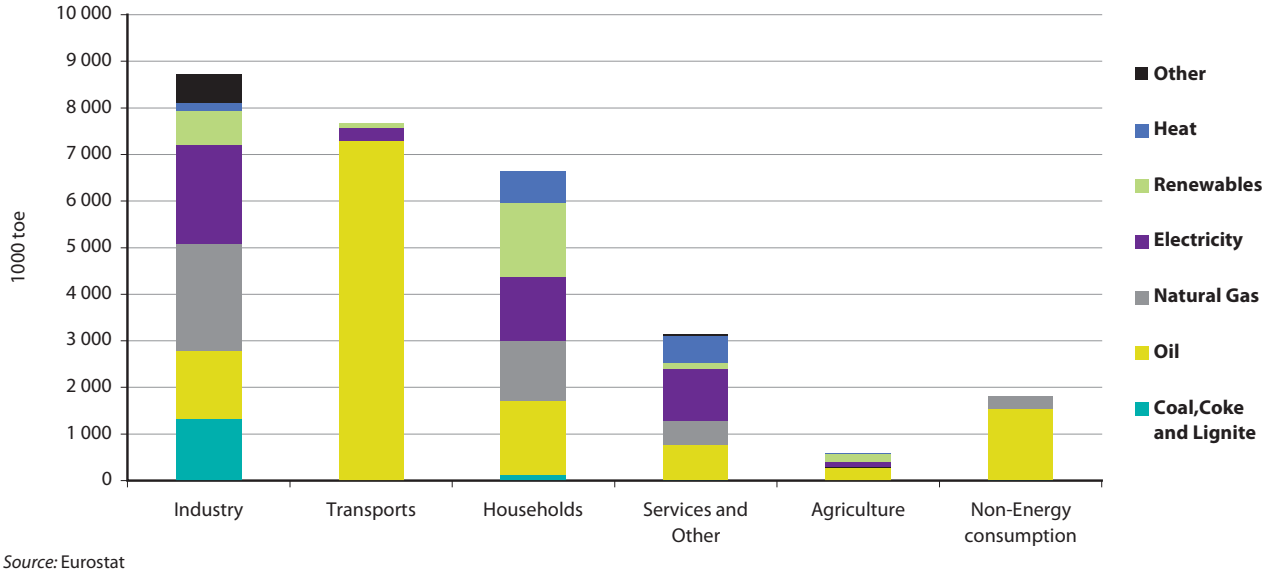
(3) Eurostat – Data in focus 7/2008, "European gas market indicators 2006"

(4) Netherlands National Energy Effocicny Action Plan, September 2007.

3.20 Austria

The electric power system in Austria is dominated by renewable energy while final energy consumption is dominated by imported oil and gas. Austria's significant hydropower potential has resulted in it having the highest share of renewable electricity production in the EU. The demand structure is characterised by rather low energy intensity; in 2006 Austria had the third lowest energy intensity in the EU. As a landlocked country with mountainous and rural areas, it depends significantly on road transport and therefore oil consumption is the highest of any fuel, amounting to 43% of final energy consumption in 2006. Some energy-intensive industries, such as iron/steel and paper/printing, remain important in the economy, and as a result industry is the largest consuming sector.

Figure 3.20.1: Final energy and non-energy consumption by sector and type of fuel, 2006

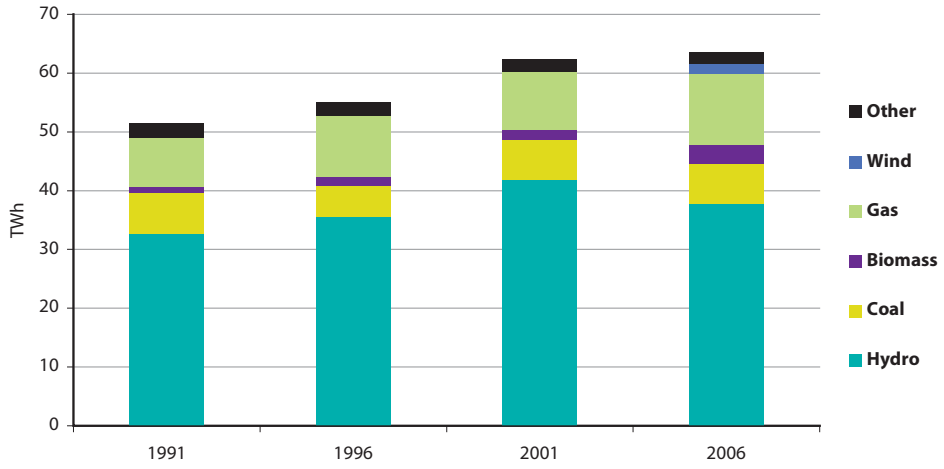


Source: Eurostat

Electric power sector

The power sector has long been dominated by hydro, which accounted for 60% of power production in 2006. Other sources have been increasing rapidly in recent years, however: electricity from biomass doubled during 2001-2006, while wind increased by a factor of 10. Coal consumption has been roughly stable, but there has been a switch from lignite to hard coal, taking advantage of the expanded international trade in hard coal in recent years. As with many EU Member States, natural gas consumption has increased significantly; in absolute terms it has increased by 43% since 1991. Nuclear power is not allowed in Austria, stemming from a law passed in 1978.

Figure 3.20.2: Gross electricity generation by source (TWh)



Source: Eurostat

Energy markets

The restructuring and liberalisation of the electricity and gas markets were completed already in 2001-2002. There is a high degree of public ownership in the power sector, and most distribution companies are part of integrated groups of suppliers. In recent years, there has been consolidation in the generation side of the power market through mergers and joint ventures; as of the end of 2006, there were 4 companies that each had more than 5% of the generation market, whereas in 2003 there were 7 companies[(1)]. In the case of gas, 4 suppliers cover 90% of the market[(2)] . The Austrian gas market is a major transit route within European systems; it is estimated that about 80% of the volume that flows through the gas grid is in transit to other countries[(3)].

Imports and energy security

The significant amount of direct fuel consumption of oil and gas in the industry sector and oil in the transport sector contributes to a high import dependency; imports amounted to 73% of gross inland consumption in 2006. It was also a net importer of electricity in 2006, accounting for 10% of total final electricity consumed. Austria does have a small amount of its own natural gas and crude oil, which amounted to 21% and 13% of total consumption, respectively, in 2006. Austria's strategic location in central Europe and integration into regional energy markets means that its own energy security, in light of increasing imports and cross-border trade, is increasingly connected to that of the entire Union.

Energy efficiency

In spite of having a number of energy-intensive industries, Austria has the third lowest energy intensity in the EU after Denmark and Ireland. Households are also major energy consumers in addition to industry and transport; the three sectors together account for 80% of final energy consumption, with agriculture, services and other uses making up the remainder. A detailed set of measures are included in the energy efficiency action plan, including cross-sector measures and also distinguishing between public and private buildings in the service sector. The plan is integrated with climate protection programs and takes account of savings to be achieved through the European Emissions Trading System (ETS); from 2015 onwards, financial assistance will only be provided for building construction that conforms to the active climate protection ("klima:aktiv") and passive-house standards[(4)].

Renewable energy

In addition to being the EU leader on renewable energy in the power sector, Austria is also the second largest market for solar thermal energy, in per capita terms, after Cyprus, and just ahead of Greece. The solar thermal market in Austria has seen the fastest rate of growth during the past five years among all EU Member States. A major legislative development in recent years was the amendment of the Green Electricity Act in 2006, which extended purchase obligations for small-scale renewables so as to extend the investment horizon, revamped the distribution of support schemes across fuels and technologies, and established a "green power settlement centre" to balance the contracts and supplies up the additional yearly feed-in tariff volumes[5]. Feed-in tariffs are set by ordinance for set periods of validity.

Table 3.20.3: Key energy figures, 2006 — in 1000 TOE

	ALL PRODUCTS	of which:								
		Hard coal & equivalents	Lignite & equivalents	Crude oil and feedstocks	Total petroleum products	Natural gas	Nuclear heat	Renewable sources	Derived heat	Electrical energy
Primary production	**9 587**	**-**	**0**	**1 004**	**-**	**1 564**	**-**	**7 019**	**-**	**-**
Net imports	24 864	3 691	40	8 357	5 382	6 541	-	264	-	589
Stock change and bunkers	-707	115	139	-143	-170	-647	-	-1	-	-
Gross inland consumption	**34 088**	**3 806**	**179**	**9 218**	**5 212**	**7 458**	**-**	**7 282**	**-**	**589**
Transformation input	17 247	3 333	149	9 209	357	2 388	-	1 429	-	-
Transformation output	14 738	1 001	-	-	9 177	-	-	-	1 585	2 074
Consumpt. of the energy branc	2 347	-	-	-	1 106	682	-	-	-	344
Available for final consumpti	**28 761**	**1 474**	**30**	**--**	**12 908**	**4 386**	**-**	**2 705**	**1 458**	**5 179**
Final non-energy consumption	1 807	12	-	-	1 522	272	-	-	-	-
Final energy consumption	**26 753**	**1 443**	**30**	**-**	**11 386**	**4 113**	**-**	**2 706**	**1 462**	**4 976**
Industry	8 746	1 332	2	-	1 470	2 283	-	713	185	2 142
Transport	7 659	-	-	-	7 298	-	-	98	-	263
of which: road transport	*6 637*	-	-	-	*6 539*	-	-	*98*	-	-
Services and others	3 717	11	8	-	1 031	536	-	308	593	1 213
Households	6 631	101	20	-	1 587	1 295	-	1 586	684	1 358

Source: Eurostat

References

(1) Eurostat – Data in focus 6/2008, "European electricity market indicators 2006"

(2) Eurostat – Data in focus 7/2008, "European gas market indicators 2006"

(3) Austria – Internal Market fact sheet, January 2007. http://europa.ec.eu/energy.

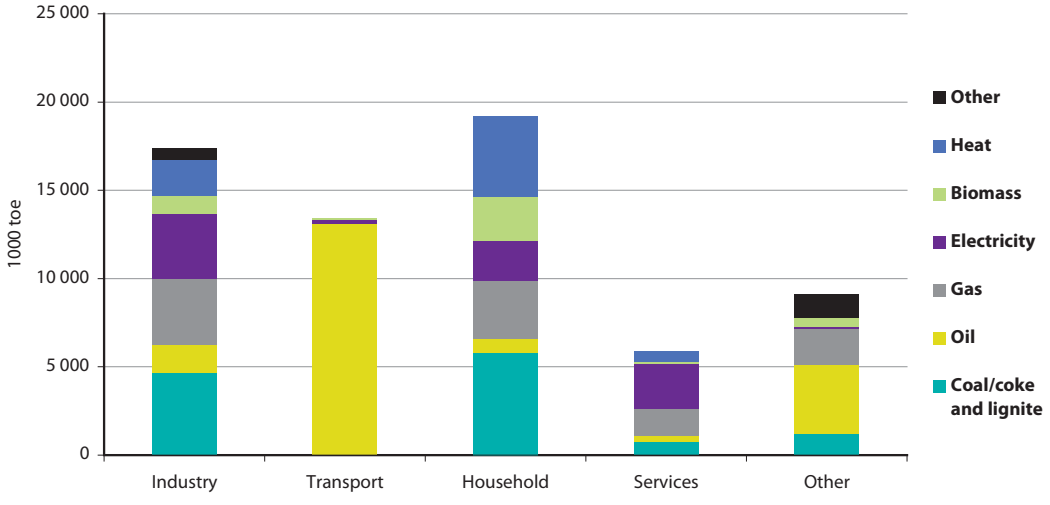
(4) Austrian Energy Agency, "Energy Efficiency Action Plan of the Republic of Austria," June 2007.

(5) RES2020, "Monitoring and Evaluation of the RES Directive implementation in EU27 and policy recommendations for 2020," EIE/06/170/SI2.442662, February 2008.

3.21 Poland

Poland has the largest reserves of coal in Europe and is a major exporter of hard coal. It is also relying on coal and lignite for 92% of its electricity production. Along with a small amount of natural gas and the use of oil for transport, the result is an overall fossil fuel dependence of 94%, which is the highest in the EU other than the island states of Malta and Cyprus. At the same time, its domestic coal and lignite resource makes it one of the most energy-independent Member States, with net imports accounting for just 20% of gross inland consumption. Final demand is dominated by households with 32%, followed by industry with 29% and transport with 22%. Energy intensity has been reduced by nearly half since 1991, but remains well above the EU average.

Figure 3.21.1: Final energy and non-energy consumption by sector and type of fuel, 2006

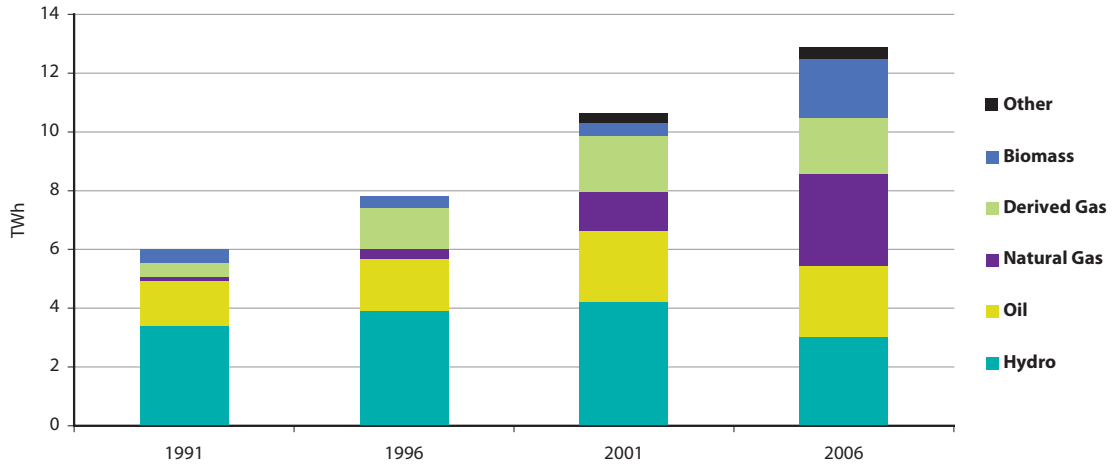


Source: Eurostat

Electric power sector

The power sector is based on coal, as Poland is the largest producer and largest exporter of hard coal in the EU, accounting for 59% of primary production in the EU in 2006. Lignite is used domestically and accounted for 36% of the electricity production, while hard coal accounted for 56% in 2006, making 92% in total. There has been an attempt to diversify somewhat in recent years; indeed, coal and lignite actually accounted for 96% in 1991. Hydro capacity is slightly greater now, at 2331 MW, than it was in 1991 (1919 MW). The increases in recent years have thus been largely made up of natural gas, derived gas, and a small amount of biomass and wind. Poland was a net electricity exporter in 2006, amounting to 7% of gross electricity production.

Figure 3.21.2: Gross electricity generation from sources other than coal and lignite



Source: Eurostat

Energy markets

The full market opening in Poland was achieved in July 2007. Cross-border exchanges are somewhat complicated by a lack of good interconnections and therefore enhancements to the network are ongoing and improved connections to Germany, the Czech Republic and Slovakia are expected to be completed during 2009[1]. The power generation side is less concentrated than in many Member States with 51 active companies, of which five accounted for 45% of power supplied in 2006. The retail side is somewhat more concentrated, with 6 companies accounting for 72% of the market[2]. The gas market is dominated by a single vertically integrated company, and only a small share of the wholesale market is purchased by retailers other than the distribution companies; at the end of 2006, 7 retailers accounted for 94% of final supply[3].

Energy efficiency

As with most eastern European countries, the energy intensity of the Polish economy, at 573 kgoe/1 000 EUR, remains well above the EU average of 203 kgoe/1 000 EUR. The National energy efficiency action plan does not provide quantitative estimates of expected savings by measure or sector, and the use of a major horizontal market-based instrument—so-called white certificates—is one of the reasons that complicate such estimates[4]. The certificates obligate electricity and gas companies to invest in efficiency, just as green certificates obligate them to invest in renewable energy. Another important element is continued support for the "thermo-modernisation" fund that has supported retrofits in buildings since 1999, which is expected to produce savings on average of 1 000 ktoe per year. The national Energy Efficiency Act of 2008 is intended to insure the reporting and verification of information to substantiate the savings achieved.

Renewable energy

At present, the largest share of renewable energy is actually the use of biomass in the household sector, which accounted for 59% of the 7% share of renewables in the final energy consumption of 2006. Renewables are being introduced in the power sector (see also Fig. 3.21.2). Changes in the Energy Law Act introduced in January 2007 were made in order to strengthen obligations for green energy purchasing, while legislation passed in 2006 provided for minimum levels of biofuels for transport[5]. The renewable energy target in the proposed EU Directive proposed to become 15% of final consumption[6]. Landfill gas, wind, and biomass offer interesting potential, but also onshore wind resources that could be installed by 2020 are estimated at 3 000 MW (the presently installed capacity was 172 MW in 2006[7]).

Table 3.21.3: Key energy figures, 2006 — in 1000 TOE

	ALL PRODUCTS	of which:								
		Hard coal & equivalents	Lignite & equivalents	Crude oil and feedstocks	Total petroleum products	Natural gas	Nuclear heat	Renewable sources	Derived heat	Electrical energy
Primary production	**76 848**	**54 512**	**12 594**	**808**	**-**	**3 880**	**-**	**5 055**	**-**	**-**
Net imports	19 645	-12 295	3	20 720	3 329	8 899	-	-66	-	-945
Stock change and bunkers	651	1 768	-10	-281	-418	-406	-	-2	-	-
Gross inland consumption	**98 269**	**44 455**	**12 586**	**21 863**	**2 369**	**12 373**	**-**	**4 987**	**-**	**-945**
Transformation input	76 391	38 410	12 578	22 595	221	1 273	-	554	-	-
Transformation output	52 359	6 839	-	-	21 338	-	-	-	8 150	13 626
Consumpt. of the energy branch	7 859	338	5	-	1 380	1 227	-	1	1 186	2 819
Available for final consumption	**64 969**	**12 546**	**4**	**5**	**21 329**	**9 761**	**-**	**4 234**	**6 964**	**8 854**
Final non-energy consumption	5 018	56	-	-	3 031	1 931	-	-	-	-
Final energy consumption	**60 163**	**12 307**	**115**	**-**	**18 416**	**7 791**	**-**	**4 230**	**7 179**	**8 854**
Industry	17 349	4 772	3	-	1 650	2 940	-	1 039	1 996	3 682
Transport	13 426	-	-	-	13 073	-	-	84	-	269
of which: road transport	*12 577*	-	-	-	*12 493*	-	-	*84*	-	-
Services and others	10 210	1 806	60	-	2 894	1 539	-	601	645	2 665
Households	19 178	5 729	52	-	800	3 312	-	2 506	4 538	2 237

Source: Eurostat

References

(1) Poland – Internal Market fact sheet, January 2007. http://europa.ec.eu/energy.

(2) Eurostat – Data in focus 6/2008, "European electricity market indicators 2006"

(3) Eurostat – Data in focus 7/2008, "European gas market indicators 2006"

(4) Ministry of the Economy, National Energy Efficiency Action Plan (NEEAP), Warsaw, June 2007

(5) Poland –Renewable energy fact sheet, January 2007. http://europa.ec.eu/energy.

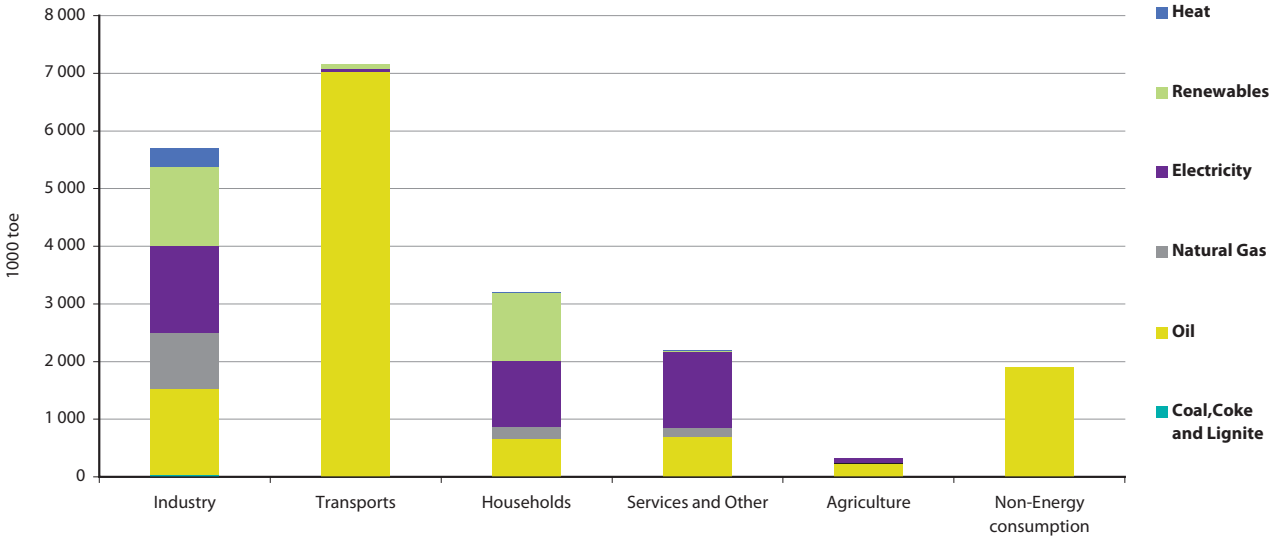
(6) COM(2008) 19 final, 2008/0016 (COD) Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources, Brussels, 23.1.2008.

(7) RES2020, "Monitoring and Evaluation of the RES Directive implementation in EU27 and policy recommendations for 2020," EIE/06/170/SI2.442662, February 2008.

3.22 Portugal

Portugal has no mineral resources and depended on imported fossil fuels—coal, natural gas, liquefied natural gas and oil—for 83% of its energy needs in 2006. Two-thirds of its electric power needs are met by fossil fuels, while the remaining one-third is met from renewables, including hydro, wind and biomass. Energy demand has been increasing slightly faster than the rate of economic growth; consequently, the energy intensity of the economy is 4% higher than it was in 1991, and is 10% above the EU-average. Final energy consumption is dominated by transport (39%) and industry (31%), which is almost the opposite of the situation in 1991, when industry accounted for 39% and transport 33%. The service sector has grown considerably in recent years, now accounting for 32% of electricity consumption compared to 21% in 1991. Portugal was a net electricity importer in 2006, accounting for 10% of its needs; this amount fluctuates somewhat annually based on hydro availability.

Figure 3.22.1: Final energy and non-energy consumption by sector and type of fuel, 2006

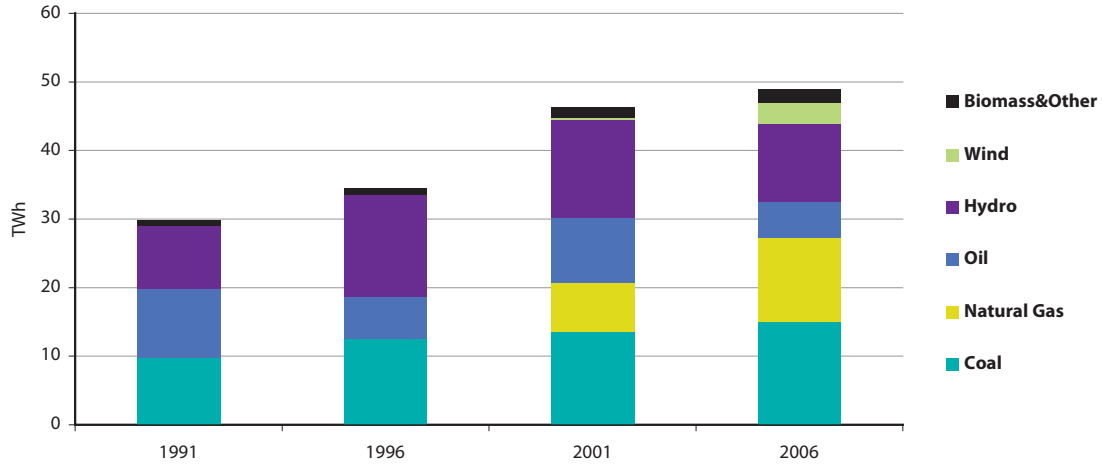


Source: Eurostat

Electric power sector

The increasing importance of the service sector and closer economic integration with the EU has contributed to significantly increasing electricity demand in the past 15-20 years, with installed capacity nearly doubling between 1991 and 2006. Much of the capacity has been natural gas and wind; the rapid introduction of gas has been the most dramatic, increasing from nil in 1996 to 12.3 TWh in 2006, which amounted to 25% of the total. Power production from coal has increased by 53% compared to 1991, but nevertheless accounts for a slightly smaller share of the total now than in 1991. Wind has entered the market rapidly; in the last five years alone the installed capacity increased by a factor of over 13; wind now accounts for 6% of total gross electricity generation. Hydro capacity increased by 52% compared to 1991 but its share of power generation is lower due to the large overall increase.

Figure 3.22.2: Gross electricity generation by source



Source: Eurostat

Energy markets

The energy market liberalisation began in 1995 and was completed in 2006. The gas market was exempted until 2007, with the market opening scheduled for completion in 2010 as customer classes are added successively. Demand for gas is dominated by the power sector, which accounted for 58% of consumption in 2006; consequently power generators were the first to be able to choose supplier, starting in 2007. There are many small electricity generators, but 3 large generators accounted for 74% of electric power supplied in 2006. The retail side is even more concentrated, with one supplier accounting for 80% of the market[1]. The wholesale gas market remains a monopoly as the market opening proceeds, while 4 retail providers accounted for 94% of the distribution of gas in 2006[2].

Energy security

Integration within the Iberian power market is continuing and will be contribute to greater reliability and security[3]. The transport and distribution infrastructure for oil and gas has improved in recent years, including work on the natural gas pipelines, the two oil terminals, and a liquefied gas natural gas terminal that started operation in 2003. The high energy import dependence and reliance on fossil fuels means that increased renewable energy and more emphasis on energy efficiency will contribute to improve energy security as well as to environmental and emissions goals.

Renewable energy

Portugal has placed tremendous emphasis on its renewable energy programmes and legislation. National legislation aims for an even higher target of renewable electricity by 2010 – 45% – than does the indicative EU target under the existing Res-E Directive (2001/71/EC) for Portugal (39%).The proposed target for 2020 is 31% renewables in final consumption[4]. In addition the aforementioned rapid pace of development for wind, another landmark is the world's first wave power plant — a 4 MW that is now operating. It is noteworthy that Portugal has ambitious targets for emerging technologies like wave energy and concentrated solar power. The target for wind power amounts to a tripling of current capacity, which would then reach 5100 MW by 2012[5].

Financial support to SMEs for renewable technologies can be provided up to 35% of investment cost, while SMEs can receive up to 100% reduction in interest on loans, with specified maximum limits (as percent of total costs) and duration generally of five years[5]. A key support mechanism is a feed-in tariff that takes into account the technology, the environmental aspects and the inflation rate through the index of prices to the consumer. There are also some minimum and maximum tariffs, according to the variations of load on the grid. For the Renewable heating and cooling sector (RES-H&C) a new Portuguese building code has recently introduced the obligation to install solar thermal systems in certain cases.

Table 3.22.3: Key energy figures, 2006 — in 1000 TOE

	ALL PRODUCTS	of which:								
		Hard coal & equivalents	Lignite & equivalents	Crude oil and feedstocks	Total petroleum products	Natural gas	Nuclear heat	Renewable sources	Derived heat	Electrical energy
Primary production	**4 320**	**-**	**-**	**-**	**-**	**-**	**-**	**4 320**	**-**	**-**
Net imports	21 569	3 493	-	13 771	176	3 662	-	-	-	468
Stock change and bunkers	696	-185	-	-85	989	-22	-	-	-	-
Gross inland consumption	**25 338**	**3 308**	**-**	**13 686**	**-93**	**3 640**	**-**	**4 320**	**-**	**468**
Transformation input	20 905	3 276	-	13 895	1 107	2 121	-	497	-	-
Transformation output	17 163	-	-	-	13 854	-	-	-	331	2 979
Consumpt. of the energy branch	754	-	-	-	445	89	-	-	-	221
Available for final consumption	**20 437**	**32**	**-**	**43**	**11 962**	**1 337**	**-**	**2 625**	**331**	**4 107**
Final non-energy consumption	1 894	-	-	-	1 894	-	-	-	-	-
Final energy consumption	**18 544**	**27**	**-**	**-**	**10 118**	**1 336**	**-**	**2 625**	**331**	**4 107**
Industry	5 694	27	-	-	1 509	964	-	1 361	317	1 517
Transport	7 142	-	-	-	7 018	10	-	70	-	44
of which: road transport	*6 149*	-	-	-	*6 069*	*10*	-	*70*	-	-
Services and others	2 507	-	-	-	927	159	-	20	8	1 394
Households	3 201	-	-	-	664	203	-	1 175	6	1 153

Source: Eurostat

References

(1) Eurostat – Data in focus 6/2008, "European electricity market indicators 2006"

(2) Eurostat – Data in focus 7/2008, "European gas market indicators 2006"

(3) Portugal – Internal Market fact sheet, January 2007. http://europa.ec.eu/energy.

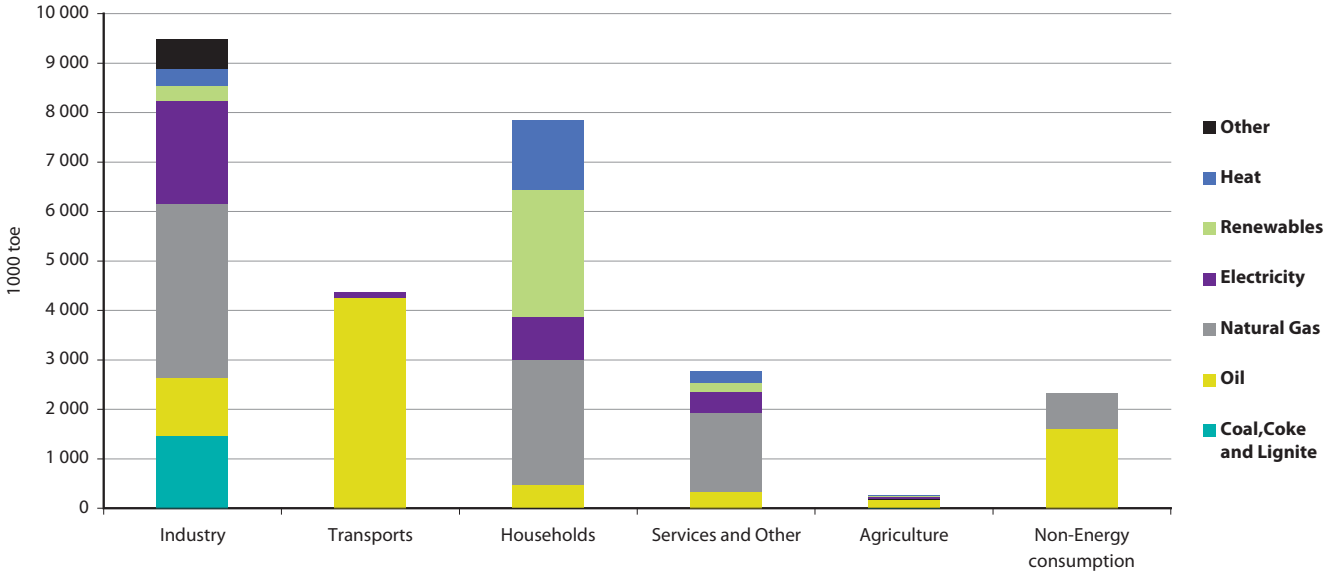
(4) COM (2008) 19 final, 2008/0016 (COD) Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the promotion of the use of energy from renewable sources, Brussels, 23.1.2008.

(5) Portuguese Government: Uma revolução no sector da energia em Portugal, 16.09.2008 - See: http://www.portugual.gov.pt/portal/pt/governos_constitucionais/gc17/ministerios/mei/comunicacao/intervencoes/20080916_mei_int_energia.htm

3.23 Romania

Romania has significant reserves of natural gas and also has domestic reserves of lignite and crude oil. Other domestic energy sources include nuclear and hydro, both of which have increased significantly since the 1990s. Industry accounts for 38% of final energy consumption, with two industry sectors—iron/steel and chemicals—accounting for 60% of industrial consumption. Furthermore, industry accounts for 59% of electricity demand. The low shares of electricity in other sectors are due mainly to the high use of natural gas and heat in the household and service sectors, along with the high level of direct uses of biomass in households—which accounts for one-third of total household energy consumption.

Figure 3.23.1: Final energy and non-energy consumption by sector and type of fuel, 2006

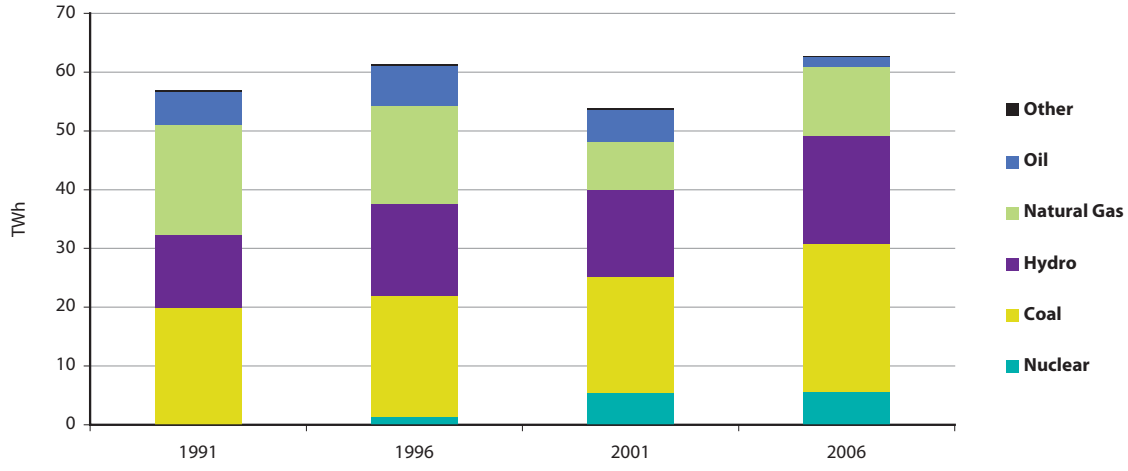


Source: Eurostat

Electric power sector

Romania has a fairly diversified electric power mix, with natural gas, hydro and coal complemented by nuclear starting in 1996, when its nuclear plant came on line. Oil has almost been phased out, while very small amounts of wind and biomass have only recently been added. Hydropower accounts for one-third of installed capacity, nuclear accounts for 4% and the remaining 63% is thermal. Overall demand was 10% higher in 2006 than it was in 1996. At the same time, demand has been generally flat after the structural changes that started in the 1990s, and Romania was a net exporter of 10% of its electricity in 2006.

Figure 3.23.2: Gross electricity generation by source



Source: Eurostat

Energy markets

The power and gas markets were opened for all customers by July 2007. The power market is less concentrated than in most EU countries, with 7 actors accounting for 86% of generation and 9 retail suppliers accounting for 73% of supply[1]. A significant amount of customer switching or contract renegotiation has occurred as a result of competitive conditions. The gas market is more concentrated, with 4 wholesale suppliers accounting for 90% of the market and 6 retail suppliers covering 96% of the market[2]. There are some 40 other small gas suppliers to connected communities.

Energy efficiency

he energy intensity of the Romanian economy is substantially lower than it was in the beginning of the 1990s, but is nevertheless the second highest in the EU after Bulgaria. The significant level of consumption in the energy-intensive sectors of iron/steel and chemicals is a major factor in the overall intensity. Households account for 41% of estimated cost-effective savings, according to the National Energy Efficiency Action Plan. Romania has long had a strong institutional commitment to energy efficiency, dating back to the creation of the Romanian Agency for Energy Conservation (ARCE) in 1990[3].

Energy security

With its domestic resources of natural gas, oil and lignite, the energy import dependence of Romania is well below the EU average; net imports amounted to 29% of gross consumption in 2006 compared to the EU-average of 54%[4]. Increasing demand for natural gas in recent years has resulted in increasing imports, which together with oil accounted for 84% of all imports in 2006. The share of imports in natural gas consumption was 33% in 2006, but is expected to increase to 60% by 2010[5]. Increasing renewable energy could help to offset the decline in domestic natural gas availability so as to lower energy import dependence. In 2007 a second nuclear reactor came online, increasing thereby the generation of electricity from nuclear power to 20%; plans also exist for two more nuclear reactors.

Renewable energy

Romania has a significant share of renewables, amounting to 12% of gross inland consumption and 29% of electricity production. Another significant area of renewable energy consumption is biomass in the household sector; the household sector accounts for 85% of biomass use. The proposed target for 2020 is 24% in final consumption[6]. Although the target is ambitious in that it would double the current share of renewables, there is significant potential in Romania for wind and biomass as well as for further hydro expansion, particularly smaller-scale hydro[7]. A quota system for renewable electricity was introduced in 2004 and biofuels legislation was passed in December 2005.

Table 3.23.3: Key energy figures, 2006 — in 1000 TOE

	ALL PRODUCTS	of which:								
		Hard coal & equivalents	Lignite & equivalents	Crude oil and feedstocks	Total petroleum products	Natural gas	Nuclear heat	Renewable sources	Derived heat	Electrical energy
Primary production	**27 413**	**11**	**6 469**	**5 091**	**-**	**9 558**	**1 453**	**4 831**	**-**	**-**
Net imports	11 888	2 552	141	8 842	-4 070	4 791	-	-	-	-367
Stock change and bunkers	817	61	254	82	212	258	-	-50	-	-
Gross inland consumption	**40 897**	**2 624**	**6 864**	**14 713**	**-3 859**	**14 608**	**1 453**	**4 781**	**-**	**-367**
Transformation input	30 536	2 465	6 833	14 676	775	4 197	1 453	90	-	-
Transformation output	23 382	1 127	-	-	14 676	-	-	-	2 948	3 813
Consumpt. of the energy branch	3 986	2	80	12	1 497	860	-	3	380	940
Available for final consumption	**27 545**	**1 276**	**-50**	**199**	**8 251**	**8 669**	**-**	**3 109**	**1 970**	**3 524**
Final non-energy consumption	2 327	-	-	-	1 602	726	-	-	-	-
Final energy consumption	**24 706**	**1 348**	**135**	**-**	**6 362**	**7 689**	**-**	**3 056**	**1 993**	**3 518**
Industry	9 481	1 348	116	-	1 176	3 516	-	293	343	2 087
Transport	4 359	-	-	-	4 248	-	-	-	-	112
of which: road transport	*3 996*	-	-	-	*3 996*	-	-	-	-	-
Services and others	3 026	-	9	-	487	1 626	-	185	258	459
Households	7 839	-	10	-	452	2 548	-	2 577	1 393	860

Source: Eurostat

References

(1) Eurostat – Data in focus 6/2008, "European electricity market indicators 2006"

(2) Eurostat – Data in focus 7/2008, "European gas market indicators 2006"

(3) Government of Romania, "First National Action Plan for Energy Efficiency".

(4) Eurostat News Release 98/2008, "Energy consumption and production: EU27 energy dependence rate at 54% in 2006," 10 July 2008.

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(6) COM (2008) 19 final, 2008/0016 (COD) Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources, Brussels, 23.1.2008.

(7) RES2020,"Monitoring and Evaluation of the RES Directive implementation in EU27 and policy recommendations for 2020," EIE/06/170/SI2.442662, February 2008.

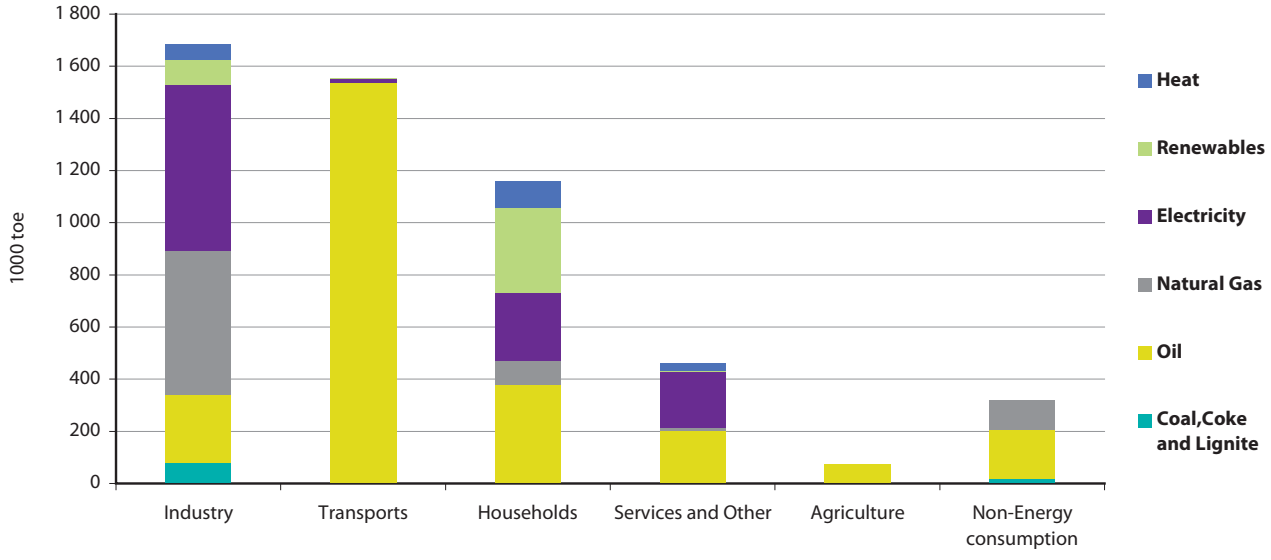
3.24 Slovenia

The energy system of Slovenia is based in part on its geographical location at the crossroads of gas and power markets in Southern and Eastern Europe; the confluence of energy markets contributes to a high level of regional electricity trade and increasing imports of gas. Its domestically available energy resources include nuclear power, lignite and a significant potential supply of biomass, since more than half of the country is covered by forests. In addition to biomass, support is provided to a variety of renewables, including small hydro, geothermal, solar thermal, wind, and solar photovoltaic.

Overall energy structure

The structure of energy demand is dominated by industry and transport, which together account for 66% of final energy consumption. There is a relatively high consumption of renewables (exclusively biomass) in households; 77% of biomass consumed was used in households and 22% in industry—mainly in wood products and paper industries. The use of biomass in thermal power stations and district heating plants was just 8% in 2006. Consumption in the service sector remains low but it includes a relatively large share of oil consumption. Household energy consumption also includes a significant amount of oil.

Figure 3.24.1: Final energy and non-energy consumption by sector and type of fuel, 2006

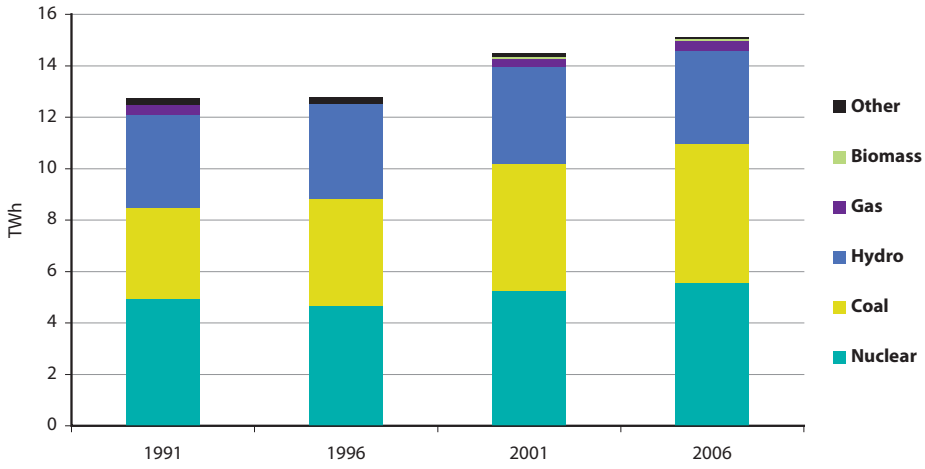


Source: Eurostat

Electric power sector

The energy mix for electricity generation has long been based on nuclear, lignite and hydro. There is also a small amount of biomass, gas, and imported hard coal in the energy mix. The amount of nuclear and hydro has been fairly stable since 1991, while coal and lignite have increased by 54%, increasing in share from 28% to 36%. The renewables share in 2006 amounted to 24.5%, making it challenging to meet the target for 2010 of 33.6% (Directive 2001/71/EC). Soft loans are available for investment costs and feed-in tariffs for renewables are established and applied to contracts with network operators that cover purchases from qualifying suppliers for a ten-year period[(1)].

Figure 3.24.2: Gross electric power generation by source



Source: Eurostat

Energy markets

Slovenia is situated geographically between several different energy markets — the central/eastern Europe markets, the Italian market, and the markets of southeast Europe. The generation and wholesale market is concentrated, with two companies covering 90% of the market, while the retail side is somewhat more competitive, with a total of 13 retail suppliers, 6 of which cover 96% of the market in 2006[(1)]. The gas market is highly concentrated with only one primary supplier covering the market and 3 retail suppliers covering 86% of the market in 2006[(2)]. The electric power distributors were legally unbundled in July 2007, while the gas distributors are exempt from unbundling as they all have less than 100 000 customers.

Energy efficiency

The energy intensity of the Slovenian economy is 50% above the EU-27 average, but it has been decreasing steadily during the past ten years. The indicative target for energy efficiency is a 9% reduction during 2008-2016. The largest sector for expected savings is residential, accounting for 27%, while industry, services, transport, and multi-sector measures each account for similar shares of the remainder[(4)]. The measures cover all the different aspects associated with energy efficiency and conservation—product standards, buildings performance, energy management systems, information measures, and a variety of cross-cutting measures.

Table 3.24.3: Key energy figures, 2006 — in 1000 TOE

	ALL PRODUCTS	of which:								
		Hard coal & equivalents	Lignite & equivalents	Crude oil and feedstocks	Total petroleum products	Natural gas	Nuclear heat	Renewable sources	Derived heat	Electrical energy
Primary production	**3 415**	**-**	**1 210**	**-**	**-**	**3**	**1 431**	**771**	**-**	**-**
Net imports	3 838	314	-	-	2 628	896	-	-4	-	4
Stock change and bunkers	129	4	38	-	88	-	-	-	-	-
Gross inland consumption	**7 342**	**318**	**1 248**	**-**	**2 658**	**899**	**1 431**	**768**	**-**	**4**
Transformation input	3 056	205	1 239	1	18	126	1 431	36	-	-
Transformation output	1 222	-	-	-	1	-	-	-	230	991
Consumpt. of the energy branch	107	0	-	-	-	3	-	-	7	97
Available for final consumption	**5 291**	**112**	**9**	**-1**	**2 641**	**770**	**-**	**423**	**189**	**1 132**
Final non-energy consumption	319	20	-	-	185	113	-	-	-	-
Final energy consumption	**4 945**	**79**	**-**	**-**	**2 449**	**657**	**-**	**423**	**189**	**1 132**
Industry	1 699	79	-	-	261	550	-	95	58	640
Transport	1 554	-	-	-	1 536	-	-	2	-	17
of which: road transport	*1 499*	-	-	-	*1 498*	-	-	*2*	-	-
Services and others	534	-	-	-	275	14	-	2	30	213
Households	1 158	-	-	-	377	93	-	324	101	263

Source: Eurostat

References

(1) RES2020, "Monitoring and Evaluation of the RES Directive implementation in EU27 and policy recommendations for 2020," EIE/06/170/SI2.442662, February 2008.

(2) Eurostat – Data in focus 6/2008, "European electricity market indicators 2006"

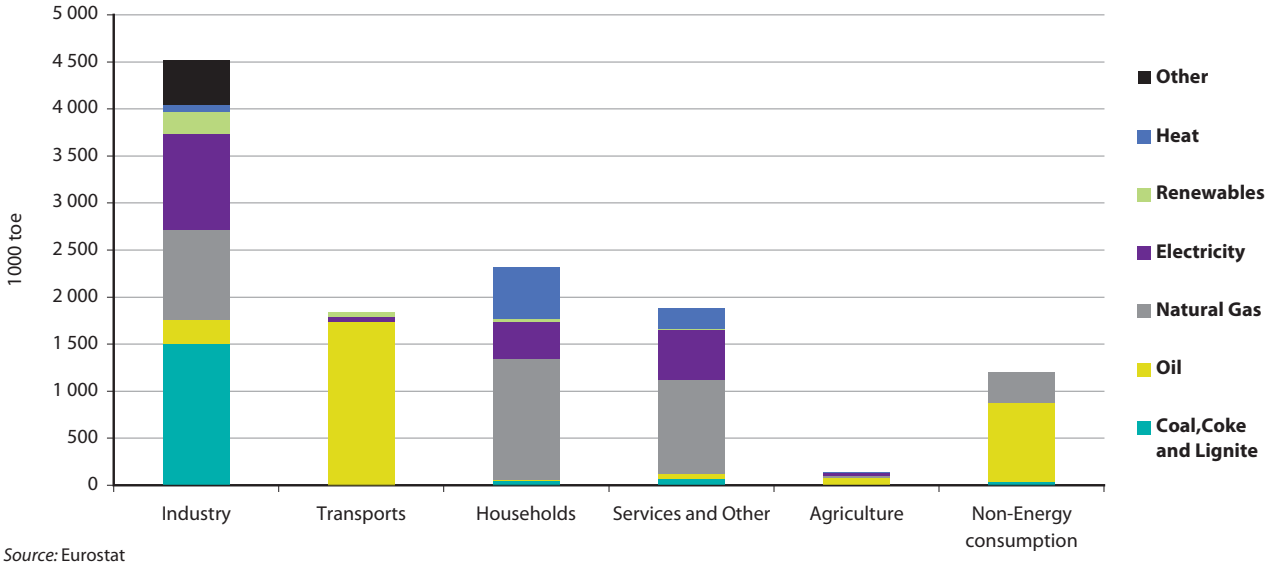
(3) Eurostat – Data in focus 7/2008, "European gas market indicators 2006"

(4) Government of the Republic of Slovenia, National Energy Efficiency Action Plan, 2008–2016, Ref: 36000-1/2008/13, Ljubljana, 31.01.2008.

3.25 Slovakia

The energy system in Slovakia is characterised by an extensive natural gas distribution system, a high dependence on fossil fuels, a significant share of nuclear in the electricity mix and its importance as a transit route for both gas and electricity. Energy demand is dominated by industry, which accounts for 42% of final energy and 50% of electricity consumption. The iron and steel sector alone accounts for 46% of the energy consumption in the industry. Among all fuels, natural gas accounts for the highest share (29%) and is used widely in households, the services sector, the industry and for non-energy use in the chemical industry.

Figure 3.25.1: Final energy and non-energy consumption by sector and type of fuel, 2006

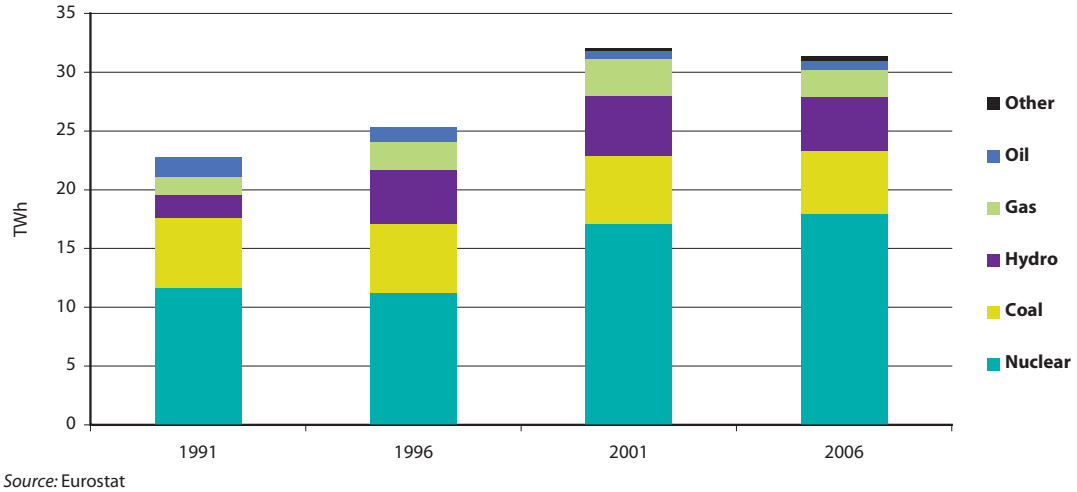


Source: Eurostat

Electric power sector

The power sector is dominated by nuclear, which took a share of 57% in gross electricity generation in 2006, and has accounted for much of the increase since 1991. The share of coal decreased from 26% to 17% over this period while hydro increased in share from 8% to 15%.

Figure 3.25.2: Gross electricity generation by source (TWh)



Source: Eurostat

Energy markets

The market opening was completed as of July 2007, but both gas and electricity markets are dominated by a few main suppliers. Two companies accounted for 84% of power generation and five companies accounted for 86% of the retail supply[1]. The gas market is based on a single supplier that imports only from Russia and consequently there were no other suppliers at wholesale or retail level as of the end of 2006[2]. The role of Slovakia as a major transit route for Russian gas to Western Europe means that developments in its market have a high profile at the EU level.

Energy security and renewable energy

High dependence on imported oil, natural gas, and coal has raised concerns, and therefore renewable energy contributes to energy security as well as to environmental goals. The indicative target for renewables is 14% for 2020[3]. The renewables roadmap for 2015 indicates that wind is expected to account for half of the increase in the power sector. With plentiful forests in relation to its population, there is a significant potential for biomass energy, but the government plan has tended to limit exploitation of biomass to remote rural areas where natural gas is not available[4]. Feed-in tariffs and targeted subsidies are used, and there is a heat purchase obligation for distributors to buy from renewable-based heat suppliers under specified conditions.

Energy efficiency

As with the other eastern European countries, energy intensity is quite high compared to the EU-average, due mainly to the significant role of energy-intensive industries, including paper and chemicals as well as the iron/steel sector. The government places high priority on improving energy efficiency, given the significant reliance on imported fossil fuels. The National Energy Efficiency Action Plan includes detailed measures that are integrated across different sectors as well as being comprehensive within the key sectors. Industry and transport are expected to account for 50% of energy savings, while horizontal or integrating measures are expected to account for 30% of the savings by 2016[5].

Table 3.25.3: Key energy figures, 2006 — in 1000 TOE

	ALL PRODUCTS	of which:								
		Hard coal & equivalents	Lignite & equivalents	Crude oil and feedstocks	Total petroleum products	Natural gas	Nuclear heat	Renewable sources	Derived heat	Electrical energy
Primary production	**6 302**	**-**	**562**	**32**	**-**	**176**	**4 646**	**886**	**-**	**-**
Net imports	12 048	3 311	285	5 718	-2 236	5 193	-	-23	-	-200
Stock change and bunkers	124	283	9	-79	-91	9	-	-5	-	-
Gross inland consumption	**18 833**	**3 594**	**855**	**6 007**	**-2 328**	**5 378**	**4 646**	**859**	**-**	**-200**
Transformation input	16 454	3 297	695	6 432	107	1 060	4 646	154	-	-
Transformation output	12 150	1 306	-	-	6 378	-	-	-	1 117	2 308
Consumpt. of the energy branch	2 031	-	3	-	557	577	-	-	136	339
Available for final consumption	**12 128**	**1 603**	**157**	**-**	**2 972**	**3 738**	**-**	**326**	**829**	**2 028**
Final non-energy consumption	1 200	36	-	-	843	321	-	-	-	-
Final energy consumption	**10 680**	**1 497**	**132**	**-**	**2 128**	**3 268**	**-**	**326**	**829**	**2 028**
Industry	4 513	1 458	52	-	250	954	-	241	66	1 021
Transport	1 832	-	-	-	1 737	5	-	45	-	45
of which: road transport	*1 743*	-	-	-	*1 694*	*5*	-	*45*	-	-
Services and others	2 019	36	36	-	124	1 026	-	9	219	568
Households	2 315	3	44	-	16	1 283	-	31	544	394

Source: Eurostat

References

[1] Eurostat – Data in focus 6/2008, "European electricity market indicators 2006"

[2] Eurostat – Data in focus 7/2008, "European gas market indicators 2006"

[3] COM(2008) 19 final, 2008/0016 (COD) Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources, Brussels, 23.1.2008.

[4] RES2020, "Monitoring and Evaluation of the RES Directive implementation in EU27 and policy recommendations for 2020," EIE/06/170/SI2.442662, February 2008.

[5] Slovak, Energy Efficiency Action Plan in accordance with the Directive on Energy end-use Efficieny and Energy services (2006/32/EC) July 2007.

3.26 Finland

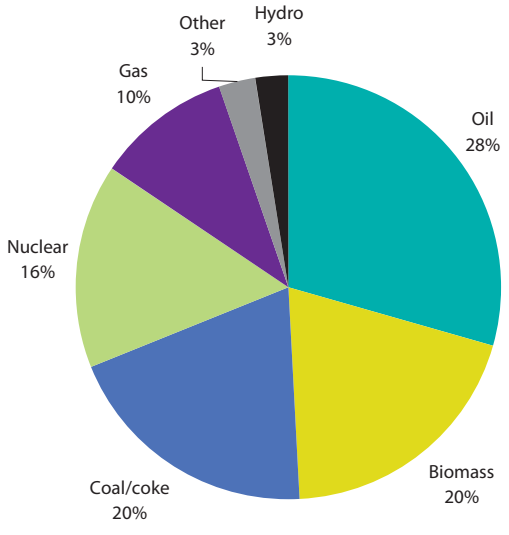
The Finnish energy system derives to a great extent from the special role of the forest sector and the pulp and paper industry within the economy; consequently, forest-based biomass is a major source of energy for that sector as well as for production of heat and power. Another major source of thermal energy comes from peat, of which Finland has an ample supply; peatlands cover about 30% of Finland's land area. Other important factors that have contributed to the evolution of the energy system include the integration of its power market with the other Nordic countries and the special requirements of heating, energy provision, and transport in a sparsely populated region with a cold climate.

Overall energy structure

The energy system (other than transport) in Finland is based mainly on heat and power production and conventional thermal power. Natural gas is used almost exclusively for industry and heat and power production. Household energy is based mainly on central provision of heat and power, and is supplemented by direct use of biomass in homes. Overall, the use of biomass accounts for 20% of total primary energy, which is the highest share of any EU country (See Figure 3.25.1). Other major sources are oil (28%), coal (20%), nuclear (16%) and gas (10%).

At present, there is very little use of biofuels for transport. However, a new law took effect in 2008 and mandates phasing in of biofuels in accordance with EU targets to reach 5.75% by the end of 2010. The requirements for blending are also contingent on meeting the EU fuel quality standards, which would be enforced, based on assessments in accordance with the existing biofuels directive, and to be done before the 2010 target is reached[1].

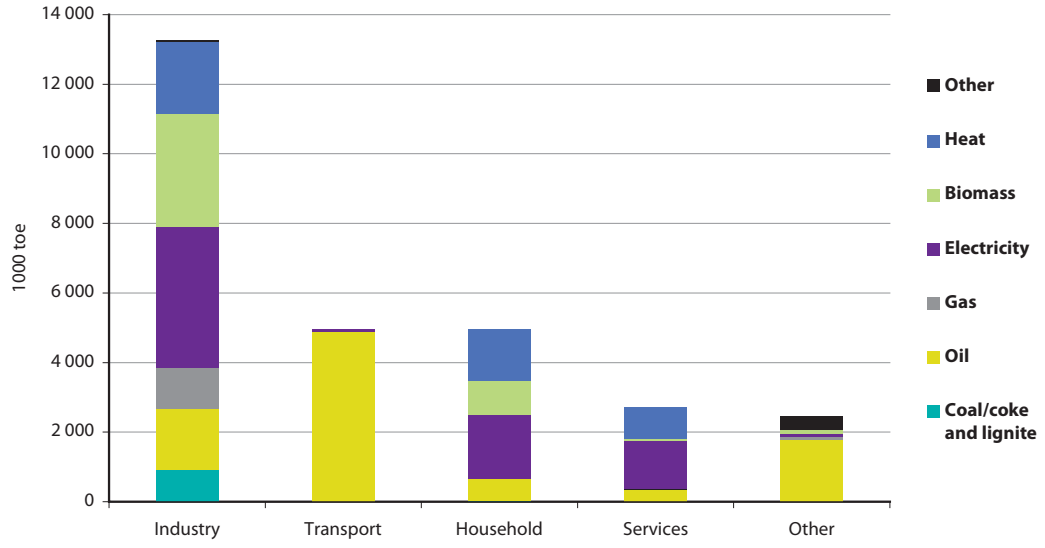
Figure 3.26.1: Primary energy consumption by fuel, 2006



Source: Eurostat

About 60% of coal used in Finland (in energy terms) in 2006 was imported hard coal, while the remainder is domestically produced lignite or peat. The availability of significant amounts of peat in Finland has contributed to a significant reliance on thermal plants. Since peat is not considered renewable, efforts to substitute for coal-based conventional thermal power are an important part of energy policies to meet the requirements of the existing EU renewable directive, which calls for a 31.5% share of gross electricity consumption by 2010[2].

Figure 3.26.2: Final energy and non-energy consumption by sector and type of fuel , 2006



Source: Eurostat

Energy efficiency

Finland's current energy intensity relative to GDP (253 kgoe/1000 EUR) is above the EU average (202 kgoe/1 000 EUR) and far above the EU-15 average (180 kgoe/1 000 EUR). As an energy-intensive industry, pulp and paper accounts for half of industrial sector energy consumption and an even higher share of industrial sector electricity consumption. Buildings energy consumption is also significant and the energy efficiency plan calls for major investments in buildings efficiency; by 2016, the savings in buildings could amount to more than 75% of all energy savings under the current plan[3].

Energy market

The electricity market is based on the Nordic cooperation that has streamlined trade as well as taking advantage of physical complementarities in the availability of hydro in Norway and Sweden vs. its own relatively large amount of thermal capacity. Biomass plays a major role in the energy system through widespread use for heat and power generation along with its natural role as an energy source in the pulp and paper sector.

Power generation is concentrated while the retail market is characterised by competitive pricing and contracts for large and medium-size customers. In 2006, five companies were generating more than 5% of the total electricity generation in the country; their cumulative share accounted for 64% of the total market. Concerning the suppliers, there were more than 100 in 2006 but only three of them were individually responsible for more than 5% of the total national electricity consumed[4].

Gas market

The gas market in Finland is based only on supply from Russia and is not connected to EU gas grids. Consequently, Finland has only one provider and is exempted from the EU gas market opening directives. Although there are many small local suppliers, in effect the retail side is also a monopoly since the main supplier (Gasum) covers 95% of the downstream market[5]. Gas is used predominantly for heat and power and in industry applications, which together account for 90% of natural gas consumption. Households and service sector each account for about 1%, and the remainder is used as feedstock in chemical industries.

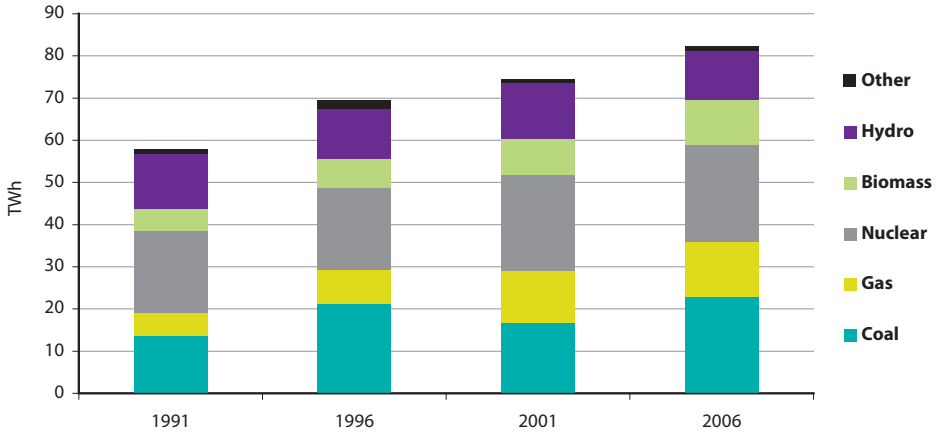
Electric power mix

The basic structure of electric power production has remained fairly stable over the past 15 years (See Figure 3.26.3), with one component that has been basically fixed in absolute terms (nuclear), two components that fluctuate according to the hydro availability on the Nordic market (coal and hydro) and two components that have been growing (gas and biomass).

Biomass and natural gas have both more than doubled over this period, and both have contributed significantly to the considerable expansion in combined heat and power. This structure is likely to shift a bit in a few years when the fifth Finnish nuclear plant will come online; it was commissioned in 2002 and planned for 2009 but construction is delayed.

Nuclear power is seen as part of an energy security strategy and its competitiveness has been maintained in part by a high level of capacity utilisation, which has ranged from 92% to 99% during the period from 1991 through 2006 (data not shown).

Figure 3.26.3: Gross electric power generation by source



Source: Eurostat

Table 3.26.4: Key energy figures, 2006 — in 1000 TOE

	ALL PRODUCTS	of which:								
		Hard coal & equivalents	Lignite & equivalents	Crude oil and feedstocks	Total petroleum products	Natural gas	Nuclear heat	Renewable sources	Derived heat	Electrical energy
Primary production	**17 787**	**-**	**3 224**	**-**	**-**	**-**	**5 909**	**8 654**	**-**	**-**
Net imports	20 946	4 603	-6	12 709	-1 139	3 876	-	-77	-	980
Stock change and bunkers	-141	594	-969	-190	425	-	-	-	-	-
Gross inland consumption	**37 821**	**5 197**	**2 249**	**12 760**	**-1 781**	**3 876**	**5 909**	**8 576**	**-**	**980**
Transformation input	33 937	5 170	1 942	14 456	461	2 630	5 909	3 148	-	-
Transformation output	26 511	594	-	-	14 476	-	-	-	4 764	6 075
Consumpt. of the energy branch	1 421	-	-	-	691	279	-	-	49	403
Available for final consumption	**28 380**	**621**	**307**	**260**	**9 552**	**968**	**-**	**4 426**	**4 452**	**7 375**
Final non-energy consumption	816	-	-	-	742	75	-	-	-	-
Final energy consumption	**26 679**	**642**	**307**	**-**	**8 168**	**890**	**-**	**4 426**	**4 452**	**7 375**
Industry	13 273	638	280	-	1 762	811	-	3 247	2 081	4 036
Transport	4 956	-	-	-	4 894	3	-	1	-	58
of which: road transport	*4 018*	-	-	-	*4 014*	*3*	-	*1*	-	-
Services and others	3 502	1	15	-	886	42	-	192	901	1 463
Households	4 947	4	11	-	625	34	-	986	1 470	1 818

Source: Eurostat

References

(1) Directive 2003/30/EC of the European Parliament and of the Council of 8 May 2003 on the promotion of the use of biofuels or other renewable fuels for transport.

(2) Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market.

(3) Motiva Oy, 2007, Finland National Energy Efficiency Action Plan (NEEAP), 13.7.2008.

(4) Eurostat – Data in focus 6/2008, "European electricity market indicators 2006"

(5) Eurostat – Data in focus 7/2008, "European gas market indicators 2006"

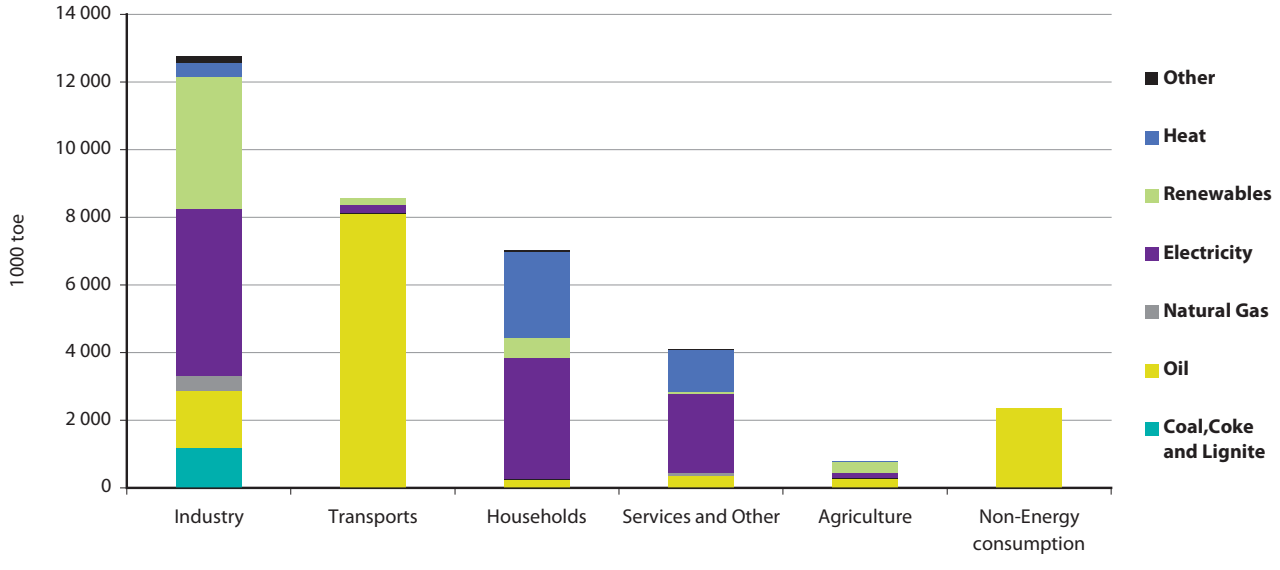
3.27 Sweden

Among the distinguishing characteristics of the Swedish energy system are the significant use of biomass and a dominance of electricity over other energy carriers/sources outside of the transport sector. Biomass use in essentially all sectors has increased significantly since the oil crises of the 1970s, most rapidly for combined heat and power production. The electricity supply has been dominated by hydro and nuclear since the 1980s. A variety of schemes to support expanded production of renewable energy were largely consolidated into the renewable electricity certificate programme, which began in mid-2003. Strong emphasis on energy efficiency has dampened total energy consumption. Key policy issues for the coming years relate to questions about the future of nuclear power and greater expansion of renewables other than biomass.

Overall energy structure

The energy system is based primarily on nuclear and hydro for electricity, petroleum products for transport, and biomass for heat and power. The resulting mix provides a fairly balanced overall primary energy supply, although with a greater reliance on electricity than is generally the case in other EU Member States. The industry sectors as well as housing and service sectors are highly dependent on electricity, partly due to fuel-switching in the 1980s and 1990s. The widespread use of district heating provides a highly efficient system for hot water and space heating in most Swedish buildings other than detached homes. Since Sweden has no significant gas infrastructure as do many other Member States, electricity and biomass/heat essentially provide the two 'legs' of the non-transport segments of the energy system. As is the case with all EU Member States, the transport sector is overwhelmingly based on petroleum fuels. Although populated areas of Sweden have a well-functioning train network and other public transit options, the geography of large distances in sparsely populated areas contributes to a higher demand for road transport services.

Figure 3.27.1: Final energy and non-energy consumption by sector and type of fuel, 2006



Source: Eurostat

Electric power sector

The mix of sources for electricity generation has been remarkably stable since the 1980s by which time all the Swedish nuclear plants had come on line; installed capacity and power generation has been fairly constant since that time. About 90% of all electricity generated in Sweden comes from nuclear and hydropower. The remainder is produced from industrial back-pressure plants, a small amount of wind, and combined heat & power plants (CHP) running on some combination of fossil fuels, biomass, and wastes. The main source of annual fluctuations in the mix is the availability of hydropower; during 'wet' years with more rainfall, there is a greater share of hydro, often for export as well as domestic use. During dry years, there is greater reliance on conventional thermal plants as well as imports.

The utilisation of power plants has shifted slightly during the last 10 years or so, due to factors such as the seasonal availability of hydro, the shutdown of two nuclear units (*Barsebäck 1* and *2*), and the increasing use of biomass in the system to replace fossil fuels. Capacity utilisation has shown a slight upward trend for nuclear, and has increased significantly for thermal and wind power, but has decreased slightly for hydro. Recent investments have been made in hydro capacity in order to improve utilisation and reduce environmental impacts. One such investment in 2007 was the new *Avestaforsen* station on the Dal River, with an installed capacity of 24 MW and expected annual energy output of about 170 GWh[(1)].

Renewable energy

Sweden has a high share of renewables, accounting for 29% of gross inland consumption in 2006, as compared to an average of 7% for the EU-27. This high share is due to the high share of biomass and other renewables for heat and power generation and also to the high share of biomass (56%) used in the pulp and paper industry. A significant expansion of wind power is planned, expected to amount to 30 TWh of generation by 2030[(2)]. The main policy support mechanism for renewables is the renewable electricity certificate scheme, which began in 2003. An estimated 12.7 TWh of renewable electricity was generated within the system in 2007[(3)].

In the transport sector, the share of biofuels amounts to 2% of the total in 2006 (the target of biofuels is 5.75% by 2010). In addition to ethanol, Sweden has developed transport sector markets for biogas, FAME (Fatty Acid Methyl Ester) and RME (Rape Methyl Ester / biodiesel)[(4)].

Energy markets

The power market continues to be dominated by three companies, which together accounted for 85% of electricity generated, 79% of installed capacity, and 51% of electricity supplied in 2006[(5)]. The total number of retail suppliers has remained stable in recent years, due in part to the fact that the Swedish market was liberalised (in stages) already starting in 1996. The gas market is quite small and at present there is only one supplier. There is some availability of "town" gas and biogas for local consumption and for transport, but this gas is not grid-connected.

Energy demand structure

The industry sector in Sweden continues to be a significant consumer, with the highest overall energy demand as well as the highest electricity demand. The industry sector accounted for 37% of final demand in 2006, as compared to an EU-average of 25%. A new industrial energy efficiency programme was initiated in 2005, and industrial sector demand is expected to decrease slightly in the coming years relative to economic growth[(1)]. Industrial energy use is concentrated in the pulp and paper sector, where there is a significant amount of biomass and wastes (black liquor) used in manufacturing.

District heating has increased in importance, as higher demand for more efficient space heating and hot water supply has been stimulated by regional and local programmes, as well as the higher prices resulting from energy and carbon taxes. The share of heat in final energy consumption increased from 6% in 1991 to 13% in 2006, while the share of biomass used to produce that heat rose from 44% to 85% over that period. The use of biomass for stand-alone (residential) heating has also increased in recent years, with an increasingly mature market for wood pellets emerging in Sweden and in other EU countries such as Austria, Germany and Finland.

Table 3.27.2: Key energy figures, 2006 — in 1000 TOE

	ALL PRODUCTS	of which:								
		Hard coal & equivalents	Lignite & equivalents	Crude oil and feedstocks	Total petroleum products	Natural gas	Nuclear heat	Renewable sources	Derived heat	Electrical energy
Primary production	**32 275**	**-**	**185**	**-**	**-**	**-**	**17 277**	**14 813**	**-**	**-**
Net imports	19 797	2 253	84	19 309	-3 250	882	-	-	-	519
Stock change and bunkers	2 811	168	-	545	2 099	-	-	-	-	-
Gross inland consumption	**50 829**	**2 422**	**269**	**19 853**	**-5 265**	**882**	**17 277**	**14 813**	**-**	**519**
Transformation input	46 336	2 364	236	21 000	564	224	17 277	4 353	-	-
Transformation output	32 734	809	-	-	20 011	-	-	-	4 330	6 928
Consumpt. of the energy branch	1 484	-	-	-	727	4	-	-	-	644
Available for final consumption	**34 624**	**866**	**33**	**-395**	**12 736**	**654**	**-**	**5 068**	**4 180**	**11 247**
Final non-energy consumption	2 368	15	-	-	2 353	-	-	-	-	-
Final energy consumption	**33 218**	**1 193**	**9**	**-**	**10 658**	**628**	**-**	**5 068**	**4 180**	**11 247**
Industry	12 760	1 193	9	-	1 656	455	-	3 925	388	4 931
Transport	8 569	-	-	-	8 107	23	-	192	-	248
of which: road transport	*7 326*	-	-	-	*7 111*	*23*	-	*192*	-	-
Services and others	4 885	-	-	-	645	117	-	350	1 264	2 501
Households	7 003	-	-	-	249	33	-	602	2 528	3 567

Source: Eurostat

References

(1) Swedish Energy Agency, 2008, "Energiindikatorer 2008: Uppföljning av Sveriges energipolitiska mål," ET 2008:08, www.swedishenergyagency.se.

(2) Swedish Ministry of Sustainable Development, "Development of the Swedish Climate Strategy: A summary of the data produced by The Swedish Energy Agency and The Swedish Environmental Protection Agency ahead of Checkpoint 2008." Remit M2006/2845/Mk

(3) Swedish Energy Agency, 2008, "The Electricity Certificate System," (page 29) ET 2008:09, www.swedishenergyagency.se.

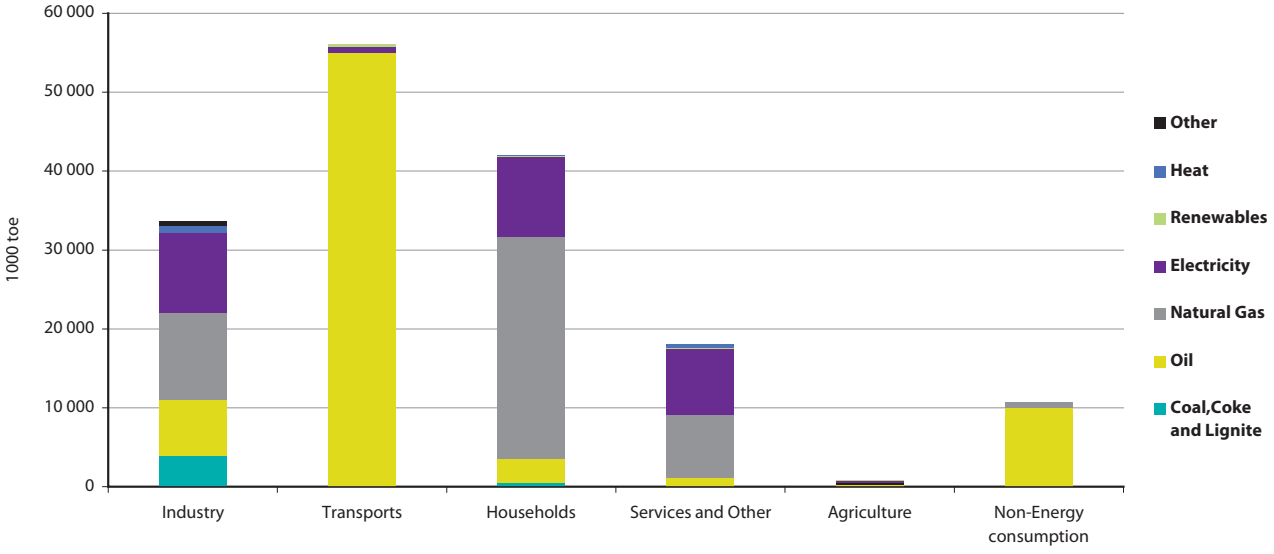
(4) Swedish Energy Agency, 2008, "Transportsektorns energianvändning 2007," ES 2008:01, www.swedishenergyagency.se.

(5) Eurostat – Data in Focus 6/2008, "European electricity market indicators 2006"

3.28 United Kingdom

The United Kingdom is one of the EU's major producers of oil and gas, and it has some coal as well. During the past few decades, natural gas has replaced coal in the power system, while nuclear power capacity has stabilised. The transition towards gas was accelerated by the goal of cutting carbon emissions, since gas combustion turbines operate with lower environmental impact. Production of North Sea oil and gas peaked in 1999-2000. Consequently, the UK went from being a net exporter to becoming a net importer of primary energy. Demand-side energy efficiency and renewable energy have received considerable support in recent years, although the share of renewable energy in gross inland consumption remains quite small (2%) in 2006.

Figure 3.28.1: Final energy and non-energy consumption by sector and type of fuel, 2006

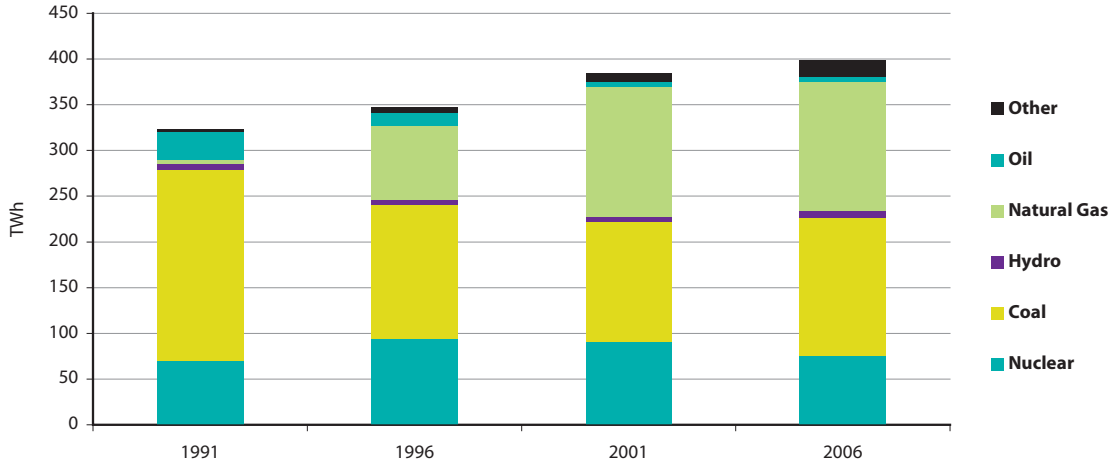


Source: Eurostat

Electric power sector

he primary change in the energy mix has been the shift from coal to natural gas; coal decreased from 64% to 38% of gross electricity generation between 1991 and 2006, while gas increased from 1% to 35%. Overall installed capacity increased by 19% during this period, while generation increased by 24%. Electricity generation from nuclear power and from hydro has been generally stable during this period, accounting for 19% and 2% of gross electricity generation in 2006, respectively.

Figure 3.28.2: Gross electricity generation by source



Source: Eurostat

Energy markets

The UK electricity sector has three markets that operate fairly independently: England and Wales, Scotland and Northern Ireland. The markets in England and Wales and Scotland are fully open, while Northern Ireland is open only for non-household customers. The UK was among the first to initiate market openings, which started already in the 1980s. Customer switching has been quite high compared to EU averages, due to the increasing competition and the associated aggressive marketing campaigns(1). The retail power market has become more concentrated, following the concentration in generation; as of the end of 2006, 6 companies accounted for 68% of generation, while 7 companies accounted for 91% of the retail market(2). For gas, 6 companies accounted for 77% of wholesale supply, while 7 companies accounted for 79% of distribution or retail supply(3). Many of the power companies are also involved in the gas market.

Energy security

The UK has a low level of imported energy compared to the EU average; the energy dependence rate was 21% in 2006 compared to the EU average of 54%(4). The energy supply issues for the future relate to the role of coal and nuclear power, both of which make some contribution to domestic supply. Under the Large Combustion Plants Directive, coal plants with a capacity of up to 7.4 GW are scheduled to close by 2016. However, various research initiatives into clean coal technology and carbon capture and storage are underway. In its recent energy White Paper, the UK government has come out in favour of nuclear power as a low-carbon generator of electricity. Renewable energy is also stressed in the new policy framework, especially wind, tidal, and biomass.

Energy demand and energy efficiency

Another element in the UK's energy transition has been the considerable fall in the share of energy consumption of industry, which now accounts for only 22% of final energy consumption, compared to an EU average of 28%. In the case of electricity, UK industry accounts for 34% compared to an EU average of 41%. Between 1991 and 2006, the overall energy intensity decreased by 29%, which is among the steepest drops within the EU-15. The UK economy has become largely service-based; the service sector accounts for 26% of electricity demand. The demand for energy in transport has been rising significantly in recent years and now represents the dominant sector in final demand, accounting for 31% in 2006.

Biofuels for transport

Since oil for transport has been the main constituent of growing energy consumption, the UK government has been quite supportive of biofuels and other renewable fuels for transport; biofuels in the transport sector accounted for 35% of the total biomass in the final energy consumption in 2006 (the EU-27 average being 9%).

The Renewable Transport Fuel Obligation (RTFO) places an obligation on fuel suppliers to ensure that a certain percentage of their aggregate sales is made up of biofuels. Changes that took effect in April 2008 will require 5% of all UK fuel sold on to come from a renewable source by 2010, on a volume basis. The RTFO expects to reduce carbon emissions from road transport in 2010 by about 0.7 - 0.8 million tonnes. At the end of an obligation period, certificates may be redeemed to the RTFO Administrator to demonstrate compliance and certificates can be traded. The UK Government also announced on 21 June 2007 that it aims to reward biofuels under the RTFO in accordance with the carbon savings that they offer from April 2010, provided that this is compatible with World Trade Organisation rules and EU Technical Standards requirements, and provided that the feedstocks from which they are produced meet appropriate sustainability standards. Financial incentives will be continued for some capital costs and infrastructure such as fuelling stations, with most incentives likely to be phased out gradually once the RTFO has created an initial market[5].

Renewable energy policy

Renewables are currently quite small in the energy system, amounting to just 2% of gross inland consumption. The UK therefore introduced the Renewables Obligation in 2002, which will run until 2020; it is an obligation that requires electricity suppliers to provide a minimum percentage of their supply from eligible renewable sources. Since it is generators that create renewable electricity in the first place, a market in tradable Renewables Obligation Certificates is created where generators are sellers and suppliers act as buyers. The level of the obligation started at 3% and will rise to 15.4% by 2016. A crucial difference between the Renewables Obligation and the Non Fossil Fuel Obligation is that the Renewables Obligation does not differentiate between technologies. One Renewables Obligation Certificates is awarded per MWh of eligible electricity produced (except for co-firing of fossil fuels and biomass whose eligibility is capped). This means that different renewable technologies compete with each other and the Renewables Obligation Certificates market is dominated by the most immediately viable forms of renewable electricity (landfill gas, waste-for-energy, co-firing onshore wind).

Table 3.28.3: Key energy figures, 2006 — in 1000 TOE

	ALL PRODUCTS	of which:								
		Hard coal & equivalents	Lignite & equivalents	Crude oil and feedstocks	Total petroleum products	Natural gas	Nuclear heat	Renewable sources	Derived heat	Electrical energy
Primary production	**183 946**	**10 421**	**-**	**78 006**	**-**	**72 008**	**19 463**	**4 048**	**-**	**-**
Net imports	49 295	31 223	-	9 401	-1 906	9 552	-	377	-	646
Stock change and bunkers	21	-568	-	-361	1 448	-498	-	-	-	-
Gross inland consumption	**229 525**	**41 334**	**-**	**87 047**	**-4 769**	**81 062**	**19 463**	**4 425**	**-**	**646**
Transformation input	173 272	38 459	-	84 743	658	25 733	19 463	2 904	-	-
Transformation output	124 671	3 379	-	-	84 608	-	-	-	1 347	33 159
Consumpt. of the energy branch	14 227	2	-	-	5 126	6 224	-	-	72	2 426
Available for final consumption	**163 321**	**6 251**	**-**	**86**	**76 596**	**48 245**	**-**	**761**	**1 275**	**29 474**
Final non-energy consumption	10 783	-	-	-	10 048	735	-	-	-	-
Final energy consumption	**150 565**	**4 520**	**-**	**-**	**66 497**	**47 480**	**-**	**761**	**1 275**	**29 474**
Industry	33 608	3 976	-	-	6 986	11 125	-	126	837	10 000
Transport	56 060	-	-	-	55 062	-	-	265	-	733
of which: road transport	*39 969*	-	-	-	*39 705*	-	-	*265*	-	-
Services and others	18 879	15	-	-	1 424	8 143	-	183	386	8 728
Households	42 018	528	-	-	3 026	28 211	-	188	52	10 013

Source: Eurostat

References

(1) UK – Internal Market fact sheet, January 2007. http://europa.ec.eu/energy.

(2) Eurostat – Data in focus 6/2008, "European electricity market indicators 2006"

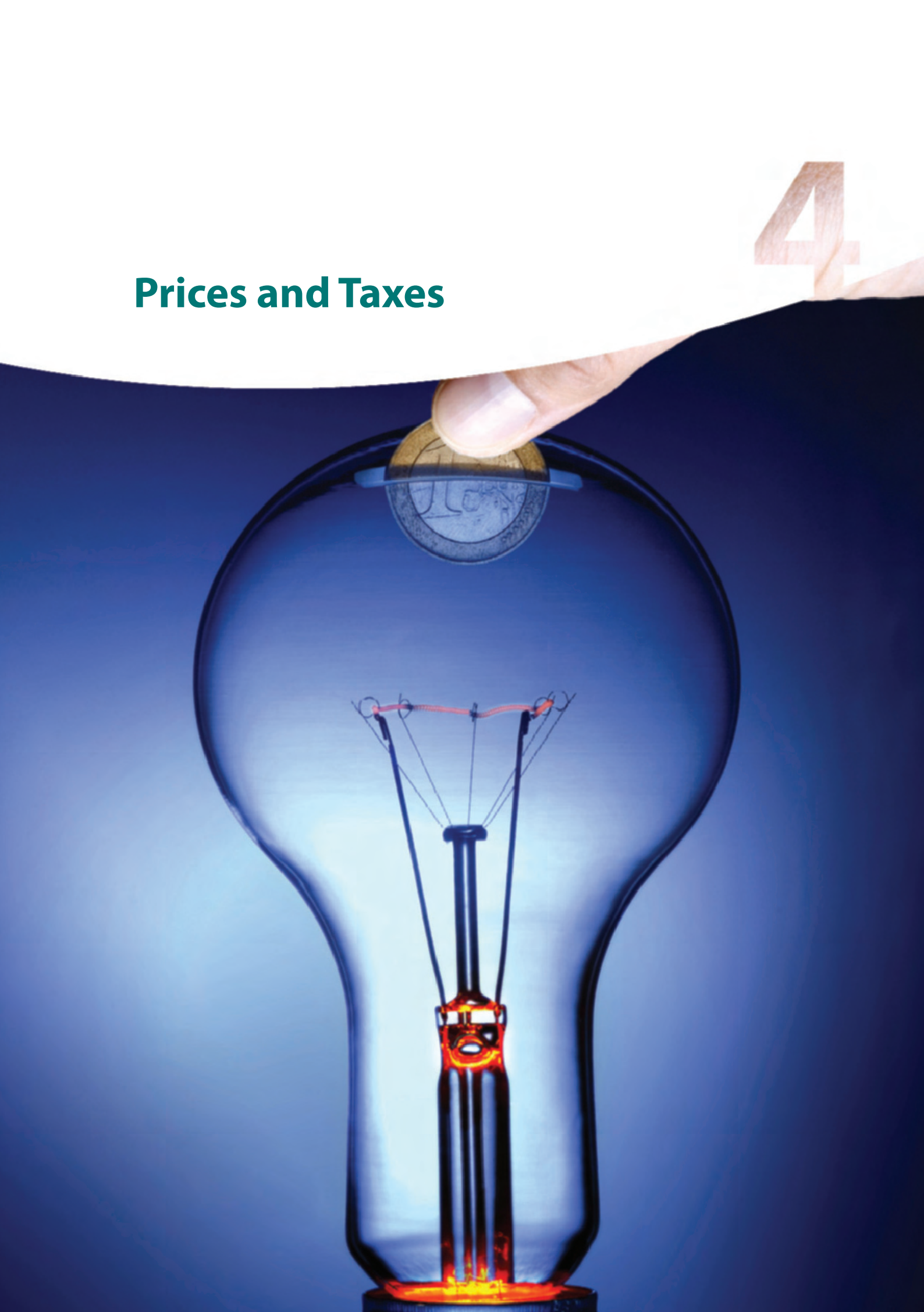
(3) Eurostat – Data in focus 7/2008, "European gas market indicators 2006"

(4) Eurostat News Release 98/2008, "Energy consumption and production: EU27 energy dependence rate at 54% in 2006," 10 July 2008.

(5) RES2020,"Monitoring and Evaluation of the RES Directive implementation in EU27 and policy recommendations for 2020," EIE/06/170/SI2.442662, February 2008.

4

Prices and Taxes



4.1 Introduction

Eurostat collects energy price data for several products such as natural gas and electricity for both domestic and industrial use. Price information on petroleum products is collected by Directorate-General Transport and Energy (DG TREN).

Information referring to electricity and natural gas prices for industrial consumers, as presented in this publication, was collected according to Directive 90/377/EEC prior to its amendment in 2007. This legal act makes reference to typical standard consumers, i.e. price data are calculated on the basis of a fixed level of consumption. Data presented in this chapter will refer to only one average consumer band per product and type of consumer (Gas or electricity and household or industrial end-users). Petroleum product prices are legally defined by Council Decision No.199/280/EC of 22 April 1999 and by Commission Decision No. 1999/566/EC of 26 July 1999. Price data in this chapter are expressed in euro (except in tables 4.6 and 4.10 where prices are expressed in purchasing power standards).

Directive 90/377/EEC has recently been amended by Commission Decision 2007/394/EC of 7 June 2007. Essential changes are outlined in chapter 5.2.

Information on gas and electricity prices paid by the various standard consumer categories as well as information on prices in national currencies can be found on the CD-ROM attached to this publication and on Eurostat's website.

The price data presented in this chapter do not take inflation into account.

The data will sometimes also feature an EU-27 average. This aggregate has been calculated by weighting national prices by the national consumptions of the product in question by the appropriate type of consumer. As an example, the EU-27 average price of electricity for industrial end-users (see Table 4.18) is calculated as the average of the national prices in the 27 Member States weighted by individual country data on the consumption of electricity for industrial use.

Caution when comparing prices expressed in euro

In this chapter, a series of tables offer an overview of energy prices over 10 years. To enable comparisons between countries and detect in which country the highest or lowest prices are charged to end customers, prices are all expressed in EUR. For countries that are not part of the Euro-area, average exchange rates for the period in question have been applied.

The reader should be aware that whereas these comparisons are well adapted between countries that have adopted the euro, these are slightly less appropriate for countries outside the euro area. Indeed, for the latter countries, the euro/national currency exchange rate might bias the price evolution between 2006 and 2007, as prices may have increased when expressed in EUR, but did not change when expressed in the national currency, due to a changing exchange rate against the euro. There are even cases where prices may have increased when expressed in EUR but actually decreased when using the national currency.

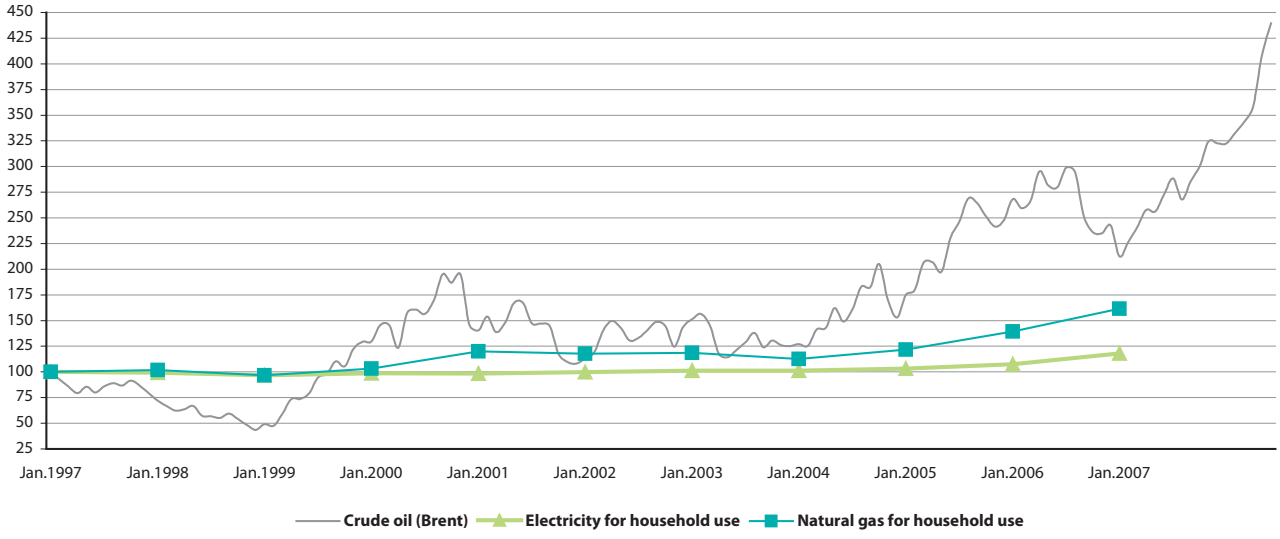
As an example, Table 4.7 outlines the gas prices paid by domestic consumers. Slovakia registered an increase from EUR 10.88 to EUR 11.48 per GJ between 1 January 2006 and 1 January 2007, corresponding to a 5.5% increase. When considering these prices paid in national currency (in this case Slovak Korunas – SKK), the price decreased from SKK 408 to SKK 399 (-2.2%). In this respect, readers must be aware that tables should be read 'vertically', i.e. comparing prices between countries for one and the same period, rather than 'horizontally', comparing prices paid in a given country over time.

Figures 4.1 and 4.2 offer a preview of the energy prices that will be further developed in this chapter. They compare the price evolution of both gas and electricity to that of crude oil (Brent), which continues to be the main indicator of energy prices on the market.

A clear link between gas and oil prices can be noted for industrial end-users and, to a lesser degree, for domestic users.

Electricity prices are less affected by the evolution of crude oil prices.

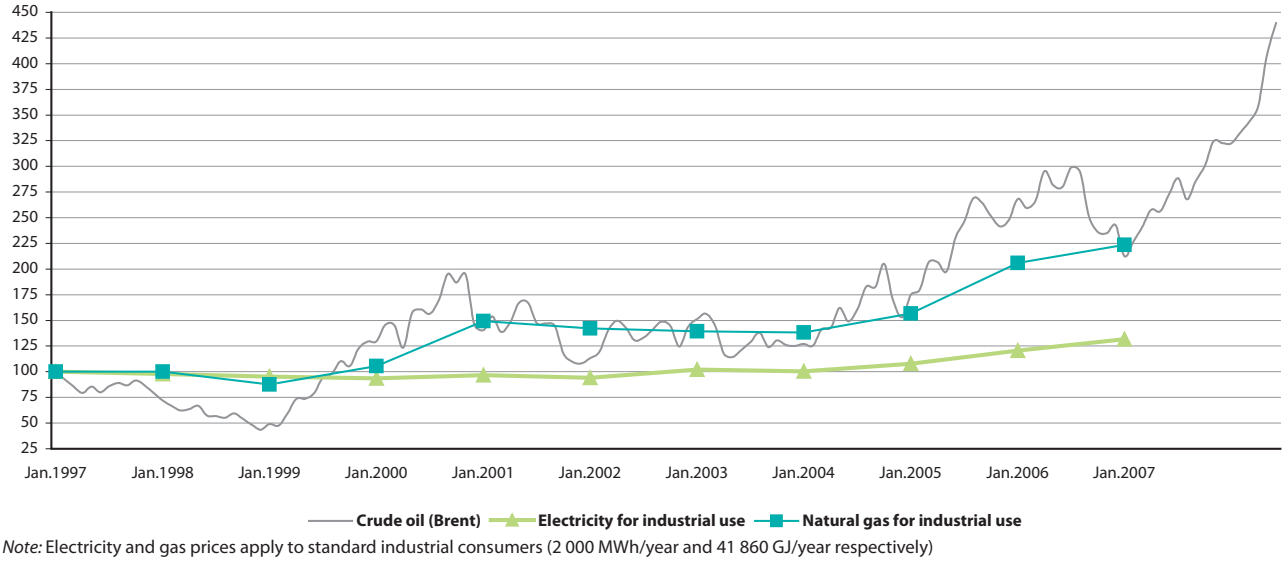
Figure 4.1: Evolution of energy prices for household consumers, 1997-2007, EU-15, all taxes included (1997=100)



Note: Electricity and gas prices apply to standard domestic consumers (3 500 kWh/year and 83.7 GJ/year respectively)

Source: Eurostat and INSEE

Figure 4.2: Evolution of energy prices for industrial end-users, 1997-2007, EU-15, VAT excluded (1997=100)



Note: Electricity and gas prices apply to standard industrial consumers (2 000 MWh/year and 41 860 GJ/year respectively)

Source: Eurostat and INSEE

4.2 Prices and taxes for household consumers

4.2.1 Electricity prices and taxes for household consumers

Based on a household consuming 3 500 kWh of electricity per year, the average amount charged in the EU was 15.30 cents per kWh in 2007 (see Table 4.3). An average household's monthly electricity bill would thus amount to EUR 45. In 2007, this average increased by 9.5% compared to the previous year (13.97 cents in 2006).

ln 2007, the highest electricity prices were found in Denmark, with 25.79 cents per kWh. Italy and the Netherlands also charged over 20 cents per kWh, with 23.29 and 21.80 cents respectively. These countries registered the highest electricity prices since 2003.

At the other end of the scale, Bulgarian households paid slightly more than a quarter of the price paid by consumers in Denmark (6.60 cents against 25.79 cents). Prices charged in Greece and in the Baltic States (Estonia, Latvia and Lithuania) were also relatively low, all of them below 8 cents per kWh.

Table 4.3: Electricity prices for household consumers, all taxes included, in EUR per 100 kWh

	1997	2002	2003	2004	2005	2006	2007
EU-27	:	:	:	:	13.36	13.97	15.30
BE	14.58	13.94	13.76	14.22	14.81	14.42	15.81
BG	:	:	:	5.83	6.44	6.60	6.60
CZ	:	7.83	7.97	8.07	8.68	9.85	10.67
DK	16.55	22.02	23.03	22.62	22.78	23.62	25.79
DE	14.72	16.70	17.08	16.98	17.85	18.32	19.49
EE	:	5.39	6.49	6.49	6.78	7.31	7.50
IE	9.18	9.94	11.79	12.56	14.36	14.90	16.62
EL	7.31	6.30	6.54	6.71	6.88	7.01	7.20
ES	12.18	10.47	10.63	10.79	10.97	11.47	12.25
FR	13.17	11.65	11.62	11.94	11.94	11.94	12.11
IT	22.37	19.01	19.84	19.50	19.70	21.08	23.29
CY	:	9.29	10.52	10.88	10.74	14.31	13.76
LV	:	:	:	5.75	8.28	8.29	6.88
LT	:	:	:	6.32	7.18	7.18	7.76
LU	11.36	12.91	13.35	13.65	14.78	16.03	16.84
HU	5.68	8.09	8.21	9.92	10.64	10.75	12.22
MT	4.90	6.31	6.85	6.68	7.64	9.49	9.87
NL	11.53	16.60	17.58	18.27	19.55	20.87	21.80
AT	12.69	13.39	13.52	14.16	14.13	13.40	15.45
PL	:	10.66	10.05	9.04	10.64	11.90	12.16
PT	13.43	12.86	13.22	13.50	13.81	14.10	15.00
RO	:	:	:	:	7.79	9.43	10.17
SI	8.07	10.29	10.00	10.10	10.33	10.49	10.64
SK	:	:	:	12.18	13.38	14.48	15.37
FI	9.39	9.36	9.91	10.79	10.57	10.78	11.60
SE	9.98	11.33	13.49	14.40	13.97	14.35	17.14
UK	10.49	10.83	10.06	8.78	8.77	10.20	13.16
HR	:	:	:	:	8.48	9.22	9.23
NO	10.99	12.95	21.06	13.60	15.71	15.33	18.56

Note: Based on the standard consumer Dc (3 500 kWh/year) on 1 January of each year

Source: Eurostat

Figure 4.4 shows a ranking of electricity prices paid at national level, making it possible to compare prices with the EU-27 average. It also provides a breakdown of electricity prices by basic price, value-added tax and other taxes applied.

Considering prices including taxes, 10 Member States recorded prices higher than the EU-27 average. These countries comprised essentially 'old' Member States, with the exception of Slovakia. The left side of the figure mainly displays Member States that recently joined the EU, where electricity prices are lower.

Price differences between individual countries can largely be explained by discrepancies in the basic price of electricity, but taxes have a considerable impact on the final price paid by domestic end-users.

The second-highest electricity prices paid by households were found in Italy (23.29 cents), 71% of which is made up by the basic price, making Italy the most expensive country in terms of basic electricity price.

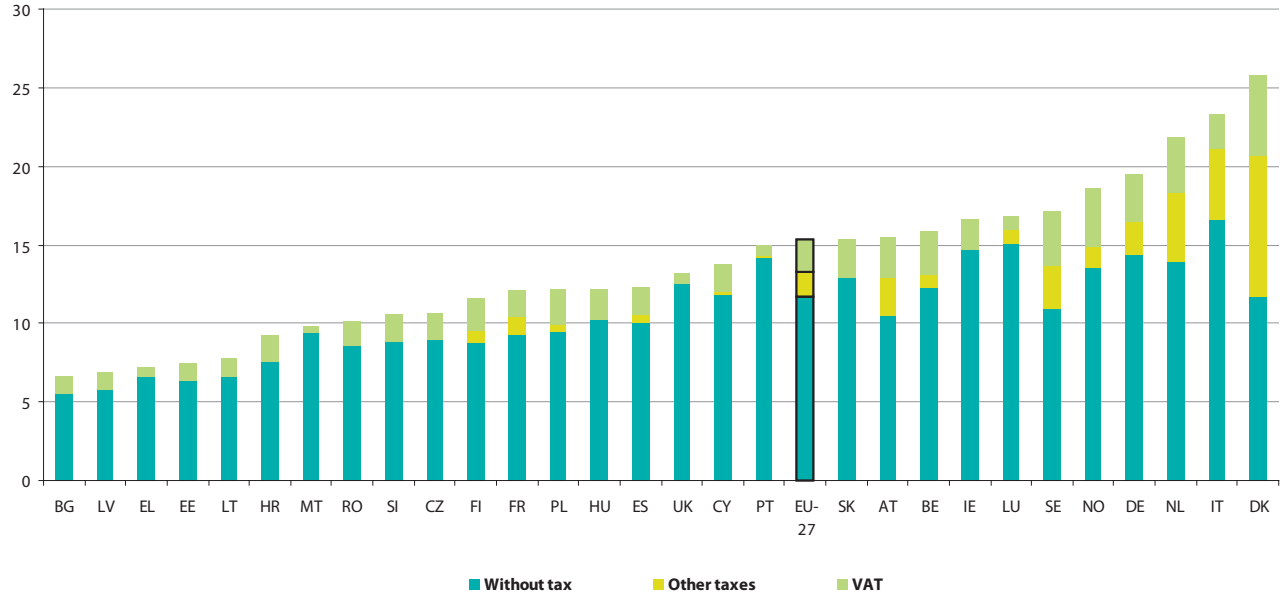
Table 4.5 completes Figure 4.4 and presents the share of all taxes in the final price. More than half of what is paid by Danish households for electricity is made up of taxes (54.6%).

Before applying taxes, basic electricity prices in Denmark are even lower than the EU-27 average (11.70 cents against 11.73 cents).

To a lesser extent, taxes in Sweden, the Netherlands and Austria were relatively high (about one third of the final price). As for Denmark, prices excluding taxes in Sweden and in Austria were also below the EU 27 average.

On the other hand, the United Kingdom and Malta registered a very low share of taxes in the final price (5%), comprising only VAT.
Eleven other Member States do not charge any other taxes than VAT to household consumers.

Figure 4.4: Breakdown of electricity prices for household consumers on 1 January 2007, in EUR per 100 kWh



Note: Based on the standard consumer Dc (3 500 kWh/year)

Source: Eurostat

Table 4.5: Share of taxes in electricity prices for household consumers on 1 January 2007

	Basic price	Other taxes (excl. V.A.T)	V.A.T	All taxes
	in € per 100 kWh			in %
UK	12.54	0.00	0.62	4.7
MT	9.40	0.00	0.47	4.8
PT	14.20	0.10	0.70	5.3
EL	6.61	0.00	0.59	8.2
LU	15.09	0.80	0.95	10.4
IE	14.65	0.00	1.97	11.9
CY	11.77	0.23	1.76	14.5
LT	6.58	0.00	1.18	15.2
LV	5.83	0.00	1.05	15.3
EE	6.35	0.00	1.15	15.3
CZ	8.98	0.00	1.69	15.8
RO	8.55	0.00	1.62	15.9
SK	12.92	0.00	2.45	15.9
HU	10.19	0.00	2.03	16.6
SI	8.87	0.00	1.77	16.6
BG	5.47	0.00	1.13	17.1
HR	7.60	0.00	1.63	17.7
ES	10.04	0.52	1.69	18.0
BE	12.29	0.78	2.74	22.3
PL	9.45	0.52	2.19	22.3
EU-27	11.73	1.52	2.05	23.3
FR	9.21	1.25	1.65	23.9
FI	8.77	0.74	2.09	24.4
DE	14.33	2.05	3.11	26.5
NO	13.61	1.24	3.71	26.7
IT	16.58	4.59	2.12	28.8
AT	10.50	2.38	2.57	32.0
NL	14.00	4.30	3.50	35.8
SE	10.88	2.83	3.43	36.5
DK	11.70	8.93	5.16	54.6

Note: Based on the standard consumer Dc (3 500 kWh/year)

Source: Eurostat

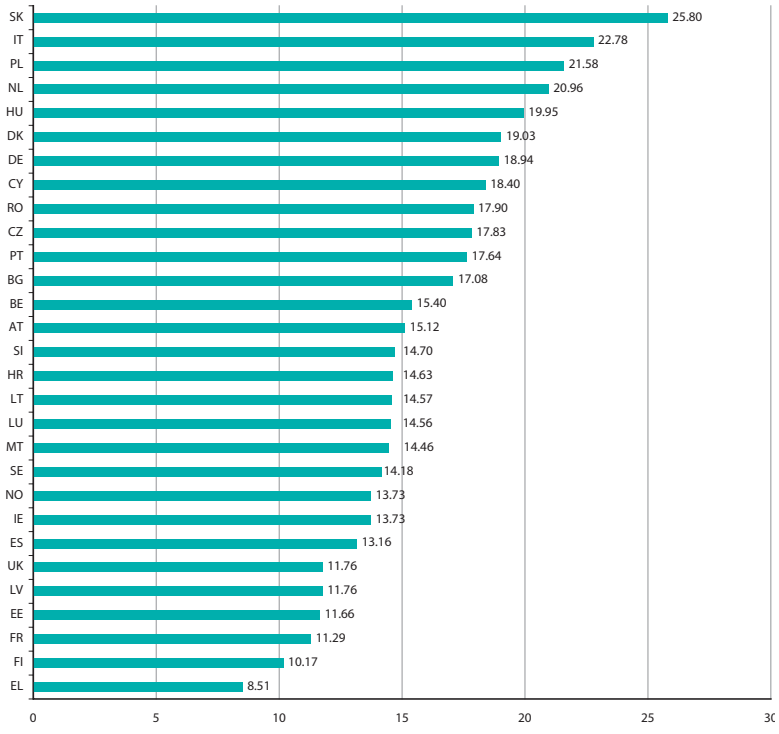
Figure 4.6 uses an alternative 'currency': the Purchasing Power Standard (PPS). The PPS is an artificial common reference currency unit that eliminates price level differences between countries. One PPS thus buys the same given amount of goods/services in all countries.

Looking at electricity prices in this way reveals a different picture: whereas Danish households were paying the most in terms of absolute prices expressed in EUR, the highest prices in PPS were registered in Slovakia (25.80 PPS per 100 kWh). The latter country ranked in tenth position among EU Member States when considering prices in EUR (see Figure 4.4). In contrast, Denmark dropped to sixth position with 19.03 PPS per 100 kWh.

Depending on the country, the difference between prices expressed in EUR and those expressed in PPS can be relatively high. For instance, prices expressed in PPS were nearly identical in 2007 for Luxembourg and Lithuania, whereas Luxembourg households were paying more than twice as much as their Lithuanian counterparts in terms of EUR (see Table 4.3). However, discrepancies between both currencies are less significant for Italy and the Netherlands, which ranked second and third for prices expressed in EUR, and remained in the top 4 when considering prices in PPS.

At the other end of the scale, Greek households paid the least for electricity in terms of PPS (8.51 PPS per 100 kWh).

Figure 4.6: Electricity prices for household consumers on 1 January 2007, all taxes included, in Purchasing Power Standards (PPS) per 100kWh



Note: Based on the standard consumer Dc (3 500 kWh/year)

Source: Eurostat

4.2.2 Gas prices and taxes for household consumers

The information on natural gas prices for household consumers is based on the standard consumer D3, corresponding to a household using gas for cooking, water heating and central heating.

In 2007, the average price including all taxes paid in the EU for one Gigajoule (GJ) of gas amounted for EUR 14.95 (see Table 4.7). This boils down to an average monthly gas bill of EUR 104, which is 15.7% higher than the average bill paid in 2006.

At national level, Denmark and Sweden were by far the most expensive countries for household consumers in 2007 (EUR 30.84 and EUR 26.58 per GJ respectively).

Gas prices in Denmark were more than five times higher than the lowest prices recorded in the EU (EUR 5.89 in Estonia). Low prices were also registered in the other two Baltic States and Hungary (less than EUR 8.00 in these three countries).

Table 4.7: Gas prices for household consumers, all taxes included, in EUR per GJ

	1997	2002	2003	2004	2005	2006	2007
EU-27	:	:	:	:	11.21	12.92	14.95
BE	8.79	10.51	10.78	10.54	11.16	13.50	12.89
BG	:	:	:	6.75	6.73	7.70	8.83
CZ	:	7.08	6.35	6.57	7.49	10.03	9.45
DK	:	17.98	18.98	19.12	28.44	29.82	30.84
DE	8.77	11.85	12.13	12.33	13.56	15.98	18.45
EE	:	:	4.64	4.64	4.63	4.63	5.89
IE	8.60	8.18	8.25	9.00	9.98	12.51	16.73
ES	10.63	12.14	12.09	11.55	11.90	13.63	14.23
FR	8.72	10.81	10.65	10.15	10.57	12.72	13.46
IT	16.14	17.15	16.77	14.92	15.34	16.50	18.34
LV	:	:	:	4.22	4.54	5.34	7.50
LT	:	:	:	5.45	5.41	6.24	7.04
LU	6.10	7.04	7.33	7.07	8.14	10.33	11.52
HU	3.36	4.35	4.41	4.76	5.10	5.28	7.16
NL	8.29	11.55	13.08	13.19	15.17	16.92	18.42
AT	11.30	11.84	12.26	13.71	13.36	15.65	15.99
PL	:	8.10	7.20	6.34	7.55	9.46	10.69
PT	:	13.85	13.34	12.05	12.34	14.52	13.88
RO	:	:	:	:	4.79	7.66	9.05
SI	5.57	9.81	9.87	9.64	10.33	12.99	13.86
SK	:	:	:	7.27	8.14	10.88	11.48
FI	7.08	:	:	:	:	:	:
SE	12.40	17.26	18.32	19.57	22.18	25.95	26.58
UK	6.83	6.97	6.89	6.83	7.26	8.24	11.76
HR	:	:	:	:	7.99	8.18	8.18

Note: Based on the standard consumer D3 (83.7 GJ/year) on 1 January of each year

Source: Eurostat

Figure 4.8 and Table 4.9 provide details on the various taxes applied to natural gas prices for household consumption.

As for electricity, high prices in Denmark and Sweden can be ascribed to higher taxes charged to household consumers in both countries (55.8% and 43.2% respectively).

With its relatively low share of taxes (11.9%), Ireland registered the sixth-highest price among Member States. Gas prices excluding taxes in Ireland ranked just below Swedish prices (EUR 14.74 against EUR 15.09 for Sweden).
The seven countries that registered prices above the EU average were exclusively 'old' Member States, while the nine lowest prices were found among new Member States.

Upon closer observation, the share of taxes in the retail prices applied in the United Kingdom, Portugal and in Luxembourg was very low compared to the EU average (4.7 to 5.7% vs. 21.9% for the latter).

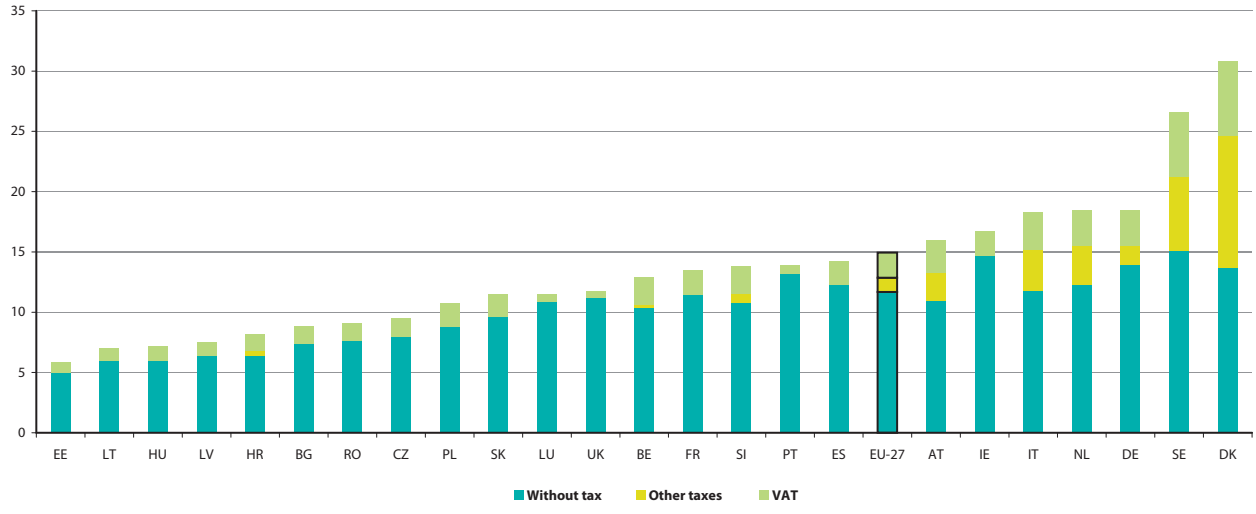
Furthermore, of the 23 Member States for which data are available, 15 do not charge any other taxes than VAT to household consumers.

Natural gas in Sweden

Natural gas is being used on a significant scale in Sweden only since 1985. Its introduction has been very late compared to other European countries. Sweden does not produce natural gas. The natural gas used in Sweden comes from North Sea gas fields and is essentially imported from Denmark.
Due to its low population density (approximately 20 inhabitants per km^2), investments in extended distribution networks are often not viable economically. Indeed, gas networks today are essentially located along the south and west coasts of the country, especially in agglomerations.

At a national level, a relatively low share of Swedish households is connected to the natural gas network and the fuel deliveries are quite limited. Overall, natural gas consumption is mostly industrial. The natural gas consumption of Swedish households corresponds to only 4% of the gross inland consumption.
A situation similar to that of Sweden applies to Finland.

Figure 4.8: Breakdown of gas prices for household consumers on 1 January 2007, in EUR per GJ



Note: Based on the standard consumer D3 (83.7 GJ/year)

Source: Eurostat

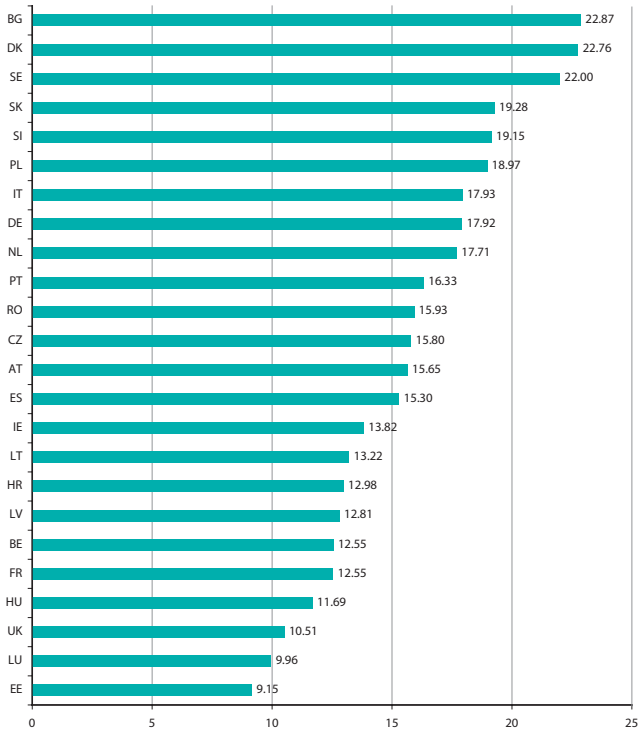
Table 4.9: Share of taxes in gas prices for household consumers on 1 January 2007

	Basic price	Other taxes (excl. V.A.T)	V.A.T	All taxes
	in € per GJ			in %
UK	11.20	0.00	0.56	4.7
PT	13.22	0.00	0.66	4.8
LU	10.87	0.00	0.65	5.7
IE	14.74	0.00	1.99	11.9
ES	12.27	0.00	1.96	13.8
FR	11.42	0.00	2.04	15.2
EE	4.99	0.00	0.90	15.3
LT	5.97	0.00	1.07	15.3
LV	6.35	0.00	1.15	15.3
RO	7.60	0.00	1.44	16.0
CZ	7.94	0.00	1.51	16.0
SK	9.64	0.00	1.84	16.0
HU	5.97	0.00	1.19	16.7
BG	7.36	0.00	1.47	16.7
PL	8.76	0.00	1.93	18.0
BE	10.33	0.31	2.25	19.9
HR	6.43	0.37	1.39	21.5
EU-27	11.68	1.18	2.09	21.9
SI	10.75	0.80	2.31	22.4
DE	13.97	1.53	2.95	24.3
AT	10.98	2.34	2.67	31.3
NL	12.30	3.18	2.94	33.2
IT	11.79	3.43	3.12	35.7
SE	15.09	6.17	5.32	43.2
DK	13.64	11.03	6.17	55.8

Note: Based on the standard consumer D3 (83.7 GJ/year)

Source: Eurostat

Figure 4.10: Gas prices for household consumers on 1 January 2007, all taxes included, in Purchasing Power Standards (PPS) per GJ



Note: Based on the standard consumer D3 (83.7 GJ/year)

Source: Eurostat

Prices expressed in Purchasing Power Standards (PPS) (see Figure 4.10), give an entirely different picture when expressed in EUR (see Figure 4.8).

Although Denmark and Sweden remain high in the ranking, Bulgaria is where the price of gas 'hurts' the most (22.87 PPS per GJ), although Bulgarian households paid the fifth-lowest price among EU countries when expressed in EUR.

Estonia registered the lowest gas prices both in terms of EUR and PPS.

4.2.3 Heating gas oil prices for delivery to household consumers

Directorate-General Transport and Energy of the European Commission collects heating gas oil prices on a half-yearly basis. Tables 4.11 and 4.12 present data referring to the prices applied around mid-January of each year. Therefore, price fluctuations throughout the year are not taken into account. However, these fluctuations could prove to be strategic, as households often stock up on heating oil only once per year and closely observe the prices before buying.

In 2008, the price for one litre of heating oil exceeded EUR 1.00 in four countries: Denmark, Sweden, Hungary and Italy (ranging from EUR 1.09 to EUR 1.20). Prices were much higher in these four countries than in most Member States: in 15 countries the price for one litre was below EUR 0.80; and even under EUR 0.70 in a further six, the lowest price being paid in Luxembourg (EUR 0.62).

Considering the breakdown of heating oil prices at national level, more than half of the retail price was made up by taxes in Sweden (53%) and Italy (50%). Heating gas oil taxes were also high in Denmark and Hungary (46%). Conversely, Malta is the only country where no VAT is charged on domestic fuel oil, and only 2.2% of other taxes were applied.

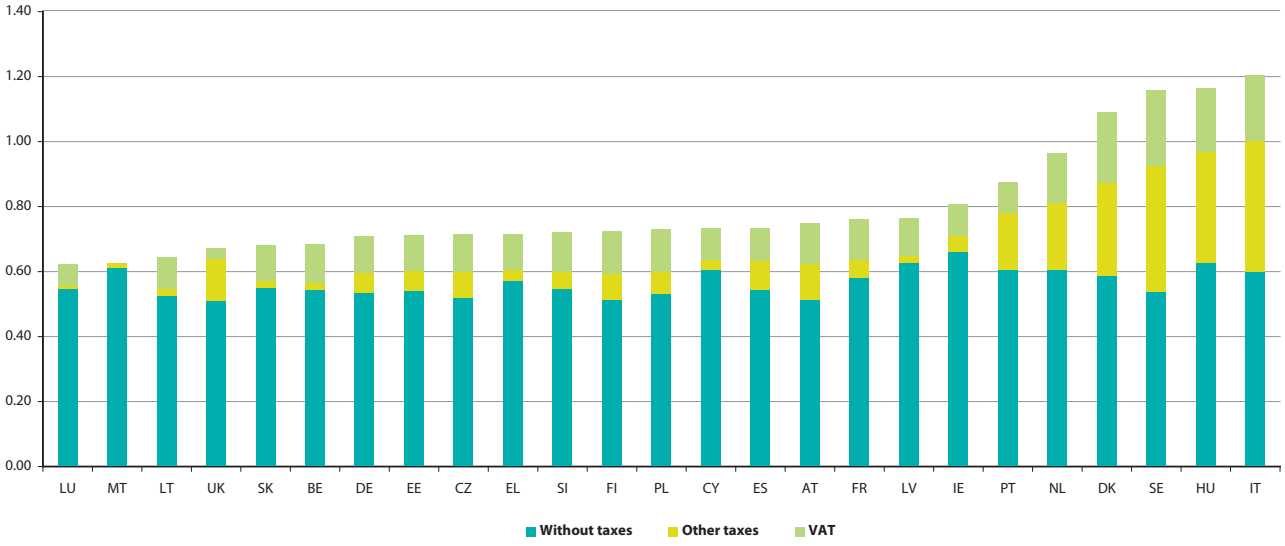
Table 4.11: Heating gas oil prices for household consumers, all taxes included, in EUR per litre

	1998	2003	2004	2005	2006	2007	2008
BE	0.199	0.319	0.303	0.372	0.549	0.494	0.683
CZ	:	:	:	0.492	0.611	0.554	0.715
DK	0.565	0.725	0.720	0.838	1.002	0.913	1.092
DE	0.223	0.401	0.334	0.431	0.588	0.537	0.708
EE	:	:	:	0.431	0.541	0.507	0.710
IE	0.263	0.465	0.444	0.526	0.685	0.630	0.808
EL	0.288	0.348	0.329	0.415	0.589	0.544	0.716
ES	0.282	0.428	0.374	0.446	0.585	0.552	0.734
FR	0.329	0.419	0.393	0.478	0.632	0.572	0.762
IT	0.722	0.875	0.851	0.952	1.102	1.046	1.203
CY	:	:	:	0.623	0.720	0.743	0.732
LV	:	:	:	0.474	0.601	0.589	0.764
LT	:	:	:	0.377	0.521	0.470	0.644
LU	0.221	0.324	0.300	0.377	0.504	0.457	0.623
HU	:	:	:	0.937	1.020	0.970	1.165
MT	:	:	:	0.370	0.557	0.559	0.627
NL	0.371	0.622	0.608	0.700	0.854	0.820	0.964
AT	0.313	0.422	0.427	0.493	0.645	0.582	0.748
PL	:	:	:	0.431	0.601	0.528	0.730
PT	:	0.465	0.425	0.500	0.649	0.622	0.876
SI	:	:	:	0.487	0.584	0.563	0.720
SK	:	:	:	0.428	0.583	0.560	0.682
FI	0.280	0.398	0.382	0.449	0.621	0.544	0.724
SE	0.505	0.698	0.778	0.853	0.992	0.976	1.156
UK	0.206	0.278	0.274	0.373	0.539	0.499	0.672

Note: Based on prices displayed on the first Monday following 15 January of each year

Source: Eurostat

Figure 4.12: Breakdown of heating gas oil prices for household consumers on 1 January 2008, in EUR per litre



Sources: Eurostat

4.2.4 Automotive fuel prices

One of the most visible signs of the evolution of energy prices are the prices paid at petrol stations for automotive fuels, as these are highly dependent on the evolution of crude oil prices.

Table 4.13 and Figure 4.14 offer an overview of the prices paid in each Member State (data are not available for Bulgaria and Romania) for one litre of premium unleaded gasoline (95 RON) as well as a breakdown of their price composition.

A turning point was reached during 2007, as the price for a litre of premium unleaded gasoline reached the EUR 1.00 mark in all Member States, ranging from EUR 1.01 in Estonia to EUR 1.49 in the Netherlands. One year earlier, 10 countries still reported prices below the EUR 1.00 mark.

In 2008, the three Baltic States and Cyprus registered the lowest prices at the pump; this has been the case since 2005 (the first year of data reporting in these countries).

As a rule, the price of gasoline was higher in 'old' Member States. For years, the Netherlands has registered the highest prices for premium unleaded fuel; amounting to EUR 1.49 in January 2008.

Looking at the breakdown, basic gasoline prices excluding taxes were the lowest in Germany and Sweden. At the same time, both countries registered the highest share of taxes in the price paid at the pump (64%). These were closely followed by six other Member States, with taxes accounting for more than 60% of the retail price.

Taxes on premium unleaded fuel were lowest in Cyprus, Malta and Latvia, ranging between 43% and 44% of the selling price.

Table 4.13: Premium unleaded gasoline prices (95 RON), all taxes included, in EUR per litre

	1998	2003	2004	2005	2006	2007	2008
BE	0.888	0.983	0.992	1.069	1.305	1.201	1.415
CZ	:	:	:	0.809	0.980	0.977	1.196
DK	0.856	1.107	1.071	1.098	1.267	1.173	1.335
DE	0.808	1.110	1.077	1.111	1.262	1.205	1.350
EE	:	:	:	0.674	0.842	0.782	1.012
IE	0.761	0.869	0.870	0.941	1.076	1.034	1.195
EL	0.689	0.753	0.738	0.767	0.941	0.912	1.100
ES	0.678	0.832	0.805	0.844	1.001	0.950	1.098
FR	0.941	1.046	0.997	1.038	1.220	1.169	1.338
IT	0.925	1.070	1.048	1.088	1.260	1.208	1.356
CY	:	:	:	0.757	0.894	0.861	1.024
LV	:	:	:	0.717	0.855	0.844	1.030
LT	:	:	:	0.708	0.890	0.796	1.020
LU	0.648	0.788	0.826	0.902	1.066	1.009	1.154
HU	:	:	:	0.958	1.053	0.999	1.146
MT	:	:	:	0.868	1.085	0.992	1.090
NL	0.966	1.159	1.188	1.248	1.407	1.342	1.494
AT	0.834	0.899	0.858	0.910	1.052	0.989	1.183
PL	:	:	:	0.875	0.970	0.943	1.182
PT	0.807	0.950	0.950	0.996	1.196	1.239	1.393
SI	:	:	:	0.820	0.919	0.974	1.059
SK	:	:	:	0.857	1.043	1.017	1.160
FI	0.960	1.084	1.052	1.143	1.232	1.169	1.355
SE	0.956	1.022	1.019	1.103	1.207	1.139	1.266
UK	0.951	1.141	1.101	1.130	1.298	1.313	1.395

Note: Based on prices displayed on the 1st Monday after the 15th January of each year

Source: Eurostat

Figure 4.14: Breakdown of premium unleaded gasoline prices (95 RON) on 1 January 2008, in EUR per litre

Sources: Eurostat

As for unleaded gasoline, the price of automotive diesel oil reached the EUR 1.00 mark during 2007 in all Member States for which data are available (see Table 4.15). In contrast, only nine Member States registered diesel prices higher than EUR 1.00 in 2007.

Although price comparisons in EUR over time for countries outside the euro area are not entirely appropriate (see the box at the beginning of the chapter), it is obvious from Table 4.15 that prices have substantially increased across the range between January 2007 and January 2008.

Looking at prices at national level, the United Kingdom registered by far the highest diesel prices at the pump, reaching EUR 1.46 per litre in January 2008. This was 16% more than in Italy (EUR 1.26 per litre), the second most expensive country in terms of diesel oil prices.

Diesel prices in the United Kingdom have been high for many years; this is largely due to the fact that taxes account for 60% of the retail price of diesel oil. As a matter of fact, in the UK diesel prices excluding taxes are the third-cheapest in the EU (EUR 0.57). However, when tax is added (comprising 76% in duties and 24% in VAT), the selling price on the forecourts soars.

Similarly to unleaded gasoline, the share of taxes in the retail price of diesel was lowest in Cyprus, Malta and Latvia, ranging from 38% to 40%.

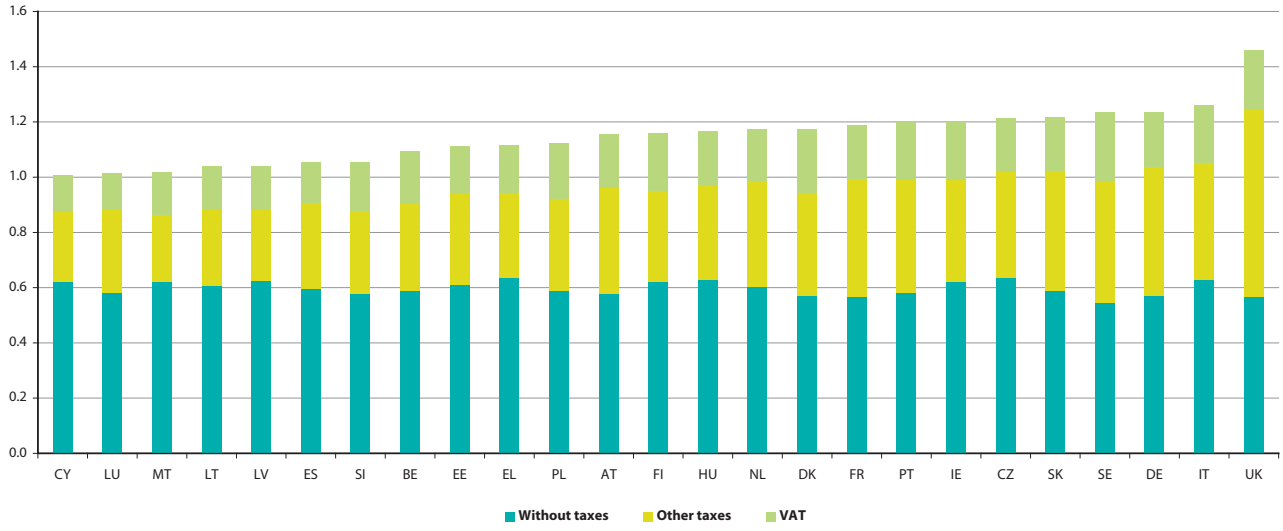
Table 4.15: Automotive diesel oil prices, all taxes included,in EUR per litre

	1998	2003	2004	2005	2006	2007	2008
BE	0.626	0.737	0.731	0.854	1.029	0.927	1.095
CZ	:	:	:	0.815	0.970	0.980	1.212
DK	0.647	0.858	0.823	0.909	1.075	0.987	1.174
DE	0.591	0.904	0.876	0.970	1.094	1.047	1.237
EE	:	:	:	0.697	0.860	0.811	1.111
IE	0.735	0.787	0.796	0.949	1.078	1.032	1.199
EL	0.515	0.657	0.642	0.774	0.919	0.916	1.116
ES	0.542	0.723	0.701	0.808	0.930	0.891	1.052
FR	0.673	0.818	0.791	0.914	1.054	1.011	1.187
IT	0.733	0.895	0.876	1.004	1.157	1.098	1.261
CY	:	:	:	0.722	0.869	0.831	1.007
LV	:	:	:	0.702	0.855	0.865	1.040
LT	:	:	:	0.715	0.878	0.813	1.039
LU	0.542	0.652	0.622	0.724	0.881	0.847	1.016
HU	:	:	:	0.937	1.020	0.970	1.165
MT	:	:	:	0.831	0.943	0.906	1.020
NL	0.670	0.803	0.826	0.909	1.043	1.007	1.173
AT	0.679	0.748	0.727	0.836	0.973	0.935	1.156
PL	:	:	:	0.830	0.965	0.917	1.122
PT	0.569	0.700	0.700	0.834	0.981	1.019	1.197
SI	:	:	:	0.816	0.914	0.924	1.055
SK	:	:	:	0.874	1.039	1.034	1.216
FI	0.668	0.818	0.776	0.876	0.997	0.960	1.161
SE	0.728	0.860	0.849	0.976	1.133	1.062	1.234
UK	0.955	1.163	1.126	1.201	1.358	1.380	1.460

Note: Based on prices displayed on the 1st Monday after the 15th January of each year

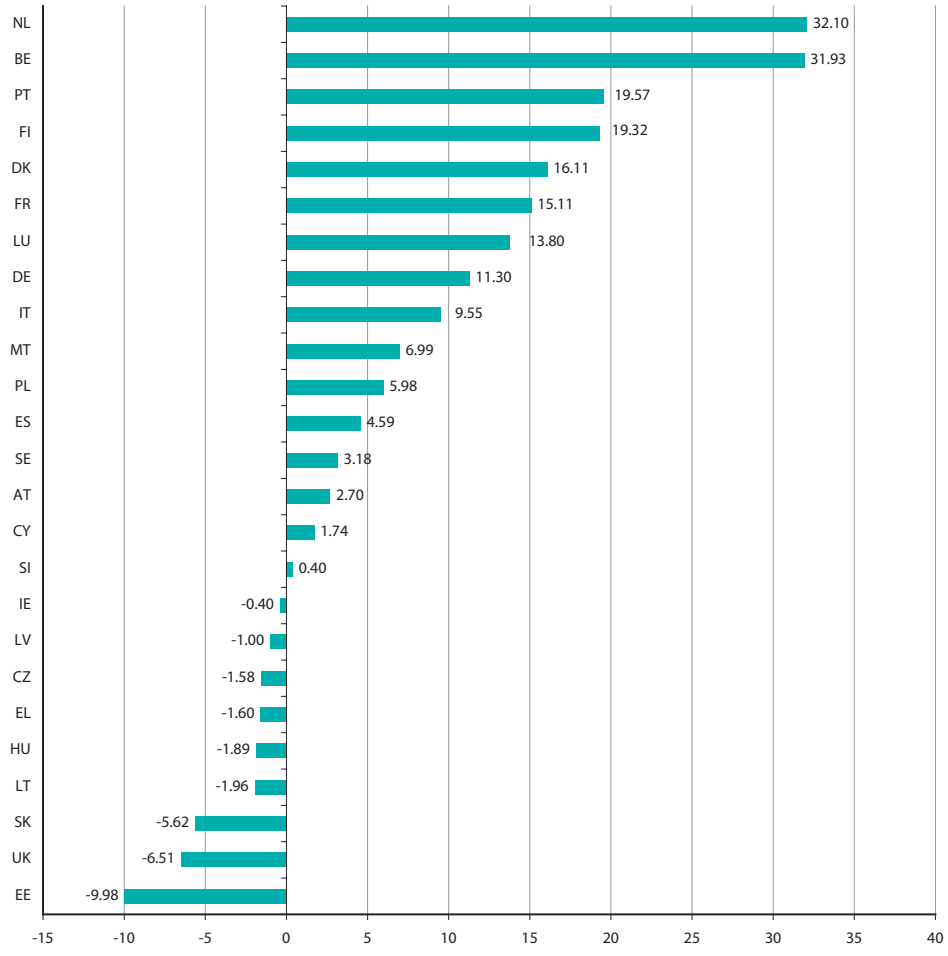
Source: Eurostat

Figure 4.16: Breakdown of automotive diesel oil prices on 1 January 2008, in EUR per litre



Sources: Eurostat

Figure 4.17: Price difference between premium unleaded gasoline (95 RON) and diesel oil on 1 January 2008, in cents per litre



Source: Eurostat

In recent years, automotive fuel prices have increased for both premium unleaded gasoline and diesel oil, but prices have risen faster for the latter. This means that the price gap between unleaded fuel and diesel is getting narrower. Between January 2007 and January 2008, premium unleaded gasoline and diesel prices have been converging in 21 Member States.

Whereas diesel was more expensive than unleaded fuel in only three Member States in January 2006 (Estonia, Ireland and the United Kingdom) this figure rose to nine in January 2008 (see Figure 4.17).

However, in the Netherlands and Belgium diesel was still considerably cheaper than premium unleaded fuel in January 2008 (around 32 cents cheaper). The difference amounted to around 20 cents in Portugal and Finland. On the contrary, diesel was nearly 10 cents more expensive than premium unleaded in Estonia.

The reduction in the price gap between both fuels can largely be ascribed to refining costs, as these are higher for diesel oil. Historically, diesel prices have been lower due to a lower tax regime. However, due to an increasing share of diesel-engine cars in most countries, the demand for diesel oil has also risen. The supply and demand principle made price for diesel increase faster than that of unleaded petrol. Between 2007 and 2008, the price gap has been decreasing particularly in Germany, Sweden and Slovenia.

4.3 Prices and taxes for industrial end-users

4.3.1 Electricity prices and taxes for industrial end-users

Based on industrial end-users consuming 2 GWh per year and excluding VAT (which is often deductible for industrial and commercial users subject to taxation), the average price of 100 kWh of electricity in the EU was EUR 9.18 in 2007, 9% more than the year before (EUR 8.42).

In 2007, EU electricity prices ranged from EUR 4.43 in Latvia to EUR 13.87 in Italy. Prices were relatively low in the Baltic States as well as in Bulgaria, Finland, France and Poland (less than EUR 6.00 per 100 kWh).

On the other side of the spectrum, electricity prices applied in Ireland, Cyprus, Germany and the Netherlands exceeded EUR 10.00 per 100 kWh, but remained nevertheless significantly lower than in Italy.

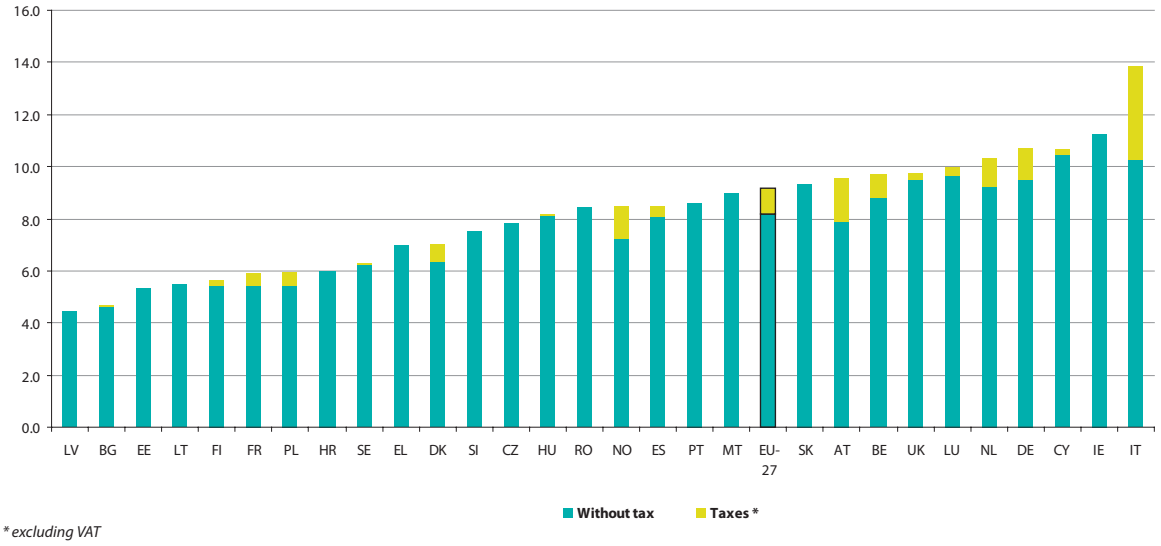
Table 4.18: Electricity prices for industrial end-users, VAT excluded, in EUR per 100 kWh

	1997	2002	2003	2004	2005	2006	2007
EU-27	:	:	:	:	7.56	8.42	9.18
BE	7.46	7.61	7.68	7.71	7.75	9.69	9.69
BG	:	:	:	4.09	4.29	4.60	4.70
CZ	:	5.18	4.99	4.92	6.01	7.31	7.83
DK	5.47	7.07	7.64	6.98	7.15	8.01	7.06
DE	8.45	7.21	8.20	8.63	9.03	9.94	10.69
EE	:	4.65	4.55	4.55	4.72	5.11	5.34
IE	6.91	7.68	7.76	8.12	9.30	10.11	11.25
EL	5.80	5.90	6.14	6.30	6.45	6.68	6.98
ES	7.03	5.47	5.55	5.66	7.21	7.57	8.51
FR	6.35	5.62	5.62	5.78	5.78	5.78	5.87
IT	9.63	10.12	10.78	10.26	10.93	12.08	13.87
CY	:	9.03	9.62	8.41	8.10	11.36	10.70
LV	:	:	:	4.31	4.09	4.09	4.43
LT	:	:	5.50	5.13	4.98	4.98	5.48
LU	7.37	7.09	7.35	7.56	8.51	8.95	9.95
HU	4.56	5.95	6.04	6.61	7.09	7.61	8.20
MT	5.96	6.98	6.36	6.20	7.06	7.11	8.97
NL	5.73	:	:	:	8.99	9.57	10.30
AT	8.38	:	:	7.59	8.27	8.63	9.52
PL	:	5.85	5.66	4.88	5.55	5.96	5.93
PT	7.49	6.65	6.73	6.84	7.13	8.17	8.60
RO	:	:	4.42	5.10	7.69	7.73	8.42
SI	6.22	5.99	5.82	6.09	6.11	6.51	7.50
SK	:	:	:	6.83	7.03	7.73	9.32
FI	4.57	4.44	6.11	5.89	5.73	5.63	5.65
SE	4.30	3.10	6.66	5.20	4.68	5.93	6.31
UK	6.04	6.40	5.63	5.01	5.93	8.22	9.74
HR	:	:	:	:	5.56	5.96	5.97
NO	4.42	4.33	5.60	5.42	6.49	6.46	8.47

Note: Based on the standard consumer Ie (2 GWh/year) on 1 January of each year

Source: Eurostat

Figure 4.19: Breakdown of electricity prices for industrial end-users on 1 January 2007, in EUR per 100 kWh



** excluding VAT*

Note: Based on the standard consumer Ie (2 GWh/year)

Source: Eurostat

Table 4.20: Share of taxes in electricity prices for industrial end-users on 1 January 2007

	Basic price	Other taxes (excl. V.A.T)	Taxes
	in € per 100 kWh		in %
LV	4.43	0.00	0.0
EE	5.34	0.00	0.0
IT	5.48	0.00	0.0
HR	5.97	0.00	0.0
EL	6.98	0.00	0.0
SI	7.50	0.00	0.0
CZ	7.83	0.00	0.0
RO	8.42	0.00	0.0
PT	8.60	0.00	0.0
MT	8.97	0.00	0.0
SK	9.32	0.00	0.0
IE	11.25	0.00	0.0
SE	6.26	0.05	0.8
HU	8.12	0.08	1.0
BG	4.65	0.05	1.1
CY	10.48	0.22	2.1
UK	9.50	0.24	2.5
LU	9.63	0.32	3.2
FI	5.42	0.23	4.1
ES	8.10	0.41	4.8
FR	5.41	0.46	7.8
PL	5.41	0.52	8.8
BE	8.80	0.89	9.2
DK	6.38	0.68	9.6
EU-27	8.20	0.98	10.7
NL	9.20	1.10	10.7
DE	9.46	1.23	11.5
NO	7.24	1.23	14.5
AT	7.86	1.66	17.4
IT	10.27	3.60	26.0

Note: Based on the standard consumer Ie (2 GWh/year)

Source: Eurostat

Figure 4.19 and Table 4.20 outline the share of taxes (excluding VAT) in the prices paid by industrial end-users.

Italy registered the highest electricity prices including taxes, which can largely be explained by the fact that taxes account for more than a quarter (26%) the retail price in Italy, by far the highest among EU Member States. When excluding taxes, Italy ranks third (EUR 10.27) behind Ireland (EUR 11.25) and Cyprus (EUR 10.48).

Industrial end-users in 11 Member States are exempt from paying taxes on electricity use (excluding VAT), and the share of taxes in most other countries is fairly low (less than 10% in 12 countries).

The reader should be aware that comparisons between the share of taxes in electricity prices at national level and the EU 27 average are not really appropriate, as the latter is mainly influenced by the very high share of taxes in Italy on the one hand, and by the absence of taxation (excluding VAT) in a large number of countries on the other.

4.3.2 Gas prices and taxes for industrial end-users

As mentioned above, most industrial consumers are exempt from paying value-added tax (VAT). This is why data from Tables 4.21 and 4.23 as well as Figure 4.22 do not take VAT into account.

As for electricity prices for industrial end-users, natural gas prices for consumers using 41 860 GJ per year increased by 9% between 2006 and 2007 (EUR 8.62 to EUR 9.37 per GJ – see Table 4.21).

However, this increase was less remarkable than the one incurred between 2005 and 2006 (33%).

In 2007, the lowest gas prices were applied in Estonia (EUR 3.69 per GJ), which also registered the lowest natural gas consumption for industrial end-users. Gas was the most expensive in Germany (EUR 13.27 per GJ), the country featuring the highest natural gas consumption in the EU in absolute terms.

As for electricity, gas for industrial use was the least expensive in Latvia, Lithuania and Bulgaria.

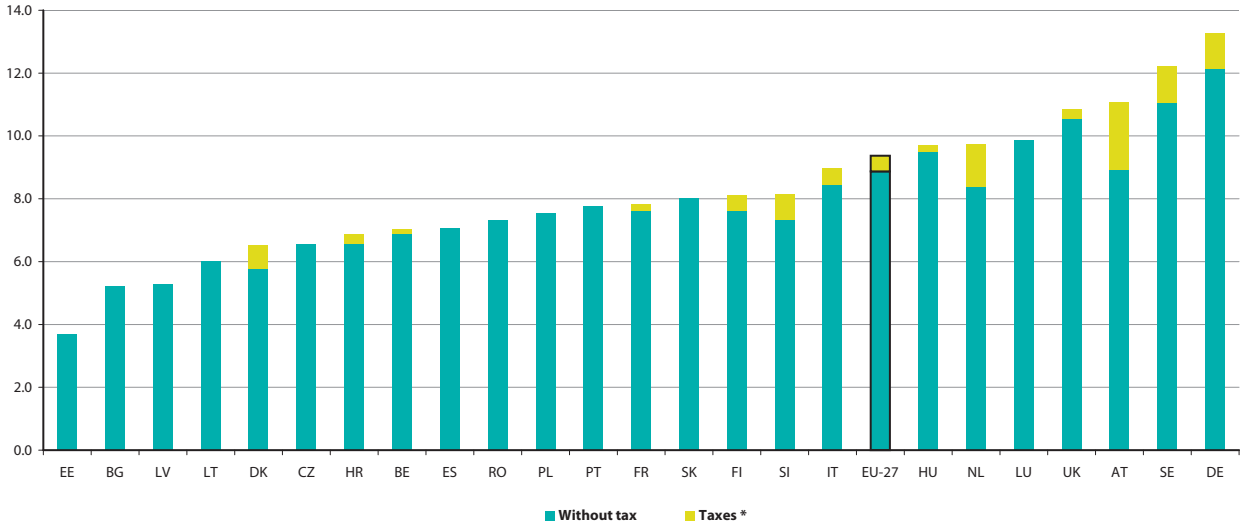
Table 4.21: Gas prices for industrial end-users, VAT excluded, in EUR per GJ

	1997	2002	2003	2004	2005	2006	2007
EU-27	:	:	:	:	6.50	8.62	9.37
BE	4.16	5.25	5.42	5.28	5.32	7.11	7.03
BG	:	:	:	3.50	3.78	4.50	5.22
CZ	:	4.68	4.14	4.20	5.11	7.34	6.56
DK	4.44	5.10	5.87	5.21	6.79	6.97	6.52
DE	5.47	7.90	7.84	7.50	8.87	11.58	13.27
EE	:	:	2.91	2.91	2.75	2.84	3.69
IE	3.83	4.88	4.94	:	:	:	:
ES	3.73	4.34	4.81	4.41	4.68	7.24	7.07
FR	3.77	5.13	5.66	5.32	6.42	8.25	7.83
IT	4.84	6.33	5.80	6.19	6.64	7.64	8.98
LV	:	:	:	3.47	3.48	4.05	5.29
LT	:	:	4.21	3.83	3.61	4.45	6.02
LU	5.01	5.90	6.17	5.94	6.95	9.01	9.85
HU	2.88	4.91	5.20	5.63	6.03	8.18	9.70
NL	4.12	:	:	6.69	7.47	9.37	9.74
AT	5.68	6.71	6.42	7.64	8.19	10.82	11.06
PL	:	6.15	5.59	4.26	5.30	6.77	7.54
PT	:	6.26	6.39	5.68	6.03	7.63	7.76
RO	:	:	2.29	2.83	3.68	6.23	7.32
SI	3.81	7.28	5.28	4.80	5.89	7.96	8.13
SK	:	:	:	5.33	5.08	7.66	8.00
FI	4.30	6.69	6.85	6.73	6.91	7.79	8.09
SE	5.37	9.14	7.87	7.65	9.20	12.26	12.21
UK	2.89	5.91	5.18	4.99	6.10	9.21	10.85
HR	:	:	:	:	6.73	6.88	6.89

Note: Based on the standard consumer I3-1 (41860 GJ/year) on 1 January of each year

Source: Eurostat

Figure 4.22: Breakdown of gas prices for industrial end-users on 1 January 2007, in EUR per GJ



** excluding VAT*

Note: Based on the standard consumer I3-1 (41860 GJ/year)

Source: Eurostat

Table 4.23: Share of taxes in gas prices for industrial end-users on 1 January 2007

	Basic price	Other taxes (excl. V.A.T)	Taxes
	in € per GJ		in %
EE	3.69	0.00	0.0
BG	5.22	0.00	0.0
LV	5.29	0.00	0.0
LT	6.02	0.00	0.0
CZ	6.56	0.00	0.0
ES	7.07	0.00	0.0
RO	7.32	0.00	0.0
PL	7.54	0.00	0.0
PT	7.76	0.00	0.0
SK	8.00	0.00	0.0
LU	9.85	0.00	0.0
BE	6.89	0.14	2.0
HU	9.48	0.22	2.3
FR	7.63	0.20	2.6
UK	10.55	0.30	2.8
HR	6.58	0.31	4.5
EU-27	8.87	0.50	5.3
IT	8.46	0.52	5.8
FI	7.61	0.48	5.9
DE	12.15	1.12	8.4
SE	11.06	1.16	9.5
SI	7.33	0.80	9.8
DK	5.77	0.75	11.5
NL	8.40	1.34	13.8
AT	8.91	2.15	19.4

Note: Based on the standard consumer I3-1 (41860 GJ/year)

Source: Eurostat

Among the 23 EU Member States for which data were available in January 2007 (Cyprus, Ireland, Greece and Malta excluded), 11 did not levy any taxes on gas. This was chiefly the case in new Member States.

On the other side of the scale, high gas prices in Germany were less the result of taxation (8%), than high basic prices (EUR 12.15).

The highest taxes on gas were registered in Austria (19.4%), which consequently recorded the third-highest retail prices in the EU. However, when looking at Austrian prices excluding taxes, these were very close to the EU-27 average. (EUR 8.91 against EUR 8.87 respectively).

It is again recalled that comparisons between the share of taxes at national level and the EU-27 average are not really appropriate as the latter is heavily influenced by high taxation in Austria on the one hand, and by the large number of countries where no taxes are applied on the other.

4.3.3 Residual fuel oil prices and taxes for delivery to industrial end-users

Residual fuel oil was mainly used in the past to power boilers, railroad locomotives and steamships; demand for it accordingly decreased during the 1980s and 1990s. Residual fuel oil is the cheapest liquid fuel on the market, but the fact that it requires a special heating system and increasing environmental restrictions have made it less attractive.

Table 4.24 and Figure 4.25 are restricted to industrial use of residual fuel oil, the largest market for this type of fuel (mostly for heating purposes).

Although price comparisons in EUR between two periods for countries outside the euro area can be somewhat problematic (see box at the beginning of this chapter), Table 4.24 shows that prices have increased in all Member States between January 2007 and January 2008, with the exception of Ireland.

The very high taxes applied to residual fuel oil in Sweden and Denmark (50.1%) have resulted in the highest residual fuel oil prices in the EU (excluding VAT), reaching EUR 840 per tonne in Sweden and EUR 677 per tonne in Denmark.

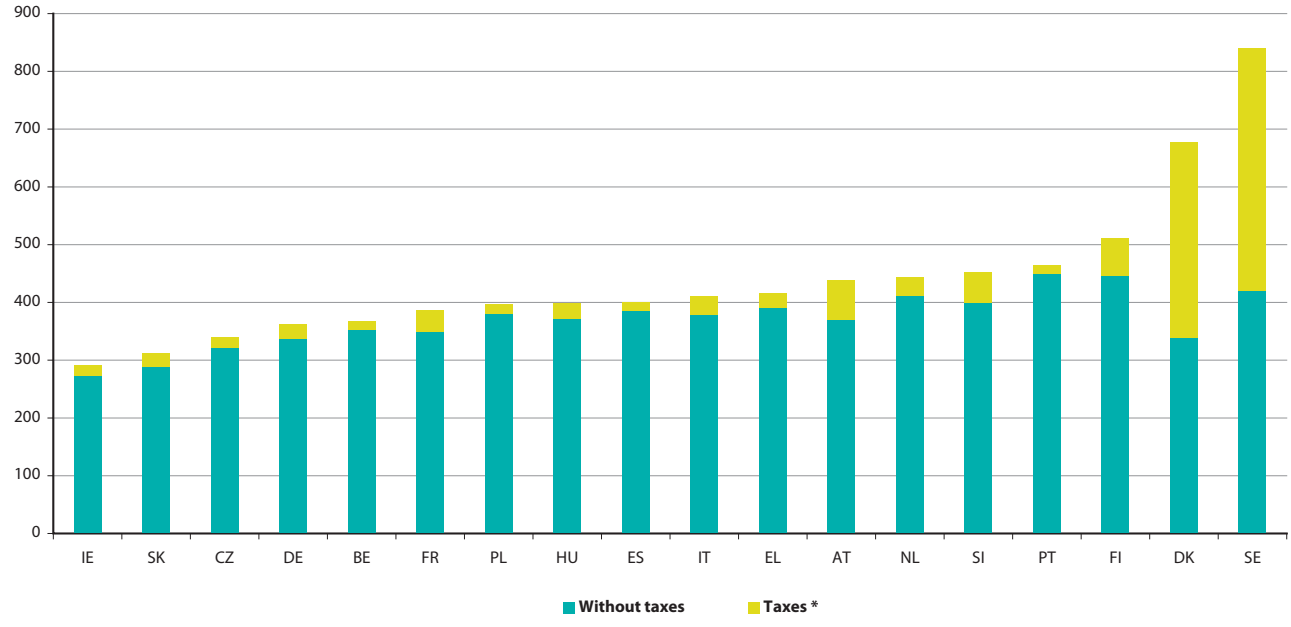
Table 4.24: Residual fuel oil prices for industrial end-users (monthly deliveries of less than 2 000 tonnes or annual deliveries of less than 24 000 tonnes), VAT excluded, in EUR per tonne

	1998	2003	2004	2005	2006	2007	2008
BE	100.81	199.60	147.83	166.18	264.44	216.19	367.70
CZ	:	:	:	163.97	261.99	240.66	339.35
DK	135.27	258.19	480.66	530.48	652.84	575.00	677.00
DE	113.88	202.45	165.10	169.90	286.00	238.25	363.00
EE	:	:	:	113.25	:	:	:
IE	161.77	:	255.75	259.23	404.22	348.10	290.59
EL	165.79	250.91	209.52	201.76	336.77	257.56	415.14
ES	145.52	252.96	200.40	213.36	349.88	285.97	400.00
FR	106.44	217.78	173.07	193.36	302.81	239.69	386.66
IT	138.33	239.33	217.99	245.89	361.72	275.78	411.16
CY	:	:	:	:	:	:	:
LV	:	:	:	:	:	:	:
LT	:	:	:	224.17	:	:	:
LU	117.40	208.91	176.42	170.59	:	:	:
HU	:	:	:	212.95	316.49	303.39	399.12
MT	:	:	:	:	:	:	:
NL	155.20	237.00	237.00	223.00	338.00	300.51	443.00
AT	140.28	233.04	179.04	216.70	337.70	294.70	438.70
PL	:	:	:	168.90	263.34	308.54	396.21
PT	150.20	254.00	224.11	235.27	379.91	329.02	464.29
SI	:	:	:	253.09	362.68	325.97	451.52
SK	:	:	:	194.44	245.39	270.50	313.00
FI	186.81	318.74	261.02	307.85	433.92	361.17	511.47
SE	357.90	550.95	580.40	623.92	750.82	674.05	840.17
UK	129.76	243.92	202.53	227.78	400.24	341.96	:

Source: Eurostat

Excluding taxes (see Figure 4.25), residual fuel oil prices were the highest in Portugal and Finland. Denmark was the second most expensive place to purchase residual fuel oil, but basic prices excluding taxes were quite low, and on par with German prices (the fourth-cheapest Member State including taxes). In relative terms, the lowest taxes on residual fuel oil other than VAT were applied in Portugal and Spain (3% and 4% respectively).

Figure 4.25: Breakdown of residual fuel oil prices for industrial end-users on 1 January 2008, in EUR per tonne



** excluding VAT*

Source: Eurostat

5

New developments in Eurostat's energy statistics

5.1 Renewable energy sources

The benefits of renewable energy

Renewable energies are energy sources derived from natural processes that are replenished constantly. Renewable energy derives directly or indirectly from the sun, from heat generated deep within the earth or is generated from solar, wind, geothermal, biomass, hydropower and ocean resources, solid biomass, biogas and liquid biofuels.

Energy can no longer be taken for granted: climate change, increasing extra-EU dependence on oil and solid fuels and soaring energy costs easily drive us to this statement. In such a framework, renewable energy becomes a key element to help achieving a more sustainable future. Its development has many advantages, be it from an environmental or economic point of view. It is widely recognised that climate change is driven by energy consumption of fossil fuels and renewable energy can contribute to a reduction of the emissions of greenhouse gases. By definition, the usage of renewable energy sources makes the supply of energy more secure and can therefore tackle the issue of oil prices. Furthermore, the EU can be considered a leader in renewable energy applications, boosting high-tech industries, offering new economic opportunities and constituting a non-negligible source of industrial development and employment.

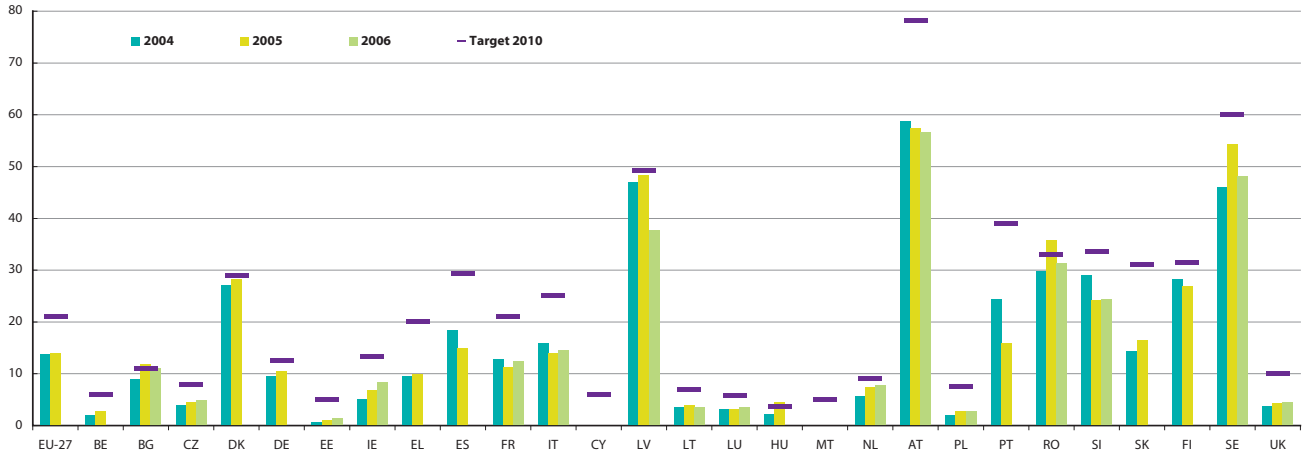
Current political and legal framework for the development of renewable energy

Two directives are currently in place and fix targets for 2010. EU Directive 2001/77/EC concerns electricity produced from renewable sources and aims at reaching a share of 21% at the level of the EU, setting individual targets for the various Member States (see Figure 5.1).

EU Directive 2003/30/EC aims at promoting the use of biofuels in petrol and diesel for transport. It fixes a minimum proportion of biofuels and other renewable fuels put on the national markets. The overall EU objective for 2010 is a proportion of 5.75 % for all transport fuels put on the national markets.

Nevertheless, these two legal acts are not sufficient to respond to the newest objectives fixed by the Spring European Council in March 2006[1], tackling mainly the security of supply, competitiveness and environmental sustainability.

Figure 5.1: Share of electricity produced from renewable sources, in %



Source: Eurostat

New objectives, new proposed legislation

This call from the European Council resulted in the adoption in January 2007 of new proposals from the European Commission for a more ambitious and integrated policy for Europe in order to tackle the issues of climate change and energy supply. The Spring European Council of March 2007 endorsed the plan and called for new objectives:

- 20% increase in energy efficiency
- 20% of reduction in greenhouse gas emissions
- 20% share of renewables in overall EU energy consumption by 2020
- 10% biofuel component in transport fuel by 2020

However, these overall objectives can't be reached without a legislative framework which would ensure equitably the participation of all Member States. Therefore, the Commission made a proposal for a new Directive[(2)] establishing binding national targets in terms of renewable energy.

As mentioned in the Article 3 and developed in the Annex I.A of the Proposal (see Table 5.2), the first objective concerns the share of energy from renewable sources in final consumption of energy in 2020, set at 20%. Whereas the targets fixed by the two Directives in place on renewables were set at the level of energy supply, the new approach focuses on the share of renewables in the final energy consumption.

Article 5 of the proposed Directive defines the final energy consumption and the three sectors it concerns: final consumption of electricity from renewable energy sources; final consumption of energy from renewable sources for heating and cooling, and final energy from renewable sources (biofuels) consumed in the transport sector (see Figure 5.3).

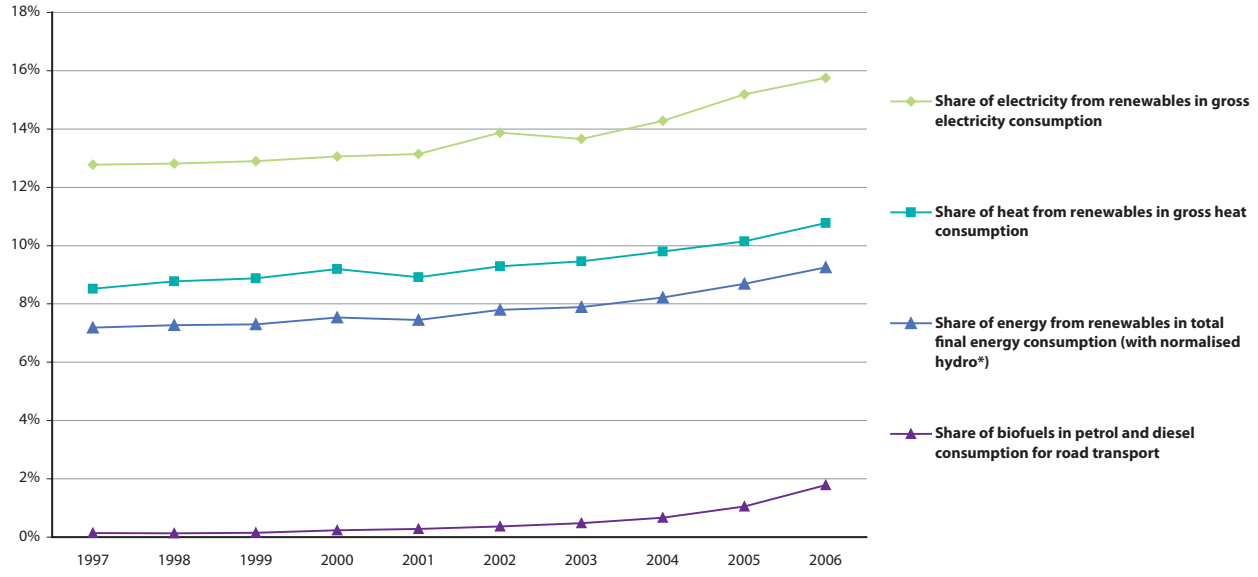
These three elements constitute the overall national target. Member States have the freedom to decide on the mix of contributions from these three sectors to reach their target in the most effective manner according the particularities of their country. They also have the possibility to contribute to their objective by supporting the development of renewable energy outside their country (other Member States or third countries). Yet, Article 3 also stipulates that the share of renewable sources in transport (biofuels) should represent at least 10% of the final consumption of energy in transport by 2020. This target concerns all Member States individually.

Table 5.2: Share of energy from renewable sources in final consumption of energy in 2005 and targets for 2020 (as displayed in the Proposal for a Directive)

	Share of energy from renewable sources in final consumption of energy, 2005	Target for share of energy from renewable sources in final consumption of energy, 2020
	(S2005)	(S2020)
Belgium	2.2%	13.0%
Bulgaria	9.4%	16.0%
Czech Republic	6.1%	13.0%
Denmark	17.0%	30.0%
Germany	5.8%	18.0%
Estonia	18.0%	25.0%
Ireland	3.1%	16.0%
Greece	6.9%	18.0%
Spain	8.7%	20.0%
France	10.3%	23.0%
Italy	5.2%	17.0%
Cyprus	2.9%	13.0%
Latvia	34.9%	42.0%
Lithuania	15.0%	23.0%
Luxembourg	0.9%	11.0%
Hungary	4.3%	13.0%
Malta	0.0%	10.0%
Netherlands	2.4%	14.0%
Austria	23.3%	34.0%
Poland	7.2%	15.0%
Portugal	20.5%	31.0%
Romania	17.8%	24.0%
Slovenia	16.0%	25.0%
Slovak Republic	6.7%	14.0%
Finland	28.5%	38.0%
Sweden	39.8%	49.0%
United Kingdom	1.3%	15.0%

Source: COM(2008) 19 final, 2008/0016(COD) Proposal for a directive on the promotion of the use of energy from renewable sources

Figure 5.3: Share of energy from renewable energy sources, EU-27, 1997-2006



* Normalisation based on hydro capacity in the last 15 years

Source: Eurostat

The statistical system: the role of Eurostat

As requested by the Council Recommendation of 9 June 1988[3], Eurostat and Member States developed together a common statistical system for the collection of data on renewable energy sources. This was supported financially by the European Commission until 1998. In 1999, a joint questionnaire on Renewables and Wastes was created by Eurostat, the International Energy Agency (IEA) and the United Nations (UNECE). This questionnaire has been enlarged over time and is still in use. The statistics collected enabled to monitor the initial target of a 12% share of renewable energy in the gross inland consumption by 2010[4]. They also enabled to establish and monitor the targets stipulated in the two Directives on renewable energy currently in use.

In the framework of the new Energy policy and the new calculation methodology of the targets, the quality of the data collected on renewable energy needs further development, especially those linked to final energy consumption.

A better quality is also required for the data on final energy consumption of the other energy commodities. In this perspective, Eurostat established in 2007 a standing Working Group to examine the quality of renewable energy statistics and implementing actions for improving it.

The final step is an adaptation of the Regulation on energy statistics and especially the Annex dedicated to renewable energy. The dissemination of the improved statistics on renewable energy is expected from 2010 onwards.

The energy production from renewable sources steadily increasing

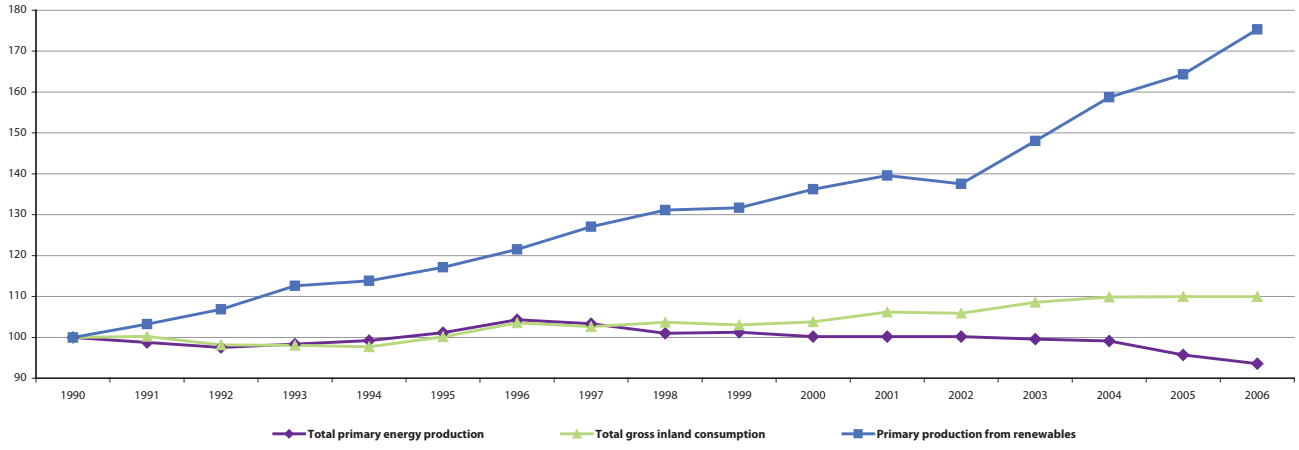
Figure 5.4 outlines the development of the primary production of energy from renewable sources compared to total primary production and the gross inland consumption of energy.

Despite a drop in 1992 and a peak in 1996, the total primary production of energy remained relatively stable from 1990 to 2002. The decrease observed from 2002 onwards has intensified in 2005 and in 2006 (-6.5% compared to 1990).

Whereas its evolution was similar to that of the total primary energy production until 1997, the total gross inland consumption increased slightly but steadily from that year onwards. In 2006, its level stood 10% higher than in 1990. The gap between both curves explained the increasing energy dependency of the EU, resulting in growing energy imports.

On top of these two curves is the development of primary production of energy from renewables. It has steadily risen from 1990 to 2001. Despite a slight drop in 2002, the primary production from renewable energy is increasing at a fast pace, a development that can largely be attributed to fairly recent political measures and incentives. In 2006, the primary production of energy from renewable sources had increased by 75% compared to 1990.

Figure 5.4: Primary energy production 1990-2006, EU-27 (1990=100)



Source: Eurostat

Table 5.5 offers details at national level as well as key indicators for the year 2006.

Whereas France had been the largest primary energy producer from renewable energy sources in absolute terms until 2004, Germany took over the leadership from 2005 onwards. In 2006, the 21 169 tons of oil equivalent (toe) produced in Germany accounted for close to 17% of the total amount of energy produced from renewables in the EU. Whereas the French production has remained fairly stable over the years, the German production more than doubled since 2000 and increased by 37% between 2004 and 2006. France's production remains mainly based on hydro sources whereas the increase of Germany can mainly be attributed to wind power.

Table 5.5: Primary energy production from renewable energy sources, in 1000 TOE

	1990	1995	2000	2004	2005	2006	2006: Share in EU-27 primary prod. from renewables	2006: Share in total national primary energy prod.	2006: Share in national gross inland consumption
							(in%)	(in %)	(in %)
EU-27	72 685	85 130	99 031	115 352	119 440	127 419	100.0	14.6	7.0
BE	649	599	641	955	1 176	1 335	1.0	10.0	2.2
BG	161	369	780	1 009	1 149	1 173	0.9	10.8	5.7
CZ	100	598	595	1 919	2 012	2 200	1.7	6.7	4.8
DK	1 199	1 534	2 065	2 835	2 955	2 957	2.3	10.0	14.1
DE	5 829	6 516	9 628	15 418	17 492	21 169	16.6	15.5	6.1
EE	450	487	512	679	680	624	0.5	16.2	11.5
IE	168	155	235	282	367	420	0.3	26.3	2.7
EL	1 105	1 289	1 403	1 554	1 634	1 793	1.4	17.8	5.7
ES	6 256	5 602	7 016	8 972	8 709	9 442	7.4	30.3	6.6
FR	16 317	18 615	18 065	17 447	16 844	17 261	13.5	12.7	6.3
IT	6 391	7 540	8 548	11 875	11 528	12 198	9.6	45.1	6.6
CY	6	42	44	48	48	50	0.0	100.0	1.9
LV	1 062	1 354	1 393	1 837	1 854	1 839	1.4	99.8	39.8
LT	321	501	656	745	776	813	0.6	25.1	9.6
LU	47	47	57	73	74	79	0.1	100.0	1.7
HU	523	626	516	966	1 185	1 282	1.0	12.4	4.6
MT	-	-	-	-	-	-	-	-	-
NL	959	1 151	1 824	2 106	2 257	2 389	1.9	3.9	3.0
AT	5 010	5 862	6 705	6 879	6 950	7 019	5.5	73.2	20.6
PL	1 597	3 924	3 809	4 325	4 550	5 055	4.0	6.6	5.1
PT	3 281	3 321	3 826	3 894	3 578	4 320	3.4	100.0	17.0
RO	2 606	2 797	4 040	4 594	4 984	4 831	3.8	17.6	11.8
SI	254	542	788	822	774	771	0.6	22.6	10.5
SK	328	503	506	758	881	886	0.7	14.1	4.7
FI	5 273	6 133	7 742	8 671	8 078	8 654	6.8	48.7	22.9
SE	11 740	13 073	15 040	13 544	15 285	14 813	11.6	45.9	29.1
UK	1 054	1 950	2 600	3 146	3 625	4 048	3.2	2.2	1.8
HR	864	719	879	977	901	929		22.5	10.4
TR	9 658	10 776	10 149	10 783	10 131	10 539		39.7	11.1
IS	1 400	1 565	2 306	2 519	2 636	3 259		100.0	:
NO	11 469	11 575	13 296	10 632	12 987	11 604		5.2	46.4

Source: Eurostat

In 2006, France ranked second with 17 261 TOE, a value close to that of Germany only a year before. Sweden and Italy follow with 14 813 TOE and 12 198 TOE respectively. Together, these four countries account for more than half of the total primary energy production from renewable energy sources in the EU (51%).

The second last column of Table 5.5 gives the proportion of energy produced from renewables in the total primary energy production of the respective country. Cyprus, Luxembourg, Portugal (100%) and, to a slightly lesser degree, Latvia (99.8%), produce energy only from renewable energy sources. Figures depend on the respective geographical characteristics of the countries but also on national policies.

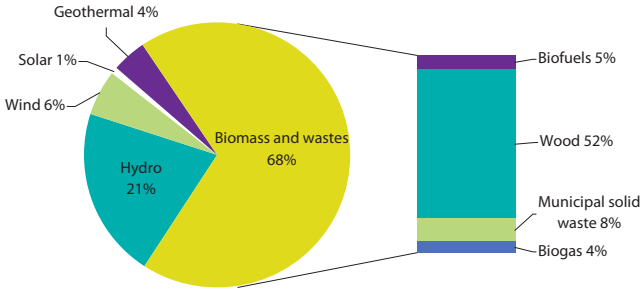
The share of energy produced from renewable in the gross inland consumption of energy is displayed in the last column of Table 5.5. This figure constitutes the reference indicator used until now in terms of renewable energy. The overall proportion in the EU reached only 7% in 2006, still far from the indicative objective of a 12% target by 2010, as set out in the White Paper[5] in 1997.

Two thirds of the renewable energy originates from biomass and wastes

Biomass and wastes are the main renewable sources of energy production in the EU (68%, see Figure 5.6). Hydro ranks second with a share of 21%, while wind, geothermal and solar account for less significant proportions (6%, 4% and 1% respectively).

Within the biomass and wastes category, wood and wood wastes account for three quarters, i.e. its share represents 52% of the total energy production from renewables. Municipal solid wastes represent 8% of this total amount while biofuels and biogas account for 5% and 4% respectively. It should be mentioned that municipal wastes also includes the non-biological fraction as many Member States are unable to split municipal wastes into biological and non-biological content, the latter supposed to be excluded from renewables.

Figure 5.6: Primary energy production from renewable energy sources – breakdown by individual source, 2006, EU-27



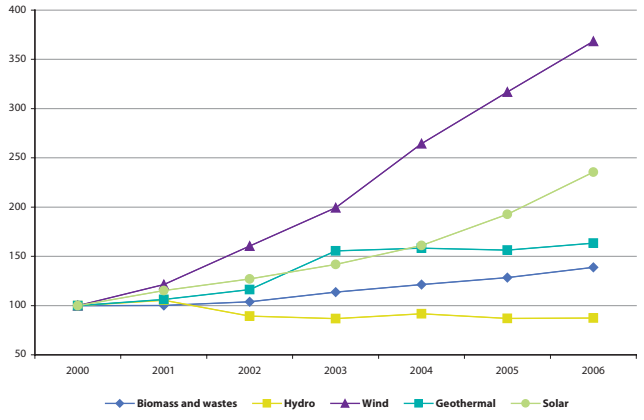
Source: Eurostat

Wind energy: a new breath of life

In terms of individual sources, wind and solar energies have witnessed the fastest development since 2000 (see Figure 5.7). The primary production from wind energy has more than tripled between 2000 and 2006 while that from solar energy has more than doubled over the same period.

To a lesser degree, geothermal energy (essentially produced in Italy) and energy produced from biomass and wastes have also increased (+63% and +39% respectively from 2000 to 2006).

Figure 5.7: Development of primary production from renewables, EU-27, 2000-2006



Source: Eurostat

50% of the EU's hydro energy from three countries

As seen earlier, energy produced from hydro represents 20.8% of the total amount of primary energy produced from renewable sources (see also Table 5.8). Despite this second rank, hydro is the unique renewable source which indeed saw a decrease in its share of primary production over the last six years. This decrease is not attributable to lower production figures but rather to an increase of the other renewable sources.

In 2006, 20% of all the EU's hydro energy was produced in Sweden; France and Italy ranked second and third with shares of 18% and 12% respectively. These three countries together were responsible for half of the total energy production from hydro sources in the EU in 2006.

In Austria and Slovakia, the energy production from hydro represented nearly 43% of their respective national energy production from renewables. Slovenia also recorded a noticeable proportion (40%). Conversely, the shares in Denmark, Estonia and the Netherlands were below 1%.

Beyond the EU borders, hydro is by far the main renewable source for energy production in Norway (89%) and, to a lesser degree, in Croatia (56%).

Table 5.8: Primary energy production from hydro sources, in 1000 TOE

	1990	2000	2006	2006: Share in total primary energy prod. from RES (in %)	2006: Share in EU-27 total (in %)
EU-27	25 101	30 374	26 515	20.8	100
BE	23	39	31	2.3	0.1
BG	161	230	364	31.0	1.4
CZ	100	151	219	10.0	0.8
DK	2	3	2	0.1	0.0
DE	1 498	1 869	1 714	8.1	6.5
EE	0	0	1	0.2	0.0
IE	60	73	62	14.8	0.2
EL	152	318	520	29.0	2.0
ES	2 184	2 534	2 198	23.3	8.3
FR	4 635	5 822	4 845	28.1	18.3
IT	2 719	3 812	3 181	26.1	12.0
CY	-	-	-	-	-
LV	387	242	232	12.6	0.9
LT	36	29	34	4.2	0.1
LU	6	10	9	11.4	0.0
HU	15	15	16	1.2	0.1
MT	-	-	-	-	-
NL	7	12	9	0.4	0.0
AT	2 709	3 598	2 999	42.7	11.3
PL	139	181	176	3.5	0.7
PT	787	974	946	21.9	3.6
RO	1 460	1 271	1 578	32.7	6.0
SI	254	330	309	40.1	1.2
SK	162	406	378	42.7	1.4
FI	934	1 261	988	11.4	3.7
SE	6 234	6 757	5 307	35.8	20.0
UK	436	437	396	9.8	1.5
HR	322	505	516	55.5	
TR	1 990	2 655	3 804	36.1	
IS	361	547	627	19.2	
NO	10 437	11 945	10 267	88.5	

Source: Eurostat

Development of biomass in Germany

It has been seen that biomass and wastes are the main sources of renewable energy production in the EU (see Figure 5.6). Table 5.9 reveals further information at national level.

Whereas France was clearly the EU leader in terms of energy production from biomass and wastes in the 1990's, Germany has been taking over this leadership since 2005. The energy production from biomass and wastes has remained relatively stable in France between 1990 and 2006. Over the same period, the German production from biomass and wastes increased from 4.3 to 16.2 million TOE.

Germany represented 18.5% of the overall energy production from biomass and wastes in the EU. Despite a stable production in the course of the past years, France still ranked second (14%). In Sweden however, production from biomass increased steadily since 1990, and is now catching up fast (11% of the EU production in 2006) with France.

Table 5.9: Primary energy production from biomass and wastes, in 1000 TOE

	1990	1995	2000	2005	2006	Share in EU-27 total in 2006
EU-27	44 175	53 008	62 914	80 847	87 293	100.0
BE	623	567	596	1 127	1 267	1.5
BG	0	219	550	743	774	0.9
CZ	0	426	444	1 803	1 973	2.3
DK	1 140	1 423	1 687	2 371	2 408	2.8
DE	4 307	4 447	6 849	12 976	16 175	18.5
EE	450	486	512	674	616	0.7
IE	108	92	141	216	217	0.2
EL	893	898	946	990	1 006	1.2
ES	4 047	3 563	4 035	5 131	5 173	5.9
FR	11 552	12 146	12 087	12 113	12 072	13.8
IT	696	1 115	1 572	3 404	3 758	4.3
CY	6	11	9	6	7	0.0
LV	675	1 101	1 150	1 564	1 603	1.8
LT	285	469	627	734	776	0.9
LU	41	39	44	59	63	0.1
HU	422	526	415	1 078	1 174	1.3
NL	945	1 113	1 732	2 050	2 123	2.4
AT	2 283	2 636	3 024	3 624	3 737	4.3
PL	1 458	3 762	3 625	4 340	4 844	5.5
PT	2 479	2 550	2 770	2 931	3 011	3.4
RO	1 146	1 362	2 763	3 229	3 235	3.7
SI	0	263	458	476	462	0.5
SK	166	76	100	473	501	0.6
FI	4 338	5 021	6 474	6 878	7 651	8.8
SE	5 502	7 204	8 238	8 938	9 415	10.8
UK	611	1 494	2 069	2 921	3 251	3.7
HR	542	267	374	355	412	
TR	7 207	7 067	6 546	5 332	5 160	
IS	0	1	2	3	2	
NO	1 032	1 140	1 349	1 278	1 279	

Source: Eurostat

Wood and wood wastes: the main category of biomass

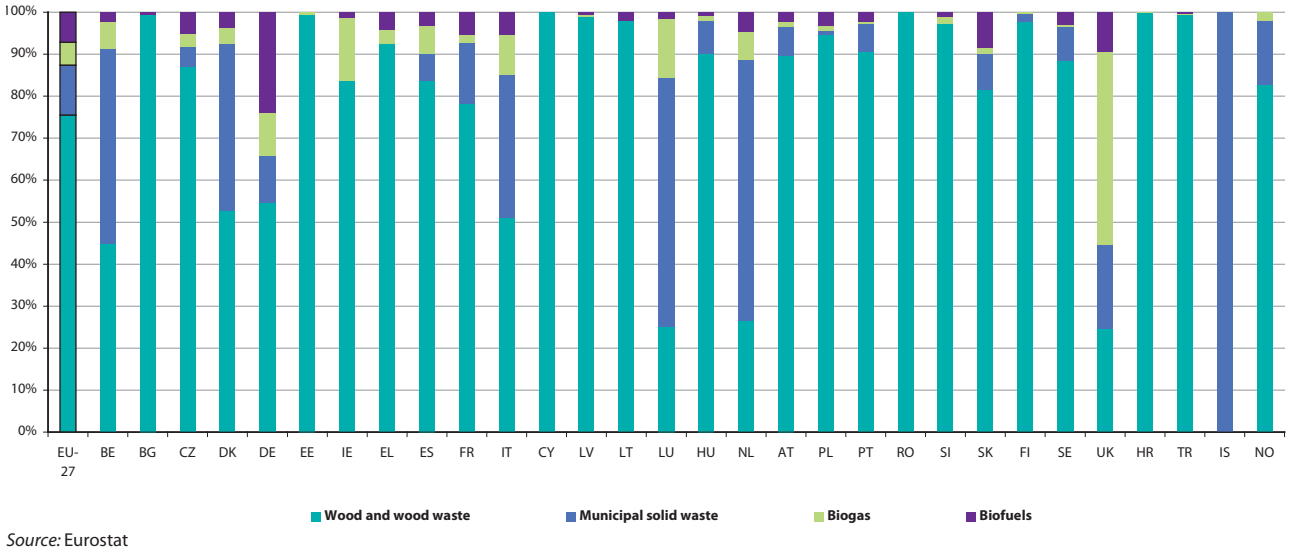
Figure 5.10 gives a breakdown of the primary energy production from biomass and wastes in 2006.

Wood and wood wastes represent the largest proportion in 22 out of the 26 EU Member States (no information for Malta). This situation is particularly noticeable in nine countries, where the share of wood and wood wastes is over 95%. These countries are essentially the Scandinavian and Baltic States (with abundant forestry industry) as well as Bulgaria and Romania.

In the Benelux countries, the incineration of municipal solid waste appears to be the most developed (share of 62% in the Netherlands, 60% in Luxembourg and 46% in Belgium). This is also the unique category of biomass in Iceland, although in absolute terms, the quantity of energy produced is not really significant (2 000 TOE).

Biogas and biofuels generally make a smaller contribution. Yet biogas contributed to 46% of the energy production from biomass and wastes in the United Kingdom in 2006, the largest share among the EU countries by a large margin. Similarly, 24% of the energy produced from biomass and wastes in Germany are made up of biofuels.

Figure 5.10: Primary energy production from biomass and wastes: share by category, 2006



Source: Eurostat

New targets for 2020: ambitious objectives

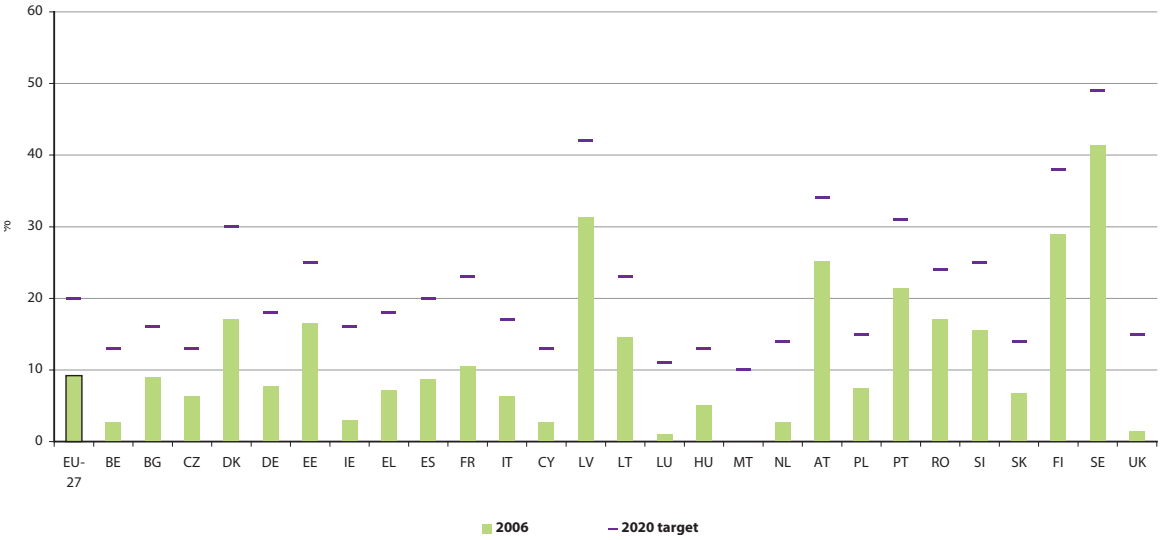
The Proposal for a Directive on renewable energy is establishing new targets in terms of shares of energy from renewable energy sources in the final energy consumption for 2020.

Figure 5.11 illustrates these individual Member States' targets and compares them with the situation in 2006.

In 2006, the overall proportion in the EU reached 9.2%.

Sweden and Latvia are the countries with the highest targets (49% and 42% respectively).

Figure 5.11: Share of energy from renewable sources in final consumption with normalized hydro in 2006 and targets for 2020



	EU-27	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	IT	CY	LV
2006	9.2	2.7	9.0	6.4	17.1	7.8	16.6	3.0	7.2	8.7	10.5	6.3	2.7	31.4
2020 target	20.0	13.0	16.0	13.0	30.0	18.0	25.0	16.0	18.0	20.0	23.0	17.0	13.0	42.0

	LT	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK
2006	14.6	1.0	5.1	0.0	2.7	25.2	7.5	21.5	17.1	15.6	6.8	28.9	41.4	1.5
2020 target	23.0	11.0	13.0	10.0	14.0	34.0	15.0	31.0	24.0	25.0	14.0	38.0	49.0	15.0

Source: Eurostat

5.2 New methodology on gas and electricity prices

There has always been a substantial public interest in electricity and gas prices, as they affect all members of society. Reliable supply at acceptable prices is not only a key driver of economic growth and competitiveness; it also affects private households' expenditure pattern. The massive rise in energy prices in recent years has increased the interest in price statistics. Eurostat has been collecting price information at EU level since the 1980s but found itself in an increasingly difficult situation as the statistical collection methods gradually became less adapted to reflect the real market situation.

Figures gradually less relevant

Indeed, the main cause can be found in the liberalisation of the gas and electricity markets in the European Union, which was decided to bring the energy sector in line with the competitive parts of its economy. Directive 2003/54/EC (electricity) and Directive 2003/55/EC (gas) concerning common rules for the internal market gave deadlines for the market opening. Certain countries anticipated the liberalisation process; others were slower in adopting the necessary measures. As a result, network and supply were unbundled, more retailers entered the market, all with their own prices and supply contracts.

Since 1990, gas and electricity prices have been collected according to Council Directive 90/377/EEC 'concerning a Community procedure to improve the transparency of gas and electricity prices charged to industrial end-users'. As suggested in the Directive's name, this legal act constituted the legal basis for prices charged to industrial and large commercial customers. In parallel, a method for the collection of prices paid by household consumers was developed and applied on a voluntary basis.

With the market liberalisation, initiated in the United Kingdom at the end of the 1990's and a couple of years later in most other EU Member States, Council Directive 90/377/EEC became less and less relevant, essentially for the following reasons.

- Prices are no longer based on fixed and published tariffs but are individually negotiated.
- The regional aspect in prices paid is no longer relevant and there is a tendency towards 'national' prices. Formerly, there were indeed noticeable differences in prices paid, depending on economic factors and/or regional population density.
- Council Directive 90/377/EEC required Member States to provide statistical information applying to 'standard consumers' (with a specified average quantity consumed). This was often considered too rigid and there was a call for information on the basis of consumption ranges.
- The Directive made provisions for price snapshot to be published twice a year: Member States had to report gas and electricity prices applicable on 1 January and 1 July of the respective year. Variations that might occur during these six-month intervals are therefore not reflected in the figures.

No more snapshots

Hence, the need for a new price collection method became increasingly necessary.

On 7 June 2007, Commission Decision 2007/394/EC 'amending Council Directive 90/377/EEC with regard to the methodology to be applied for the collection of gas and electricity prices charged to industrial customers' was adopted. The main changes are the following:

- Prices recorded are based on a system of consumption bands.
- Prices are still collected twice per year (on 1 January and 1 July) but now refer to the average prices paid by end-users over the previous six months.
- Prices are recorded as national weighted average prices.

The first communication of price data to Eurostat will reflect the average price paid by end-users during the second half of 2007.

Whereas the former legislation set out that information should be provided according to typical consumers with a specific annual consumption, the new Commission Decision specifies a number of consumption bands.

OLD

(Council Directive 90/377/EEC)

Standard industrial consumer categories

I_1: 418.6 GJ annual consumption, no load factor

I_2: 4 186 GJ annual cons., modulation 200 days

I_{3-1}: 41 860 GJ annual cons., modulation 200 days

I_{3-2}: 41 860 GJ annual cons., modulation 250 days

I_{4-1}: 418 600 GJ annual cons., modulation 250 days

I_{4-2}: 418 600 GJ annual cons., modulation 330 days

I_5: 4 186 000 GJ annual cons., modulation 330 days

For gas prices, the reporting procedures are as follows:

NEW

(Commission Decision 2007/394/EC)

Industrial End-User – Annual gas consumption in GJ

	Lowest	Highest
Band – I1:		< 1 000
Band – I2:	1 000	< 10 000
Band – I3:	10 000	< 100 000
Band – I4:	100 000	< 1 000 000
Band – I5:	1 000 000	<= 4 000 000

Similarly, the number of surveyed electricity consumer categories have been reviewed and modified:

OLD

(Council Directive 90/377/EEC)

Standard industrial consumer categories

Ia: 30 MWh annual electricity consumption

Ib: 50 MWh annual electricity consumption

Ic: 160 MWh annual electricity consumption

Id: 1 250 MWh annual electricity consumption

Ie: 2 000 MWh annual electricity consumption

If: 10 000 MWh annual electricity consumption

Ig: 24 000 MWh annual electricity consumption

Ih: 50 000 MWh annual electricity consumption

Ii: 70 000 MWh annual electricity consumption

NEW

(Commission Decision 2007/394/EC)

Industrial End-User – Annual electricity consumption expressed in MWh

	Lowest	Highest
Band – IA:		< 20
Band – IB:	20	< 500
Band – IC:	500	< 2 000
Band – ID:	2 000	< 20 000
Band – IE:	20 000	< 70 000
Band – IF:	70 000	<= 150 000

A new legal act further supported by a voluntary element

In order to remain in the scope of former Council Directive, the largest consumer category according to the Commission Decision that amends it covers the 1 to 4 million GJ band (gas) and 70 to 150 thousand MWh band (electricity). However, on a purely voluntary basis, Member States also report average prices paid by industrial end-users that go beyond this band. Indeed, it was agreed to include an 'open band' for those end-users that consume more than 4 million GJ of gas and more than 150 thousand MWh of electricity respectively.

Furthermore, it is specified what price information is to be supplied by the Member States; and here too, some changes were introduced. Whereas the former Directive asked for the basic price, the price with taxes and duties (but without VAT), and the price inclusive of all taxes and duties (i.e. including VAT), the recent Commission Decision somewhat altered the requested price levels. The following elements will have to be reported.

- Basic price, i.e. with no taxes, duties or value-added tax
- Price including non-recoverable taxes and duties
- Price including recoverable and non-recoverable taxes and duties (i.e. incl. VAT).

As most industrial and commercial customers are exempt from paying value-added tax, the reporting of the gas and electricity prices including non-recoverable taxes and duties is of particular interest, as this category represents the real price that is paid by industry.

Households not covered by Commission Decision

The former Council Directive applied to 'industrial end-users' and so does the recent Commission Decision amending it. Households are hence not covered by a legal act. Nevertheless, household prices have been collected in the past on the basis of a voluntary agreement between Eurostat and the Member States. With the reporting principles changing for industrial end-users, changes in the agreement for the reporting of prices paid by households became necessary, too. Eurostat has managed to bring along the necessary changes and as from the 1st of January 2008 onwards, price information of industrial end-users and households are now reported according to the same principles.

One might question the utility of collecting, among the industrial end-users, the gas and electricity prices inclusive of all recoverable and non-recoverable taxes and duties (incl. VAT), as these commercial customers either do not pay certain taxes or get partially refunded. Here, the interest lies in the fact to be able to compare prices paid by the industry and by households. Apart from this comparison, the main interest will be focused on 'prices including non-recoverable taxes and duties' for industrial end-users and 'prices including all taxes' (i.e. including value-added tax) for households.

Price split for electricity only

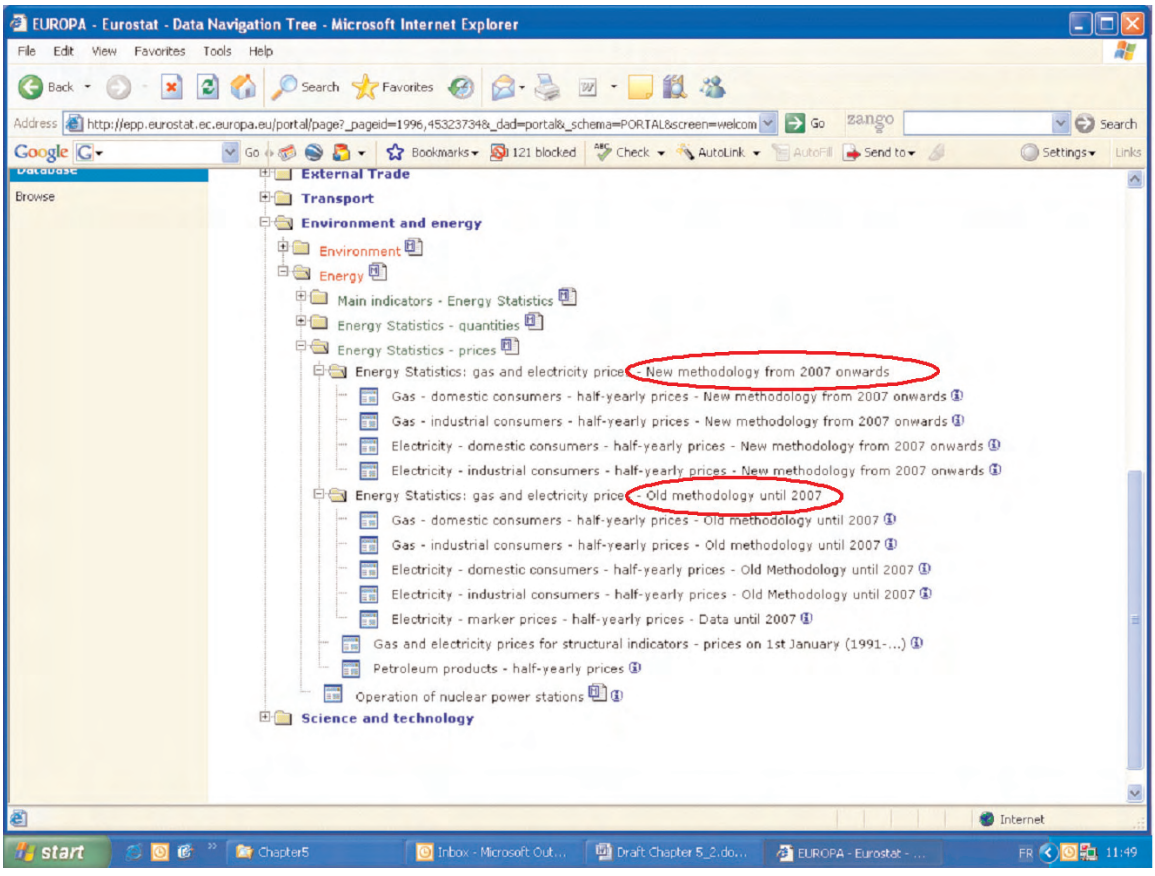
Reflecting the unbundling of network operators and suppliers in the electricity market, the recent Commission Decision also requires the Member States to report the industrial end-user prices according to their main components, but only once per year (during the January reporting relating to the second half of the previous year). Indeed, point n in Annex II of Commission Decision 2007/394/EC stipulates that the following components should be made available:

- The network price
- The 'energy and supply' price (total price minus network price and minus all taxes and levies)
- Taxes and levies.

A new start of time series

The changes brought about in the recent Commission Decision are such that a comparison with the statistics reported in the framework of the old Council Directive is hardly possible: instead of a twice yearly price snapshot there are now average half-yearly prices. Also, prices are no longer based on tariffs but are weighted average prices on the basis of market shares of the gas and electricity vendors. A retro-active correction of historic data is quite impossible and so is a coupling of time series.

This lack of comparability made Eurostat decide to create a new set of tables in its reference database NewCronos. Users that log to this free accessible database will find separate trees for price data until and after 2007.



One exception concerns the 'Structural Indicators', a multi-topic set of statistical indicators used to underpin the Commission's analysis in their annual progress reports to the European Council (also available through Eurostat's reference database NewCronos). Here, the structure inherent to this data collection made Eurostat decide to keep the time series and introduce a 'break in series'. The relevant table in the Structural Indicators' collection, composed of information stemming from the EU legal act (industrial end-users) and voluntary agreements (households) still includes four consumer categories, but the standard consumption quantity formerly used was replaced by consumption bands.

Structural Indicators

	OLD	NEW
Gas for industrial end-users	Consumer type I3-1: 41 860 GJ / year	Consumer type I3: 10 000 – 100 000 GJ / year
Gas for households	Consumer type D3: 83.7 GJ / year	Consumer type D2: 20 – 200 GJ / year
Electricity for industrial end-users	Consumer type Ie: 2 000 MWh / year	Consumer type Ic 500 – 2 000 MWh / year
Electricity for households	Consumer type Dc: 3 500 kWh / year	Consumer type Dc 2500 – 5 000 MWh / year

Implementation

As suggested earlier, the transition from the old to the new methodology occurred mid-2007. For the 1 July dataset, to be reported two months after the end of the reference period, Member States were offered the possibility to report either the snapshot prices (old method, situation on 1 July 2007) or the average prices (new method, average prices applying during the first half year of 2007). For the dataset in question, the majority of the Member States still reported according to the old method. The new method was already applied by 7 Member States. It is recalled that as from 1 January 2008, all have to report according to the new method.

Eurostat does more than only compiling

Finally, the role of Eurostat is not limited to the gathering of data coming from the various reporting authorities. The price statistics being expressed in national currency, Eurostat proceeds to the conversion in Euro for non-Eurozone countries. This conversion is performed on the basis of the average of the two quarterly Euro exchange rates. Furthermore, the households prices are expressed in Purchasing Power Standards (PPS). Using PPS eliminates the differences in price levels between countries, giving a more accurate picture of the relative purchasing power of households.

Also, the various aggregates (EU-27, EA) are calculated, based on weighted average consumption figures. It should be noted that detailed gas and electricity consumption figures become available substantially later. Hence, the 2008 aggregate data will be weighted with the consumption figures of 2006. These aggregate data are however updated as soon as more recent consumption figures become available.

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European Commission

Panorama of energy – Energy statistics to support EU policies and solutions

Luxembourg: Office for Official Publications of the European Communities

2009 — 138 pp. — 21 x 29.7 cm

ISBN 978-92-79-11151-8
ISSN 1831-3256

Price (excluding VAT) in Luxembourg: EUR 30