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Inventory of public aid granted to different energy sources

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1. INTRODUCTION

The Green Paper "Towards a European strategy for the security of energy supply"¹ drew attention to the opaque nature of State aid in the energy sector and recognised the need to draw up an inventory of all forms of State aid granted by the Member States to various energy products.

This is the approach adopted in the Directive of the European Parliament and of the Council on the promotion of renewable energy sources.² Article 8 of the Directive provides that, on the basis of reports drawn up by Member States, the Commission shall present to the European Parliament and the Council a summary report on the implementation of the Directive. In particular, the report will identify any discrimination between different energy sources. In the light of the conclusions of the report, the Commission should, if appropriate, submit an EU framework proposal concerning schemes providing aid to electricity produced from renewable energy sources.

Similarly, various working parties within the Commission have also acknowledged the need to make a comparative examination of the various sources of energy, including renewable energies and Euratom loans.

A working party has therefore been set up by the Commission to study trends at national and EU level in the treatment and support of various sources of energy.

The findings of this study will ensure, firstly, that the public aid granted is consistent with the political priorities of the European Union, in particular with regard to transport policy, energy policy, and EU policy on security of supply and the promotion of renewable types of energy. The next stage is to verify whether certain energy sources are, through aid schemes, given advantages that do not adhere to the objectives of energy policy and combating climate change, as has been the case in the past.

The first phase in this wide-ranging exercise was to draw up an initial factual inventory of public aid granted to the various energy sources. It is important for the Commission to have a clear insight into the whole range of public aid granted at national and EU levels in order to enable the European Union to launch a genuine debate on energy policy and the options available and to determine whether some energy sources are given more advantages than others.

The findings of this first exercise are summed up in this document. The technical reports on public aid in respect of each source of energy are annexed to this document.

2. METHODS

This inventory identifies and records the various national and EU measures taken in the field of energy, where the relevant information is available. It is an initial document containing factual information which may be used as a frame of reference for energy policy and the monitoring and assessment of public aid to the various energy sources. It may also provide the starting point for a reform of national and EU aid schemes and for analysing their impact on the relevant markets (e.g. electricity, transport, heating markets, the industrial market). As this is the first report or inventory of this type compiled by the Commission, the information it contains should be treated with caution. The inventory is based on the information available and will be updated when further information becomes available.

¹ COM(2000) 769 final, adopted on 29 November 2000.

² Directive 2001/77/EC of the European Parliament and of the Council of 27.9.2001, OJ L 283/33, 27.10.2001.

The inventory goes beyond the strict legal concept of State aid. In order to investigate any discrimination between energy sources, the inventory must be as wide-ranging as possible, covering all the public aid with an effect on the various energy sources. It therefore covers measures that go beyond the strict concept of State aid as defined, for example, in Article 87 of the EC Treaty. The concept of public aid is based on economic data, not on the legal criteria laid down in the EC Treaty.

What does the inventory cover? A broad definition of public aid. The inventory should cover measures likely to offer direct or indirect advantages to the energy source, in particular, all measures to (i) maintain consumer prices below market prices, (ii) maintain producer prices higher than market prices, (iii) reduce costs for consumers and producers by means of direct or indirect aid.

The most common forms of aid covered by this inventory are listed below. (The list is not comprehensive.)

- direct (non-refundable) aid/subsidies,
- interest-free or low-interest loans, interest rate subsidies and State/public guarantees,
- injection of public capital in cases which would be rejected by private investors,
- long-term tolerance of an inadequate rate of return on public investments or even losses,
- exemption from taxes, levies, duties or parafiscal taxes,
- tax benefits, such as:
 - more favourable depreciation terms than the rest of the economy,
 - reserves (exempt from tax on income/profits) higher than necessary in order to cover forthcoming commitments,
- advantageous conditions for the purchase of public-owned land or buildings,
- advantageous conditions for the provision of goods or services by public organisations,
- public funding of R&D activities,
- measures as in the case of Preussen Elektra,³ which do not involve State resources,
- aid to consumers in order to promote a particular energy source (e.g. gas heating),
- general financial rules which do not necessarily involve the transfer of funds to given energy sources (e.g. price fixing, limitation of liability, etc.).

Apart from this list, the concept of public aid to energy sources is open-ended and, as such, can cover new measures not specifically listed here. Forthcoming studies and/or initiatives will make it possible to draw up a more accurate list of measures which have, or may have, a substantial economic impact on the markets in question.

Nor is the analysis limited to national aid, as it also includes measures taken at EU and even at international level.

Lastly, the measures listed are measures which, it is presumed, may afford advantages to specific energy sources. However, no detailed financial and legal analysis is carried out in order to assess whether a measure listed actually does offer economic advantages to operators. The inclusion of a

³ CJEC, judgment in the Preussen Elektra Case of 13 March 2001, C-379/98. According to this judgment, the fact that German law requires electricity supply undertakings to purchase electricity produced from renewable energy sources at minimum fixed prices does not mean that this constitutes State aid within the meaning of Article 87(1) of the EC Treaty as it does not involve any transfer of public resources.

measure in the list cannot, therefore, be interpreted as recognition of any sort of specific advantage by the Commission. The wording used should prevent any legal interpretation of this kind.

The inventory gives quantitative information where it is available. For other types of aid, where quantitative information is not readily identifiable, it analyses the relevant features of the aid.

Where such information is available, the inventory gives specific details of the amounts of aid granted each year to the different energy sources. This is facilitated in particular by the vast amount of information provided for some energy sources in the Commission's annual reports. One example is the information on State aid to the coal industry examined by the Commission in accordance with the ECSC Treaty. At the same time, given that this inventory is an initial analysis document covering a wide factual area, using a methodology which must remain flexible, there is no attempt to quantify and/or compare, in every instance, the amounts of all the existing aid. There are some aid measures which are occasionally difficult to assess in figures or for which figures either do not exist or have not been forwarded to the Commission. In such cases, the inventory takes a more qualitative approach, analysing the broad outline of aid for which quantitative information either is not available or is hard to assess. This approach is fleshed out by an additional investigation quantifying in greater detail the aid already listed or to be listed. When this stage has been completed, the possibility of drawing up a summary table will be ascertained. The summary table should make it possible to compare the amounts of public aid identified for each energy source for the purposes of this operation.

Reference period for which the inventory lists the aid identified. On practical grounds, the period covered by the study has been confined to the period following the opening up of energy markets (in application of, for instance, Directive 96/92 on the internal electricity market and Directive 98/30 on the internal gas market). The report therefore covers the late 1990s, before which time European energy markets, particularly gas and electricity markets, were not opened up to competition. Nonetheless, a comprehensive qualitative overview of aid granted in the past, of which the Commission is aware and whose effects may still be observed, is appended to the inventory.

The inventory as a tool to monitor the future impact of aid on the various markets in question.

There is no attempt in the inventory to assess the impact of each type of aid on the markets in question (internal energy market, transport markets, domestic markets, heating market, etc.) in quantitative terms. This will be done at a later stage. Details of the context and specific features of each source, as well as the level of any aid granted, will be needed to evaluate impact and relations between energy sources at a later date. In this document, the aim has therefore been to describe the specific features (legal, economic, political and even social) and, in some instances, the reasons traditionally cited to justify the aid. In no case should these comments be taken as meaning that the Commission endorses the measures. The wording used should prevent any legal interpretation of this kind.

Classification of aid: comparable treatment of the various energy sources. One of the objectives highlighted in the Green Paper and in Directive 2001/77/EC is to undertake a comparison of the various forms of public aid granted to the various energy sources. This document endeavours to provide a comparable classification of the different types of public aid. The inventory therefore covers possible forms of public aid on the basis of the various cost components for each energy source. All the analyses include the three traditional cost components borne by the economic operator, i.e. investment, operating costs (fuel) and operating costs other than fuel-related. The inventory also identifies other forms of possible public aid more closely linked with horizontal elements such as financial costs, taxation, research and development, and different treatment in

relation to external factors.⁴ This approach should eventually make it possible to undertake a better comparison of the supported aspects (costs) of the various energy sources and hence identify any discrimination between the different sources.

3. RESULTS

The analysis results, broken down according to energy source, are summed up below.

3.1. Oil and Coal

Solid fuel and oil make up a significant part of the European Union's energy supply. While most Member States have ceased solid fuel production on their territory, this source of energy still accounts for nearly 15% of gross domestic energy consumption in the European Union. One reason for the relative stability of the share of solid fuel in overall energy consumption is the fact that EU coal has been replaced by imported coal. Oil constitutes the primary source of energy, accounting for 40% of gross domestic energy consumption in the European Union. In absolute terms, oil consumption continues to rise, driven by demand from the transport sector.

By way of introduction, mention should be made of the question of the external costs connected with the extraction and use of these sources of energy. While it is far from easy to quantify these costs, it is nevertheless clear from studies carried out on the subject that they are highest for solid fuels and oil than for other sources of energy. Only part of these costs is internalised, even though industry has made major efforts in recent years to reduce the environmental impact inherent in the extraction and use of coal and oil. It should be noted, however, that these external costs are generated by the sectors (e.g. the transport sector) which use the fuels.

3.1.1. Solid fuels

The Commission has found that significant amounts of aid are granted by the Member States for the extraction of EU coal, which since 1965 has largely been overtaken by imported coal. Four countries (France, Germany, Spain and the UK) are still producing coal. Only the United Kingdom has successfully maintained a more or less competitive coal industry, at the cost of extensive mine closures. Lignite mining and peat extraction do not, however, benefit from any State aid.

Despite the efforts made by coal-producing countries to increase productivity, the gap between production costs and world market prices for coal is such that it is difficult to discern a genuine improvement in operating conditions (except in the United Kingdom). The current reduction in coal production in the four coal-producing Member States has led to a steady reduction in the volume of aid. Nonetheless, the amount of aid granted remains high (€6 300 million in 2001 for the EU as a whole). The aid is authorised by the Commission in accordance with the provisions adopted under the ECSC Treaty.

The ECSC Treaty expired on 23 July 2002. In July 2001, the Commission adopted a proposal for a Council Regulation on aid to the coal industry to be granted after that date. The proposed scheme is based on continued access to coal reserves in the context of security of supply. Under the new scheme, however, aid payments to the coal industry will be gradually phased out. The Council adopted the Regulation in question on 23 July 2002 (Council Regulation (EC) No 1407/2002 on State aid to the coal industry, OJ L 205, 2.8.2002). France will have ceased all coal production by

⁴ Impact on the environment and health, either subject to payment through taxes or pollution rights schemes, or without payment in the case of public savings and accident risk coverage schemes (insurance, probabilistic assessment of accident costs in excess of the ceiling covered).

2005, and Germany has already undertaken to reduce its production significantly after the ECSC Treaty expires.

In addition to granting State aid directly to the coal industry, some Member States have implemented measures to promote the use of solid fuel in electricity generation. These measures concern the electricity generating sector directly, but nevertheless also constitute indirect aid to the solid fuels whose use is promoted (peat, coal and lignite). In the same context, Directive 96/92/EC on common rules for the internal electricity market enables Member States to give priority, up to a 15% limit, to electricity produced by generating plants using indigenous primary energy fuel sources. This provision also constitutes a form of aid - albeit indirect - to solid fuels.

Solid fuels have also benefited from research-related measures. Part of the ECSC's operational budget is earmarked for research (€23 million in 2001 for coal). The fact is, however, that these funds originate from levies imposed on coal and steel production and it is therefore industry that pays contributions, as it were, to fund this budget. Under the provisions of the Treaty of Nice of 26 February 2001, not yet ratified, revenue from reserves accumulated through these levies will, upon the expiry of the ECSC Treaty, be allocated to research in the coal and steel sectors (approximately €8 million a year for coal). Moreover, successive programmes for EU research, technological development and demonstration activities (Thermie (1994-1998), Energie (1998-2002)) also set aside part of their budgets for solid fuel research (totalling €30 million for 1999, 2000 and 2001). Priority is given to promoting clean coal techniques. There has, however, been a clear drop in EU funding for solid fuel research, with priority being increasingly given to new and renewable energies. The sixth research programme (2002-2006) provides no funds for solid fuel research. Nonetheless, projects will be carried out with the support of the EU programme with a view to developing capture and sequestration technologies for CO₂, a by-product of fossil-fuel combustion generated by power plants operated using coal, gas or oil.

3.1.2. Oil

The information available to the Commission does not show a great deal of State aid to the oil sector to promote oil production.

EU legislation lays down minimum rates for excise duty on the different categories of mineral oil (petrol, diesel oil for motor vehicles, diesel oil for heating, fuel oil, etc.). It also makes provision for various types of exemptions from or reductions of excise duty, some mandatory and others optional. It would, however, be rash to consider these derogating measures as forms of aid to oil. The fact is that most of these reductions and exemptions are not meant to promote the use of mineral oils. Rather, they are measures generally intended to benefit an economic sector by reducing the tax burden or to promote more environmentally friendly products. Furthermore, the tax rate on mineral oils in the Member States, even where there are reductions in excise duty rates, is much higher than that on other primary energy sources, such as coal and natural gas. In this context, the concept of aid to oil through reductions of or exemptions from excise duty is one that ought to be examined with care.

EU funding of research is another highly significant form of aid to oil. Between 1975 and 1998, nearly €750 million were allocated by the EU to research projects and projects for the demonstration of innovative technologies in the hydrocarbon sector (oil and gas). The original aim was to promote prospecting and extraction in the North Sea with a view to ensuring the security of the energy supply. There has been a gradual change in the projects selected, the current objectives being to enhance the competitiveness of the oil sector and protect the environment. As in solid fuel sector research, there has been a distinct reduction in EU funding of research in the oil sector (about

€45 million over 1999, 2000 and 2001). Oil is not included in the priorities of the sixth research programme (2002-2006).

3.2. Renewable sources of energy ("renewables")

As emphasised in various Commission documents, promoting renewable sources of energy (renewables) is one of the EU's priorities. Developing renewables reduces the impact of energy production on the environment and at the same time helps secure EU independence from energy imports. Over the past ten years, the EU's renewable energy production capacity has shown a substantial growth, in particular in wind and biomass energy.

The Commission has been made aware of the need for public aid in view of the level of competitiveness of renewables compared with conventional energy sources. The EU and the Member States are now financially supporting the development of renewable energy sources. Such aid must, however, comply with the Commission's guidelines on State aid for the environment.

The Member States support renewable energies through (i) various direct price support schemes, including quotas, certificates, fixed or firm prices, (ii) aid to capital investment, (iii) aid to consumers, essentially consisting of tax measures, (iv) aid to research and development and (v) aid for the development of specific energy sources, such as biomass.

At the same time, the EU provides aid for the development of renewables through (i) its regional policy funds, (ii) Altener, the European programme for promoting renewable energies, (iii) R&D, (iv) aid to the development of biomass sources. Despite widespread calls for an EU tax instrument to promote renewables, one does not exist as yet.

As renewables are still a relatively recent field, it is very difficult to quantify the amount of aid allocated to the sector. Though generating renewables is diverse and decentralised by its very nature, national aid is used in various projects, often without a common administrative framework. In their national programmes and in the European programmes they manage, Member States often use different calculating methods and often have no statistical data available. EU regional policy and the agricultural funds present the same difficulties. As they are not primarily intended to promote renewable energies, the reports and statistics do not provide sufficiently accurate information on the sums disbursed on renewable energy sources.

3.3. Nuclear energy

In investigating the existence of public aid to nuclear energy, two periods in the history of the nuclear sector should be distinguished.

In the early years of the European Atomic Energy Community (Euratom), aid granted for the construction of nuclear power plants formed part of a policy of promoting and developing a form of energy that was still in its infancy. Emphasis was therefore placed on increasing capacity in order to meet an increasing demand for electricity from consumers rather than on the terms for financing the investment necessary. Moreover, new power plants were often prototypes applying new technologies. For most nuclear power plants built in this period the investment has still not been written off. In the second period, nuclear energy came to maturity. The information currently available to the Commission shows the following:

- Projects for **investment recently notified to the Commission** under Article 41 of the Euratom Treaty did not receive public aid.

- Aid to **nuclear research** (RTD) has diminished over many years in most Member States and at EU level. In particular, although aid granted by EU Member States for nuclear technology amounted to \$55 billion in the period 1974-1998 (an average of \$2.2 billion per year for the whole EU), in 1998 it was only \$942 million per year for the whole EU. This research, whose aim in the beginning was to promote nuclear energy under the Euratom Treaty, in particular under Articles 2 and 6 thereof, now focuses instead on the management of radioactive waste and nuclear safety.
- Although **Euratom loans** are still available⁵ to cofinance investment projects for generating electricity from nuclear energy and for fuel cycle installations, they have not been used to build new nuclear power plants in the European Union since the end of the 1980s.
- Reserves/provisions for **decommissioning nuclear power stations and disposing of radioactive waste** have in most cases been set aside by nuclear electricity producers or end-users in order to meet their future obligations in this area. The reserves/provisions are larger in the nuclear sector than in other industrial sectors because of the specific nature of the nuclear energy. These provisions are necessary because of the nature of the nuclear industry, in particular to prevent future generations having to pay the consequences for the current use of nuclear power plants. In the debate on the Directive on the internal electricity and gas markets there was recognition of the importance of guaranteeing availability of the funds at all times for future dismantling activities, not only for the purposes of the internal energy market, but also to ensure that those funds are specifically destined for those activities. Accordingly, the Commission gave a commitment at its meeting of 6 March 2002 to present an initiative in the following months, before the conclusion of the negotiations on the Directive on the internal market.
- The investigation did not reveal the existence of any public aid to nuclear energy users in respect of **fuel supply**.
- Nor has a **study of fiscal data** revealed any measures specifically applicable to the nuclear energy sector in the light of the information available.
- Measures taken with regard to civil liability in the event of an accident are a response to calls to establish safety conditions which will minimise risks to life and health. Such requirements have given rise to international conventions on the subject and national obligations based on Article 98 of the Euratom Treaty, which requires Member States to take all measures necessary to facilitate the conclusion of insurance contracts covering nuclear risks.

3.4. Gas

Natural gas, discovered at the beginning of the 1950s, has taken decades to come to the fore in the energy sector. It has since become a major source of energy. In some countries, there is a rapid increase in the share of natural gas in electricity generation. This share should continue to grow and eventually partially replace other sources of energy (coal) used to generate electricity. The Green Paper on the security of supply noted that by the end of the decade, thermal power stations operating on natural gas should account for about two-thirds of the increase in energy demand. The Green Paper expects that in 2020-30 almost half of electricity will be produced by natural gas, i.e. 45% of the natural gas consumed.

⁵ These Euratom loans have existed since 1977.

This increase in demand and the increase in intra-EU trade entail a greater demand for transport infrastructure (intra-European and trans-European transport networks, port infrastructures for liquefied natural gas (LNG), natural gas storage facilities). Gas transport costs vary according to whether pipelines or ships are used. Both are relatively costly. The viability of distribution via pipelines depends crucially on the distances involved.

Consequently, most of the public aid listed focuses on infrastructure. This aid to the development of transport and distribution infrastructure in regions where there is no adequate distribution network has been listed at national (State aid) and EU levels (regional and structural funds). Such aid has traditionally been motivated (see the Green Paper on security of supply) by the need to have a supply network that is guaranteed to be safe and secure.

Aid for research and innovation (see, in particular, EU aid under the framework programme for research and development) should also help to guarantee a reliable gas supply at low cost.

From the angle of demand, Member States have introduced tax measures (tax exemptions) and various types of aid to speed up the introduction of gas as a source of energy. One example is the national aid awarded to combined-cycle electricity producers, many of whom use gas as an energy source.

Aid to gas exploration has also been recorded in some countries

4. CONCLUSION

The Green Paper and the Directive on the promotion of renewable energy sources call for a comparative analysis of the public aid granted to the different energy sources, beginning with a survey of all the possible forms of aid to the various energy sources. This inventory should cover all aid schemes and should not be confined to State aid to energy as defined in the Treaties, since this would be likely to produce a narrow, partial and even discriminatory overview.

To that end, the inventory should cover all possible forms of aid both at European Union and at national level. Given the complexity of an analysis of this kind and the varying amounts of information available on each energy source, the first stage should be to compile a report outlining the general trends and, in view of the wide range of situations involved, the different types of aid to energy sources.

The methods for compiling the inventory are designed to be as homogeneous as possible so as to enable such a comparison of energy sources. The data provided in the inventory should give a more accurate view of existing aid and also identify the information that could be used for a more detailed analysis.

Careful thought must be given to the means of making good any information gaps which come to light. An in-depth economic analysis to identify the effects of aid in each of the markets concerned (electricity, heating, transport, etc.) is also recommended.

5. ANNEXES

5.1. Report on public aid to coal and oil

5.2. Report on public aid to renewable energy sources

5.3. Report on public aid to the nuclear sector

5.4. Report on public aid to gas

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1. SUMMARY

Solid fuel and oil make up a significant part of the European Union's energy supply. While most Member States have ceased solid fuel production on their territory, this source of energy still accounts for nearly 15% of gross domestic energy consumption in the European Union. This relative stability of the share of solid fuel in overall energy consumption is connected with the fact that at least a proportion of EU coal has been replaced by imported coal. Oil is the primary source of energy, accounting for 40% of gross domestic energy consumption in the European Union. In absolute terms, oil consumption continues to rise, driven by demand from the transport sector.

With regard to public aid, attention should first be drawn to the issue of the external costs connected with the extraction and use of these sources of energy. While it is far from easy to quantify these costs, it is nevertheless clear from studies carried out on the subject that they are higher for solid fuels and oil than for other sources of energy. Only part of these costs is internalised, even though industry has made major efforts in recent years to reduce the environmental impact inherent in the extraction and use of coal and oil. It should be noted, however, that these external costs are generated by the sectors (e.g. the transport sector) which use the fuels. The fact that these costs are not internalised is therefore a form of indirect aid to primary energy sources, in this case to coal and oil.

1.1. Solid fuels

Significant amounts of aid are granted by the Member States for the extraction of EU coal which since 1965 has largely been overtaken by imported coal. Four countries (France, Germany, Spain and the UK) are still producing coal. Only the United Kingdom has successfully maintained a more or less competitive coal industry, at the cost of extensive mine closures. Lignite mining and peat extraction, however, do not benefit from any State aid.

Despite the efforts made by coal-producing countries to increase productivity, the gap between production costs and world market prices for coal is such that it is difficult to discern a genuine improvement in operating conditions (except in the United Kingdom). The current reduction in coal production in the four coal-producing Member States has led to a steady reduction in the volume of aid. Nonetheless, the amount of aid granted remains high (€6 300 million in 2001 for the EU as a whole). The aid is authorised by the Commission in accordance with the provisions adopted under the ECSC Treaty.

The ECSC Treaty expired on 23 July 2002. On 23 July 2002, the Council adopted a Regulation, proposed by the Commission, on aid to the coal industry to be granted after that date. The new scheme is based on maintaining access to coal reserves in the context of security of supply. Under the new scheme, however, aid payments to the coal industry will be gradually phased out. The Council adopted the Regulation in question on 23 July 2002 (Council Regulation (EC) No 1407/2002 on State aid to the coal industry, OJ L 205, 2.8.2002). France will cease all coal production by 2005 and Germany has already given a commitment to significantly reduce its production after the ECSC Treaty expires.

In addition to State aid direct to the coal industry, some Member States have implemented measures to promote the use of solid fuel in electricity generation. These measures concern the electricity generating sector directly, but nevertheless also constitute indirect aid to the solid fuels whose use is promoted (peat, coal and lignite). In the same context, Directive 96/92/EC on common rules for the internal electricity market enables Member States to give priority, up to a 15% limit, to electricity

produced by generating installations using indigenous primary energy fuel sources. This provision also constitutes a form of aid - albeit indirect - to solid fuels.

Solid fuels have, in addition, benefited from research-related measures. Part of the ECSC's operational budget is earmarked for research (€23 million for coal in 2001). The fact is, however, that these funds originate from levies imposed on coal and steel production and it is therefore industry that pays contributions, as it were, to fund this budget. Under the provisions of the Treaty of Nice of 26 February 2001, revenue from reserves accumulated through these levies will, upon the expiry of the ECSC Treaty, be allocated to research in the coal and steel sector (approximately €8 million a year for coal). Moreover, successive programmes for EU research, technological development and demonstration activities (Thermie (1994-1998), Energie (1998-2002)) have also set aside part of their budgets for solid fuel research (totalling €30 million for 1999, 2000 and 2001). Priority is given to promoting clean coal techniques. However, there has been a clear reduction in EU funding for solid fuel research, with priority being increasingly given to new and renewable energies. The sixth research programme (2002-2006) provides no funds for solid fuel research. Nonetheless, projects will be carried out with the support of the EU programme with a view to developing capture and sequestration technologies for CO₂, a by-product of combustion which is generated by power generation plants using coal, gas or oil.

1.2. Oil

The information available to the Commission does not show a great deal of State aid to the oil sector to promote oil production.

EU legislation lays down minimum rates for excise duty on the different categories of mineral oil (petrol, diesel oil for motor vehicles, diesel oil for heating, fuel oil, etc.). It also makes provision for various types of exemptions from or reductions of excise duty, some obligatory and others optional. It would be a mistake, however, to regard these derogating measures as forms of aid to oil pure and simple. The fact is that most of these reductions and exemptions are not meant to promote the use of mineral oils. Rather, they are measures generally intended to benefit an economic sector by reducing the tax burden or to promote more environmentally friendly products. Furthermore, the rate of tax on mineral oils in the Member States, even where there are reductions in excise duty rates, is much higher than that on other primary energy sources such as coal and natural gas. Consequently, the concept of aid to oil through reductions of, or exemptions from, excise duties is not straightforward and must be treated with proper caution.

EU funding of research is a highly significant form of aid to oil. Between 1975 and 1998, nearly €750 million were allocated by the EU to research and demonstration projects for innovative technologies in the hydrocarbon (oil and gas) sector. The original aim was to promote prospecting and extraction in the North Sea with a view to ensuring the security of the energy supply. There has been a gradual change in the projects selected, the current objectives being to enhance the competitiveness of the oil sector and protect the environment. As in solid fuel sector research, there has been a distinct reduction in EU funding of research in the oil sector (about €45 million over 1999, 2000 and 2001). Oil is not given priority in the Commission's proposal for a sixth research programme (2002-2006).

The table below gives an overview of the various categories of public aid to solid fuels and oil. The amounts indicated are approximate; they are intended to give a rough idea of the amounts of the various types of aid involved. The exact amounts (and the precise period they cover) are specified in the body of the text.

SOLID FUEL		OIL	
National aid	EU aid	National aid	EU aid
<i>Production - Extraction - Investment (State aid)</i>			
a. Lignite, peat: no State aid b. Coal: * ECSC scheme: (expires July 2002) covers operating losses + burdens inherited from the past Amount: €6 300 million per year * EC scheme: (from July 2002) New aid scheme Covers operating losses + burdens inherited from the past * Trend: steady reduction in the amount of aid		No financial aid (see, however, the Commission's examination of fiscal measures in connection with the Code of Conduct for business taxation)	-
Consumption			
a. Tax measures * Reduced VAT rate in 5 States → * Reduced excise duty in 6 States b. Aid to electricity generated from solid fuel c. Priority for indigenous fuel in generating electricity	There is no EU framework for taxing solid fuels (consequently, in the absence of a common frame of reference, it is hard to assess whether national legislation creates a tax framework that is more or less conducive to solid fuel consumption)	a. Tax measures * Reduced VAT rate in 4 States → * Exemption from or reduction of excise duty b. Priority for indigenous fuels in generating electricity	Excise duty is harmonised at EU level. Excise duty exemptions or reductions may therefore be analysed in relation to a common taxation framework. In any case, excise duty reductions and exemptions are only very indirect aid in respect of oil

SOLID FUEL		OIL	
National aid	EU aid	National aid	EU aid
Research			
Very low amounts: €1-3 million/year	a. ECSC research programme: €23 million/year. These funds come from ECSC levies paid by industry. b. Thermie - Energie programme: €10 million/year. Steady reduction (priority for research in other energies) c. Carnot programme: €0.5 million/year (seminars, measures for cooperation in the technology sector)	Very low amounts: +/- €1 million/year (higher amounts in France and the Netherlands)	Thermie - Energie programme: €15 million/year. Steady reduction (priority given to research in other energies)
Regional Policy			
-	None (the projects financed support the redevelopment of former mines)	-	None (except for one project in Greece under structural funds 2000-2006)
Social and employment policies			
-	None (no measures specific to the sector)	-	None (no measures specific to the sector)

2. PREFACE AND METHODOLOGY

This document has been compiled on the basis of the data available to the Commission (reports on State aid to the coal industry, data on demonstration projects in the coal and oil sectors, etc.).

It is a compromise between a quantitative and a qualitative approach. In the case of aid to coal industry, it was possible to indicate the precise amounts of aid granted each year thanks to the comprehensive information contained in the Commission's annual reports. In addition to this quantitative approach to coal industry aid, a more qualitative approach was adopted to describe some current and future trends in the policy on coal subsidies. On the other hand, a very cautious approach has been adopted in, for instance, quantifying the external costs connected with the extraction and use of solid fuel and oil and in considering advantages connected with tax measures. A more qualitative approach has therefore been adopted with regard to these types of public aid.

3. SPECIFIC FEATURES OF THE SECTORS

3.1. Economic characteristics

3.1.1. *Solid fuels*

On the EU energy market, solid fuels continue to lose ground to gas which, together with nuclear energy, is one of their chief competitors in electricity generation. Estimates for 2000 show that the share of solid fuels dropped to 14.7% of the total market compared with 15.4% in 1999. The share of solid fuel in total energy consumption in the European Union in 2001 will drop to 14.5%. Each year, the Commission publishes a detailed report on the current EU solid fuel market and the outlook for the following year.¹

The main use of solid fuels is in electricity generation. Lignite and peat are used exclusively for generating electricity. As for coal, 70% is used to generate electricity and the remainder is mainly used to produce coke that is used in steel production and, to a far more limited extent, for industrial and domestic purposes.

The quantity of coal extracted in the European Union continues to diminish, with an estimated production of 87 million tce² in 2000 compared with 185 million tce in 1992. Production has dropped in all producer countries (France, Germany, Spain and the United Kingdom). This trend is connected with the fact that the greater part of the EU's coal industry is structurally loss-making, with geological constraints hampering competition with coal imported from third countries. In parallel with this reduction of EU production, coal imports from third countries have increased, though not to the same extent (from 147 million tce in 1992 to 165 million tce in 2000). One significant reason for this is that EU coal is being replaced in part by other energy sources, in particular natural gas.

3.1.2. *Oil*

In contrast, oil still maintains a predominant position, even though its share in overall energy consumption in the European Union has diminished from 60% in 1970 to about 40% today. In absolute terms, however, the demand for oil continues to grow. This trend is mainly due to the considerable growth in the demand for energy from the transport sector which depends on oil for

¹ See the Commission Report "The Market for Solid Fuels in the Community in 2000 and the Outlook for 2001", SEC(2001) 1605 final.

² tce = tonne coal equivalent.

98% of its energy requirements, which is equivalent to 67% of the overall demand for oil.³ Private households are also major consumers of oil products. European industry, on the contrary, has markedly reduced its consumption of oil in the past twenty years, shifting instead to natural gas and electricity.

Thanks to the North Sea oil fields, the European Union produces about 160 million toe⁴ (1997), or virtually 4.4% of world production. Extraction costs are around \$7-11 per barrel compared with \$1-3 per barrel in the Middle East. These high production costs can make oil exploration and development projects problematic at times when the barrel price is low. This was the case in particular at the end of 1998 when the price of crude oil fell to just \$10 a barrel.

While EU production has to some extent made it possible to reduce the European Union's dependence on imports from third countries, the EU is still dependent on external supplies for between 60 and 70% of its overall demand.

³ Commission Green Paper on a European Strategy for Security of Energy Supply, COM(2000) 769.

⁴ toe = tonne oil equivalent.

3.1.3. Energy balance

Gross internal energy consumption in the European Union in million tonnes oil equivalent (Mtoe)

	1999		2000		estimates for 2001	
		%		%		%
Solid fuel	219.0	15.4	211.6	14.7	211.6	14.5
broken down as follows:						
- indigenous coal	62.77	4.41	54.1	3.75	50.69	3.47
- indigenous peat and lignite	47.36	3.33	47.9	3.33	48.69	3.34
Crude oil	562.8 ⁽⁵⁾	39.5	565.1	39.2	567.4	38.9
Natural Gas	333.3	23.4	349.4	24.2	365.5	25.0
Nuclear energy	218.4	15.3	223.1	15.5	223.3	15.3
Other areas	89.7	6.3	92.0	6.4	92.1	6.3
Total	1423.3		1441.2		1459.8	
% increase			1.26		1.29	

Source: Commission Report "The Market for Solid Fuels in the Community in 2000 and the Outlook for 2001".

3.2. External costs

3.2.1. Level of external costs

By way of introduction to this inventory of public aid to solid fuel and oil, mention should be made of the external costs connected with the production and use of solid fuels and oil. These include in particular the costs linked with pollution ensuing from the use of solid fuel in generating electricity, pollution ensuing from the use of oil products in the transport sector, and pollution ensuing from accidents such as hydrocarbon spills. To some extent, these costs can be internalised by adopting rules and regulations to oblige producers or users of a particular energy source to take preventative action or pay compensation for damage caused in its production or use. There is no denying, however, that the costs of the damage and the risks connected with oil and solid fuel are borne in great part by society as a whole.

The fact that the producers and users of these energy sources pay only limited compensation for these costs may be regarded as a form of indirect aid. (Obviously, this is not to suggest that State aid within the meaning of the EC Treaty is involved, since there is no transfer of State resources.) It should be noted, however, that oil and coal do not intrinsically entail external costs. Rather, it is the use of these energy sources (e.g. in power stations using coal to generate electricity or in road transport using oil products) that leads to the external costs. In the specific case of road transport, while unpaid external costs may be treated as public aid, this is mainly aid to the transport sector. It is aid to oil only in an extremely indirect sense.

The real costs of electricity in Europe have been investigated in a large-scale study (ExternE) cofinanced by the Commission in the amount of €10 million. According to this study, the cost of generating electricity from solid fuels (coal, lignite, peat) or oil would double if external costs, such as damage caused to the environment and to human health, were taken into account.⁶ Such costs

⁵ Oil from indigenous production in the EU accounts for approximately 170 Mtoe.

⁶ Evaluating these costs, mainly connected with CO₂ emissions, is a very sensitive undertaking. The costs should, for instance, be considered in the light of the recent proposal for a directive of the European Parliament and the Council, which provides an EU framework for trading greenhouse gas emission rights and establishes an EU emission rights market. The objective of the proposal is to limit the cost of reducing emissions by making reductions where they are the least costly (see

have to be borne by society as a whole; they are not included in the bills paid by electricity consumers. Preliminary work has shown that the total cost for the transport sector could amount to 1 to 2% of GDP.

External costs for electricity production in the EU (cents/kWh)

Country	Coal & lignite	Peat	Crude oil	Gas	Nuclear energy	Biomass	Hydro-electricity	PV	Wind energy
Austria				1-3		2-3	0.1		
Belgium	4-15			1-2	0.5				
Germany	3-6		5-8	1-2	0.2	3		0.6	0.05
Denmark	4-7			2-3		1			0.1
Spain	5-8			1-2		3-5			0.2
Finland	2-4	2-5				1			
France	7-10		8-11	2-4	0.3	1	1		
Greece	5-8		3-5	1		0-0.8	1		0.25
Ireland	6-8	3-4							
Italy			3-6	2-3			0.3		
Netherlands	3-4			1-2	0.7	0.5			
Norway				1-2		0.2	0.2		0-0.25
Portugal	4-7			1-2		1-2	0.03		
Sweden	2-4					0.3	0-0.7		
UK	4-7		3-5	1-2	0.25	1			0.15

Source: European Commission press release of 20 July 2001 "New research reveals the real costs of electricity in Europe".

Accidental hydrocarbon (oil and gas) spills are another significant source of costs for society. All EU countries, with the exception of Austria and Luxembourg which have no access to the sea, are members of the International Oil Pollution Compensation Funds (IOPC Funds) which up to a given ceiling provide compensation for costs connected with oil spills. There are no risks of maritime pollution involved in transporting solid fuels.

3.2.2. Internalisation of external costs

While there is no denying the magnitude of external costs connected with the production and use of solid fuels and oil, it should also be noted that major efforts have been made by industry in recent years to minimise these costs.

Extraction is governed by extremely stringent environmental standards, keeping the effects of such activities on water, air and soil quality and on the landscape to a minimum. Attention should also be drawn to voluntary agreements put in place by industry to use methane recovered from coalmines.

With regard to the use of solid fuel, power stations have made considerable efforts to reduce pollutant emissions (sulphur dioxide SO₂, nitrogen oxide Nox) through the use of clean coal techniques. Moreover, new coal-fired power stations emit between 20 and 30% less CO₂ than old

document COM/2001/581 final). The quantification of external costs in the ExternE study gives a nonetheless very useful picture of the scale of these costs for solid fuel and oil compared with the costs generated by other sources of energy.

plants with an equivalent electricity output. In years to come, it will be possible to achieve further reductions in CO₂ emissions as new technologies come to the fore.

The oil industry has also invested large sums to reduce the content of particular components in oil products. The European Union has played an important role in promoting this technical progress, in particular under the Auto-Oil I programme, which was designed to provide the basic scientific, technical and economic elements to recommend the introduction at EU level of new environmental specifications applicable to petrol and diesel fuel. On the basis of the results of the programme, a Directive was adopted by the European Parliament and the Council which has led to the removal of lead from petrol and the gradual reduction of particular components (in particular, sulphur) in diesel and petrol.⁷ An EU programme, Auto-Oil II, was then launched, on the basis of which the Commission adopted a proposal for a Directive to progressively introduce non-sulphur fuel by 2011.⁸ It is clear that in order to develop these new fuels industry is required to make major investments to adapt its production processes. The amount of the investment necessary cannot, however, be estimated safely. The oil industry published estimates of the costs of the new specifications linked with the Auto-Oil I programme. They proved in fact to have been considerably overvalued.

Increasingly, Member States are imposing taxes on fossil fuels, particularly oil products, to take into consideration the effects of their use on the environment. Among the various taxes on oil products, apart from excise duties, a number of Member States have applied indirect taxes specifically designed to take CO₂ emissions related to the consumption of these products into consideration.

The Commission proposal of 12 March 1997 for a Directive restructuring the Community framework for the taxation of energy products⁹ will give Member States greater scope for applying environmental taxes to energy products. Taxation is an important additional instrument available at the service of emission reduction policies or as a means to offset the additional costs involved in placing cleaner products on the market. In the longer term, it should help gear decisions on production and consumption towards sustainable development. The proposal for a Directive will therefore give Member States the possibility of applying differentiated rates of taxation according to the environmental quality of products without the prior authorisation of the Commission.

The Commission's proposal for a Directive of 24 July 2002 aligning tax arrangements for diesel fuel used for commercial purposes with a view to improving environmental protection and eliminating the significant distortions in competition which exist in the liberalised road transport markets¹⁰ provides for gradually harmonising the excise duties applied by the Member States to diesel fuel used for commercial purposes and aligning the minimum rates of excise duty applied to other types of diesel and lead-free petrol. Specifically, by 2006 the minimum rate of excise duty on lead-free petrol would be applied to diesel fuel for non-commercial purposes, on the grounds that the lower rate of tax on diesel fuel presently applied is not justified in terms of protection of the environment.

⁷ Directive 98/70/EC of the European Parliament and of the Council of 13 October 1998 relating to the quality of petrol and diesel fuels and amending Council Directive 93/12/EEC (OJ L 350, 28.12.1998, p. 58).

⁸ Proposal for a Directive of the European Parliament and of the Council on the quality of petrol and diesel fuels and amending Directive 98/70/EC [COM(2001)241 final, 11.5.2001; OJ C 213 E, 31.7.2001, p. 255].

⁹ COM(1997) 30 final, OJ C 139, 6.5.1997, p. 14.

¹⁰ COM(2002) 410 final

3.3. The legal framework

3.3.1. Solid fuels

Until 23 July 2002, coal is covered by the ECSC Treaty (the other solid fuels, specifically lignite and peat, are subject to the provisions of the EC Treaty). As the ECSC Treaty expires on 23 July 2002, coal will be subject to the EC Treaty from 24 July 2002. The expiry of the ECSC Treaty *ipso facto* entails the expiry of all secondary legislation adopted pursuant to the ECSC Treaty.

Many ECSC rules still in force have become obsolete following the far-reaching changes affecting the coal sector. The most important rules still relevant today are as follows:

- Commission Decision No 3632/93/ECSC of 28 December 1993 establishing Community rules for State aid to the coal industry. Commission Decision No 341/94/ECSC of 8 February 1994 implementing Decision No 3632/93/ECSC.

On 25 July 2001 the Commission adopted a proposal for a new State aid scheme to be applicable after 23 July 2002 (based on Article 87(3)(e) and Article 89 of the EC Treaty).¹¹ The Council adopted the Regulation on the new aid scheme on 23 July 2002.¹²

- Decision 85/161/ECSC amending Decision 77/707/ECSC concerning Community surveillance of imports of hard coal originating in third countries and intended for power stations.
- Commission Decision No 2277/96/ECSC of 28 November 1996 on protection against dumped imports from countries not members of the European Coal and Steel Community (amended by Commission Decision No 1000/1999/ECSC of 11 May 1999).

At the proposal of the Commission, Regulation No 1407/2002 on State aid to the coal industry was adopted by the Council on 23 July 2002 (OJ L 205, 2.8.2002) providing for State aid after that date. The new scheme is based on maintaining access to coal reserves in the context of security of supply. It requires aid to the coal industry to be gradually tailed off.

3.3.2. Oil

The main EU rules applicable to the oil sector are:

- Council Directive 68/414/EEC of 20 December 1968 imposing an obligation on Member States to maintain minimum stocks of crude oil and/or petroleum products (amended by Council Directive 98/93/EC of 14 December 1998).
- Council Directive 73/238/EEC of 24 July 1973 on measures to mitigate the effects of difficulties in the supply of crude oil and petroleum products.
- Council Decision 77/706/EEC of 7 November 1977 on the setting of a Community target for a reduction in the consumption of primary sources of energy in the event of difficulties in the supply of crude oil and petroleum products.
- Directive 94/22/EC of the European Parliament and of the Council of 30 May 1994 on the conditions for granting and using authorisations for the prospecting, exploration and production of hydrocarbons.

¹¹ OJ C 304 E, 30.10.2001, p. 202.

¹² OJ L 205 of 2.8.2002, p.1.

- Council Regulation (EC) No 2964/95 of 20 December 1995 introducing registration for crude oil imports and deliveries in the Community; Council Decision of 22 April 1999 on a Community procedure for information and consultation on crude oil supply costs and the consumer prices of petroleum products.

4. PUBLIC AID TO SOLID FUEL

4.1. National aid

4.1.1. Aid to production

4.1.1.1. State aid to the coal industry under the ECSC Treaty

Only coal benefits from State aid (notified as such by the Member States). Aid to coal mining is granted under the ECSC Treaty. Since 1965, the High Authority and subsequently the Commission have on various occasions adopted rules to bring Member States' financial support for the coal industry in line with the objectives of the ECSC Treaty. Successive regulations governing aid have been adapted to general economic trends and in particular to the development of the energy and coal markets in the European Union.

The last scheme adopted on the basis of Article 95 of the ECSC Treaty through Commission Decision 3632/93/ECSC of 28 December 1993¹³ is in line with the creation of an internal energy market. Its main objectives are making State aid transparent by gradually transferring the cost of all direct or indirect aid mechanisms to public budgets and continuing the modernisation, rationalisation, restructuring and reduction of activity.

Under the terms of Decision No 3632/93/ECSC, aid to the coal industry must be notified to the Commission, which will authorise it if it complies with the criteria and conditions laid down in the Decision. Annex 7.1 to this Report lists all Commission Decisions relating to the period 1999-2001.

The Commission has adopted regular reports specifying the amounts of aid granted since 1965. The latest report concerns aid in 2000.¹⁴ These documents also include a qualitative assessment of the use made of aid.

The amounts paid by each Member State from 1997 to 2001 are shown in the table below.

€ million		1997	1998	1999	2000	2001
Germany	Aid to production ¹⁵	4 918	4 274	4 313	3 607	2 756
	Aid not linked with production ¹⁶	412	513	388	1 086	1 401

¹³ OJ L 329 of 30.12.1993, p. 12.

¹⁴ Commission Report on the application of the Community rules for State aid to the coal industry in 2000; COM(2001) 327 final.

¹⁵ Aid to production includes operating aid (Article 3 of Decision 3632/93/ECSC) and aid for the reduction of activity (Article 4 of Decision 3632/93/ECSC). They cover the difference between production costs and the selling price freely agreed between the contracting parties in the light of the conditions prevailing on the world market.

¹⁶ Aid not linked with production comprises aid to cover exceptional costs (Article 5 of Decision 3632/93/ECSC) to cover expenditure which results or has resulted from modernisation, rationalisation and restructuring of the coal industry (burden inherited from the past).

Spain	Aid to production	704	759	727	698	625
	Aid not linked with production	364	401	344	423	445
France	Aid to production	371	384	354	389	349
	Aid not linked with production	585	615	630	621	642
United Kingdom	Aid to production	-	-	-	143	101 estimate
	Aid not linked with production	-	-	-	-	-
EU	Aid to production	5 993	5 417	5 394	4 837	3 832
	Aid not linked with production	1 361	1 529	1 362	2 130	2 487
Total		7 354	6 946	6 756	6 967	6 319

As indicated above, all coal-producing Member States have, since the entry into force of Decision 3632/93/ECSC, included aid to the coal industry in their public budgets to ensure transparency of State support. In addition, with regard to the prices applied, the scheme has done away with the vertical agreements between coal producers and consumers and the "reference price" systems inherent in such agreements. Community coal is consequently delivered to electricity producers at prices equivalent to those for coal of a similar quality from third countries.

In this way, the current scheme for State aid to the coal industry has made it possible to phase out indirect aid to the coal sector. This included, in particular, the *Kohlepfennig* scheme in Germany under which aid was granted to electricity producers procuring indigenous coal.

4.1.1.2. State aid to the coal industry under the EC Treaty

The ECSC Treaty and the EU rules on Member State support for the coal industry expire on 23 July 2002. In order to provide a framework for the future of EU coal, which will largely remain uncompetitive in relation to imported coal, the Commission adopted on 25 July 2001 a proposal for a Council Regulation on aid to the coal industry for the post-ECSC era.¹⁷ This scheme is based on the principle of minimum coal production intended to contribute towards the creation of an "indigenous primary energy base", so as to enhance the security of energy supply (continued access to reserves). However, the objective of security of energy supply, justifying the maintenance of subsidised EU coal production, should be attained under acceptable economic conditions. This latter principle means that the action to restructure and reduce activity in the coal industry taken under State aid schemes implemented under the ECSC Treaty should be continued beyond 23 July 2002. The Council adopted the aforementioned Regulation on 23 July 2002.¹⁸

According to the principles of the new scheme, the process of gradually closing down the coalmines making the greatest losses, commenced under the ECSC Treaty, should therefore be continued after 23 July 2002. This restructuring will help achieve the gradual reduction of aid to the coal industry.

¹⁷ COM(1997) 423 final; OJ C 304 E, p. 202.

¹⁸ OJ L 205 of 2.8.2002, p.1.

The proposed scheme makes express provision that aid granted must not lead to discrimination between buyers or users in the European Union. With regard to competition in the coal sector specifically, it should be noted that intra-EU trade in coal is extremely limited. Most coal produced is used to generate electricity, and power plants are very often located close to the mine supplying them. The high cost of producing coal in the Community means that none of the four Community coal-producing States can afford to consider transporting coal over long distances.

On the subject of competition among coal users, and more specifically among electricity producers, the proposed scheme lays down clear rules to prevent any distortion. The scheme proposed by the Commission provides that aid should cover the difference between coal production costs and "the selling price freely agreed between the contracting parties in the light of the conditions prevailing on the coal market". Secondly, the amount of aid "may not cause delivered prices for Community coal to be lower than those for coal of a similar quality from third countries". These rules are intended to guarantee that no specific advantage is granted to an electricity producer using EU coal rather than imported coal, since this would be tantamount to subsidising EU coal. Aid granted under the proposed scheme will not, therefore, distort competition between electricity producers.

Developments in the coal industry over the next few years are expected to be as follows:

Germany	Coal production was 33 million tonnes in 2000. Under the coal industry's restructuring plan, production should be about 26 million tonnes in 2005. The German authorities have already given a commitment to further reduce activities after 2005 by about 5-6 million tonnes. Under the restructuring plan, the volume of aid must not exceed €2 800 million in 2005 (compared with €4 693 million in 2000).
Spain	Coal production was 15 million tonnes in 2000. Under the 1998-2005 coal industry restructuring plan, there will be a steady reduction in production and in aid. However, there is no clearly defined production target a few years hence.
France	Coal production was 3 million tonnes in 2000. Under the National Coal Pact, signed in 1994 between Charbonnages de France and the trade unions, production will cease completely in 2005. However, aid will still have to be granted beyond that date to cover burdens inherited from the past (miners' pensions, mine closures, etc.).
United Kingdom	In 2000 coal production was 32 million tonnes, only about 8 million tonnes of which was subsidised. At the moment, it is difficult to forecast developments in the UK coal industry after 2002. Under the current restructuring plan being implemented in the UK, no aid should in principle be granted after the expiry of the ECSC Treaty.

4.1.2. *Aid to consumption*

4.1.2.1. Tax measures

With regard to VAT, some countries apply a reduced rate - between 10 and 12% - to coal used as fuel for private consumption (Belgium, Ireland, Italy, Luxembourg). Coal consumption for private

use has, however, greatly diminished in recent years. In the United Kingdom, a 5% reduced rate is applied to coal for private use.

With regard to excise duties, there is at present no EU-wide system. A Member State may therefore decide whether or not to impose tax on solid fuel as it sees fit, although it must be without prejudice to the applicable rules on State aid (Articles 87 and 88 of the EC Treaty). Six Member States tax coal or particular uses of coal (Denmark, Finland, Netherlands, Italy, United Kingdom and Sweden).

The Commission proposal of 12 March 1997 for a Directive restructuring the Community framework for the taxation of energy products imposes a minimum rate of taxation on solid fuels.¹⁹

The Commission proposal is currently blocked as a unanimous decision cannot be reached in the Council. Discussions are currently under way within the Council to enable the 15 Member States to come to an agreement in the course of 2002. Indeed, the European Council of Barcelona of 15-16 March 2002 asked the Council to adopt this proposal for a Directive by the end of 2002.

4.1.2.2. Aid to electricity generated from solid fuel

A number of Member States have taken measures promoting the use of solid fuel in generating electricity. While these measures directly concern the electricity generating sector, they nevertheless constitute indirect aid to solid fuel whose use is being promoted. The measures are likely to influence the choice of fuel in favour of solid fuels.

Spain, Austria and Ireland have been authorised by the Commission to implement various compensation schemes for electricity generated from solid fuels [State aid schemes N 49/99 (Spain), N 34/99 (Ireland) and N 6/A/2001 (Austria)]. These schemes have a dual objective. On the one hand, they may be implemented as a transitional measure in connection with the liberalisation of the electricity market. The schemes are intended to cover the costs of transition to competition in order to partially offset the effects on electricity producing companies of the liberalisation of the electricity sector due to the implementation of the Directive 96/92/EC.²⁰ The aim is therefore to cover stranded costs, i.e. the costs of commitments or guarantees of operation that may be affected by the electricity sector liberalisation process. On the other hand, some schemes are designed to provide compensation for obligations resulting from a service of general economic interest. Such measures are designed to compensate companies for the obligation imposed upon them to produce a specific proportion of their electricity output from indigenous solid fuels. It is basically a premium for generating electricity from indigenous fuel, justified on the grounds of security of the energy supply.

In the same context, two cases may be mentioned of subsidies granted in 1992 and 1995 by the German *Länder* for the construction of power plants using lignite.²¹ In the words of the Commission Decision of 9 December 1998 authorising one of these cases of aid under Article 92(3) of the EC Treaty (now Article 87(3)(a)), "While the primary beneficiaries of the aid are the operators of the power plant, the aid also indirectly benefits the eastern German lignite industry [...] The aid was an incentive for the use of lignite as a fuel, although the construction of a power plant run with other fuels such as gas would have been the cheaper solution. [...] It has to be borne in mind that, in this case, lignite was chosen in preference to gas, hard coal and mineral oil. On the energy market, each of those fuels can be substituted by any of the others." The Decision goes on to put the actual

¹⁹ COM(1997) 30 final; OJ C 139, 6.5.1997, p. 14.

²⁰ Directive 96/92/EC of the European Parliament and of the Council concerning common rules for the internal market in electricity.

²¹ See International Energy Agency, Energy Policies of IEA Countries, 'Germany' - 1998 Review.

impact of the aid into perspective, "The Cottbus (power plant) project, however, is an ad hoc measure which in no way aims at and in no way has the effect of subsidising systematically the Eastern German lignite industry. This is confirmed both by the fact that Laubag (the lignite producer) will not obtain artificially high prices, but will have to sell its product at market prices and by the fact that the lignite required for this project accounts for only a marginal share, i.e. 0.9 %, of Laubag's annual production. [...] There is, at best, an indirect benefit stemming from a long-term contract, which accounts for only 0.9 % of Laubag's annual lignite production."²²

Lastly, on 8 July 1999, the Commission adopted a Decision in response to a request from Germany for authorisation of a transitional scheme concerning common rules for the internal market in electricity.²³ Under the liberalised scheme established in Germany pursuant to Directive 96/92/EC, all eligible clients (end consumers and distributors) can enter into supply contracts outside the VEAG company network. However, to avert the risk of a massive shift of demand towards competing suppliers which would make it difficult or even impossible for VEAG to sell its electricity produced from lignite, German law provides for a transitional scheme, under which eligible clients may be refused access to the network in the new *Länder* so as to guarantee a sufficient outflow of electricity produced by the lignite-fired power plants (exceptional arrangements until end 2003). The investment authorised for VEAG to build such plants may be at risk in the liberalised system if it is not protected by an access refusal clause, as electricity produced from lignite is more costly than that produced from other energy sources. This scheme is therefore a derogation from the provisions of Directive 96/92/EC which obliges the Member States to open up the electricity sector to competition.

4.1.2.3. Priority given to indigenous fuel in electricity generation

Article 8(4) of Directive 96/92/EC concerning common rules for the internal market in electricity provides that "a Member State may, for reasons of security of supply, direct that priority be given to the dispatch of generating installations using indigenous primary energy fuel sources, to an extent not exceeding in any calendar year 15% of the overall primary energy necessary to produce the electricity consumed in the Member State concerned."

This allows Member States, up to a 15% limit, to prioritise the use of electricity from generating plants using indigenous primary energy fuel sources. It therefore allows Member States to give priority (precedence) to power stations using solid fuel produced in the Member States (coal, peat, lignite).

4.1.3. Aid to research

In general, the Member States disburse very limited sums on research connected with solid fuel. According to a study compiled by the Vrije Universiteit of Amsterdam in 2001 at the request of the European Parliament,²⁴ the amounts range between €1 and 3 million a year. Only the few Member States which still produce coal - France, Germany, Spain and the United Kingdom - contribute considerably more to research in this sector (between €4 and 6 million a year according to the aforementioned report).

²² OJ L 220, 20.8.1999, p. 33.

²³ OJ L 319, 11.12.1999, p. 18.

²⁴ The study has not yet been published by the European Parliament.

4.2. EU aid

4.2.1. Aid to research

Three types of programmes of aid for research can be identified in respect of solid fuels.

4.2.1.1. ECSC research programme

EU research is financed from funds forming part of the ECSC operational budget. These funds come from levies on coal and steel production charged under Articles 49 and 50 of the ECSC Treaty.²⁵

For the period 1997 to 2002, the following amounts were granted for research in the coal sector:

Year	Budget (million €)
1997	29
1998	28
1999	28
2000	25
2001	23
2002 (estimate)	20

Only part of these amounts (approximately 15%) is transferred for the purposes of research to the coal and coke producers who have paid ECSC levies. The volume of research carried out by the coal industry has diminished along with volume of coal production. Increasingly, funds have been paid to universities, consultants and independent research centres.

In addition, 70% of the budget is dedicated to clean coal technologies. Developing these technologies is a task for research centres, equipment manufacturers and electricity producers rather than for coal producers.

With regard to the post-ECSC period, the Treaty signed in Nice on 26 February 2001 provides that the Council shall adopt all the provisions concerning the financial consequences of the expiry of the ECSC Treaty. Provision is made for setting up a Coal and Steel Research Fund. The revenue from the former ECSC funds - totalling about €1 300 million - will be exclusively allocated to research undertaken in sectors linked to the coal and steel industry.

Pending ratification of the Nice Treaty, no measure has yet been adopted by the Council to implement the Protocol annexed to the Treaty. As all provisions relating to ECSC funds must be adopted before the ECSC Treaty expires in July 2002 in order to avoid a legal vacuum, a Decision of the representatives of the Governments of the Member States meeting within the Council was adopted on 27 February 2002.²⁶ This decision assigns the task of transitional management to the

²⁵ See in particular Commission Decision No 2749/2000/ECSC of 13 December 2000 fixing the rate of the levies for the 2001 financial year; OJ L 318, 16.12.2000, p. 13.

²⁶ OJ L 79, 22.3.2002, p. 42.

Commission as soon as the ECSC Treaty expires, pending the entry into force of the Treaty of Nice. This is in fact legal window-dressing which does not alter the substance of the system.

4.2.1.2. Thermie and Energie research programmes

Under the fourth framework programme of European Community activities in the field of research, technological development and demonstration (Thermie programme), the funds allocated to demonstration projects (not counting research projects) in the solid fuel sector are approximately as follows:

(million €)	Demonstration projects
1995	22.0
1996	4.7
1997	18.5
1998	13.2
Total	58.4

The Directorate-General for Research has indicated that it does not have statistics on the research projects financed under the fourth framework programme.

Under the fifth framework programme (Energie programme), research in the solid fuel sector has mainly focused on projects financed under key action 5.1.2 "More efficient energy conversion processes or cycles, including combustion efficiency". DG RTD has also indicated that some research projects have been financed under key actions 5.1.1 "Cleaner fuels by substitution and treatment" and 5.4.1 "Reduction of local and global environment degrading emissions". Overall, it should be noted that the amounts are clearly down compared with those allocated to research under the fourth framework programme. In this context, it should be pointed out that the Commission has financed an important research project connected with integrated gasification combined cycle technology (the Elcogas IGCC project in Puertollano).

(million €)	Research projects	Demonstration projects
1999	20.9	9.0
2000	(According to DG RTD, however, this sum in part covers some projects not connected with solid fuel)	5.2
2001		0
2002 (estimate)	Not available	6
Total	-	20.2

Research in the solid fuel sector is not included among the priorities of the sixth framework programme for research (2002-2006).²⁷ EU funding will be earmarked for new and renewable

²⁷ Adopted on 27 June 2002.

energy sources, replacement fuels, projects connected with energy saving and energy efficiency, and medium- and long-term projects such as fuel cells, hydrogen and photovoltaic energy. Nonetheless, projects will be carried out with the support of the EU programme with a view to developing capture and sequestration technologies for CO₂, a by-product of fossil-fuel combustion generated by power plants operated using coal, gas or oil.

4.2.1.3. Carnot programme

The Carnot programme promotes the use of clean and efficient technologies in industrial installations using solid fuels.²⁸ The aim is to reduce emissions, in particular CO₂ emissions, by promoting the use of technologies enabling clean use of coal at reasonable cost. Two types of actions are financed under the programme: measures promoting cooperation among national, EU and international entities and measures promoting strategic industrial cooperation through seminars, visits to industrial sites, studies, etc.

The current programme covers the period 1998-2002.

Year	Budget (million €)
1998	0
1999	0.5
2000	0
2001	0.5
2002 (estimate)	0.5
Total	1.5

4.2.2. Aid under regional policy

No measures promoting solid fuels have been taken in connection with developing trans-European networks in the energy sector (Article 154 of the EC Treaty).

Under regional policy, the Directorate-General for Regional Policy has not recorded any funding for solid fuel.²⁹

Action has been taken, in particular in Germany and the United Kingdom, to provide financial support for schemes to redevelop the sites of former mines to encourage the development of new economic activities in these industrial areas. These actions, previously financed under the RECHAR programme, are now covered by Objective 1 (Development and structural adjustment of regions whose development is lagging behind) and Objective 2 (Economic and social conversion of regions

²⁸ Council Decision 1999/24/EC of 14 December 1998; OJ L 7, 13.1.1999, p. 28.

²⁹ It should, however, be noted that the EU has financed projects for the construction of power stations, some of which use solid fuels. The EU has contributed €26 million to support the planned construction of a peat-fired power station in Ireland (see International Energy Agency, Energy Policies of IEA Countries, 'Ireland' - 1999 Review). The grant of EU funds to an electricity company has helped promote peat production indirectly (see section 4.1.2.2).

facing structural difficulties) of the structural funds. They are not, however, actions benefiting solid fuel as such since the projects they finance are those implemented after solid fuel extraction has ceased.

4.2.3. *Aid linked with EU employment and social policies*

According to the Commission, EU measures connected with social policy, particularly those under the European Social fund, are not targeted at specific sectors. A cross-sectoral approach to labour market problems is adopted, particularly involving general measures to reintroduce people into the labour market, general measures in support of training, etc. It is not therefore possible to identify specific measures or specific effects in a given sector.

5. PUBLIC AID TO OIL

5.1. National aid

5.1.1. *Aid to investment*

Information provided by the Directorate-General for Competition does not show that there have been many cases of State aid for the oil sector.

However, many tax measures applied by the Member States are currently under review in connection with the compilation of a Code of Conduct for business taxation.³⁰ This exercise covers tax measures which set an effective tax rate considerably below that normally applied in the Member State concerned and which have, or may have, an noticeable influence on the siting of economic activities within the European Union. Some of these measures may constitute State aid which ought to be examined in the light of Articles 87 and 88 of the EC Treaty.

5.1.2. *Aid to consumption*

5.1.2.1. Tax measures

Member States generally apply the standard VAT rate to oil products. Only a few of them apply a reduced VAT rate for particular uses and specifically for heating oil (Luxembourg - 12%, Ireland - 12.5%, Portugal - 12% and the United Kingdom - 5%). Some Member States (Ireland, Italy and Portugal) apply a reduced VAT rate of between 10 and 12% to heavy fuel for industrial use.

With regard to excise duty, Directive 92/81/EEC is essentially based on defining an excise rate per product/use pair.³¹ The products are mineral oils: gasoil, petrol, fuel, LPG, etc. The uses are: heating fuel, motor fuel, industrial use and commercial use. Each product/use pair (e.g. gasoil used as heating fuel or fuel used as motor fuel) is subject at national level to a specific excise duty rate higher than or equal to the minimum applicable EU rate laid down by Directive 92/82/EEC of 19 October 1992.³²

The Directive also, however, makes provision for cases in which the Member States are permitted to apply a reduced rate to or exempt mineral oils from excise duty (without prejudice to the application of Articles 87 and 88 of the EC Treaty).

³⁰ See the report submitted to the Ecofin Council of 29 November 1999 by the Primarolo group (published on the Council's Internet site on 29 February 2000 at <http://ue.eu.int/newsroom>).

³¹ OJ L 316, 31.10.1992, p. 12. Directive last amended by Directive 94/74/EC (OJ L 365, 31.12.1994, p. 46).

³² OJ L 316, 31.10.1992, p. 19.

It is not entirely clear whether such reductions of, or exemptions from, excise duty constitute aid to oil.

- Most of the reductions and exemptions are not intended to promote the use of mineral oils. They are measures taken to give an advantage to a particular economic sector by reducing the tax burden on a category of costs in that sector, i.e. the costs of heating fuel or motor fuel. However, while the primary purpose of most of these measures is to create a tax advantage for a sector, it may nevertheless also constitute indirect aid to oil products.
- The concept of advantage must be evaluated in relation to a common standard from which a particular measure derogates. In this case, the reductions of or exemptions from excise duty could be considered an advantage (an incentive for using mineral oil) as they allow a rate that is lower than that generally applied in a Member State. However, the level of taxation of mineral oils in the Member States - even where reduced excise duty rates are applied - is considerably higher than the tax level on other primary sources of energy such as coal and natural gas. In many countries, these two energy sources are not subject to tax rates equivalent to excise duties on mineral oil.

In view of these facts the concept of aid to oil through reductions of or exemptions from excise duties is a wholly relative notion to be treated with due care.

a. Statutory exemption

In accordance with Article 8(1) of Directive 92/81/EEC, the Member States must exempt particular uses of mineral oil from excise duty. These uses include products used as fuel in aviation other than for private tourism as well as for shipping on Community waters (including fishery activities) other than on board private pleasure craft.

b. Optional exemption or reduction

Article 8(2) of Directive 92/81/EEC enables Member States to apply full or partial reductions of or exemptions from excise duty on mineral oil (e.g. fuel used for navigation on inland waterways and for passenger and goods transport on railway networks).

In this context, mention should be made of a proposal for a Council Directive, adopted by the Commission on 7 November 2001,³³ which should enable, though not oblige, Member States to reduce excise duty on pure biofuels or biofuels mixed with other fuels if used for heating or transport purposes.

c. Exemption or reduction based on specific policies

In accordance with Article 8(4) of Directive 92/81/EEC, the Council may authorise Member States to introduce exemptions from or reductions of excise duty on mineral oil in connection with specific policies.

To date, about 100 derogations have been authorised on the basis of this provision. The reasons adduced by the Member States have been quite diverse, and come under the following headings:

- fuel used for pleasure craft and private aircraft;
- derogations granted to the industrial and commercial sectors (in particular to industrial undertakings which are major consumers of energy);

³³ COM(2001)547.

- derogations intended to promote the use of less environmentally damaging products (in particular oil products with low sulphur content);
- derogations connected with considerations of regional policy (excise duty reductions in less developed regions) or social policy (tax reduction for fuel used in vehicles driven by the disabled);
- fuel used in road transport (local public transport, taxis, long-distance lorry drivers).

For the Member States concerned, these derogations are tools serving environmental protection, transport and energy policies. By differentiating excise duty rates, Member States may help promote the use of more environmentally friendly products by using the price signal to which consumers are sensitive. Through excise duty differentiation it is possible both to guide and to reduce the demand for energy products.

By Decision of 12 March 2001,³⁴ the Council extended most of the derogations in force for another six years, except for those for road transport operators (France, Italy and the Netherlands) which are extended for a period of two years. In the case of the latter, the Commission has already announced that it will not propose their extension beyond the two-year period provided for in the Decision. Moreover, the Council Decision is without prejudice to possible proceedings for distortions of the functioning of the single market that could be instituted under Articles 87 and 88 of the EC Treaty.

5.1.2.2. Priority given to indigenous fuel in electricity generation

Article 8(4) of Directive 96/92/EC allows Member States to require that, up to a 15% limit, priority be given to electricity from power plants using indigenous fuel from primary energy sources (see section 4.1.2.3).

This provision is likely to apply to electricity produced from oil extracted in the EU. It should be noted, however, that this possibility has little or no effect in practice as the use of oil products (heavy fuel) in generating electricity is being increasingly sidelined.

5.1.3. Aid to research

Rather like the position for research relating to solid fuel, the budget earmarked by the Member States for oil and gas research is very limited, quite often around €1 million a year. According to the study compiled by the Vrije Universiteit of Amsterdam in 2001, there are two Member States making a greater contribution to this research: France, through the Institut Français du Pétrole, part of whose revenue accruing from tax levied on oil products is allocated to research, and the Netherlands.

5.1.4. Financing mandatory storage of oil products

Directive 68/414/EEC, amended by Directive 98/93/EC,³⁵ introduces an obligation for Member States to maintain stocks equivalent to 90 days of consumption for each of the three main categories of oil products used to generate energy. Member States with indigenous oil production benefit from a reduction of the level of obligatory storage in proportion to their production, but with a 25% ceiling.

³⁴ OJ L 84, 23.3.2001, p. 23.

³⁵ OJ L 358, 31.12.1998, p. 100.

Member States remain free to organise their own internal storage methods. Two main categories can be distinguished: decentralised systems, in which oil companies are responsible for maintaining the mandatory stocks, and centralised systems, in which a separate central body is responsible for maintaining stocks. In practice, several Member States have a system in which the two methods are combined. Nine Member States have a central entity responsible for maintaining oil stocks: Portugal, Finland, Ireland, France, Germany, the Netherlands, Spain, Austria and Denmark.

In decentralised storage systems, the costs connected with mandatory storage are borne by the oil companies. In centralised storage systems, the mechanisms applied in the Member States make provision for financing the central storage entity, e.g. through tax levied on oil products, with the revenue being transferred to the entity, or through the payment of fees by operators that make use of the entity's services. As a result, the cost linked with mandatory storage of oil products is in all cases passed on to the final price of the products. Accordingly, none of these measures can be regarded as an advantage benefiting oil products.

On 11 September 2002, the Commission adopted two proposals for Directives to improve security of petroleum product and natural gas supply (COM(2002) 488 final). In particular, the Commission proposed that all Member States should have to set up a national stockholding agency responsible for covering at least one third of the security stock obligation.

5.2. EU aid

5.2.1. Aid to research

5.2.1.1. Thermie and Energie research programmes

After the 1973 oil crisis, the European Union decided to finance programmes to further technological progress in oil and gas exploration and in the transmission of oil and gas. At the beginning of the 1970s, the chief concern was to ensure security of energy supply. EU aid was therefore focused on technologies that would make it possible to exploit energy resources in the North Sea.

In the years that followed, the scope of the programmes was gradually expanded to include projects to boost the competitiveness of the oil sector and projects relating to protection of the environment. Priority was given to projects designed to reduce the environmental impact of hydrocarbon exploitation and projects to improve the competitiveness of European technology.

Between 1975 and 1998, nearly €750 million were allocated by the European Union to research and innovative technological demonstration projects in the hydrocarbon sector (see Annex 7.2: EU aid for technological developments in hydrocarbons (oil and gas)). Under the fourth framework programme of European Community activities in the field of research, technological development and demonstration (Thermie programme), the European Union funded research in the oil and gas sector to a level fairly similar to that granted in the past.

Year	Budget (million €)
1995	24.9
1996	18.3
1997	25.4

1998	29.0
Total	97.7

Under the fifth framework programme (Energie programme), research in the hydrocarbon sector is financed as part of key action 6.4 "More efficient exploration, extraction and production technologies for hydrocarbons". During the first three years of the fifth framework programme, EU financing has totalled €48.9 million.

(million €)	Research projects	Demonstration projects
1999	26.9	1.5
2000		11.3
2001		7.2
2002 (estimate)	Not available	Not available

All these sums cover oil and gas research as a whole. For many research projects it is not possible to distinguish whether a particular project concerns gas or oil. In fact, the latest drilling equipment and seismic analysis systems can be used for oil as well as gas.

As regards the period 2002-06, like solid fuel research, research in the hydrocarbons sector is not one of the priorities of the sixth framework programme for research.

5.2.2. *Aid under regional policy*

There are no measures benefiting oil in connection with the development of trans-European networks in the energy sector (Article 154 of the EC Treaty).

In the context of the structural funds for 2000-2006, the EU "Competitiveness" programme for Greece includes measures to develop oil product transmission via pipelines and/or the construction of underground storage facilities for products currently located in the Perama area of Attica (Priority 7 of the EU "Competitiveness" Objective 1 programme). The aim is to improve environmental protection and reduce the risk of a serious accident in a densely populated area. The project will further improve the capacity to lay down strategic oil product reserves. When carrying out the measures, conditions of fair competition will have to be ensured.

The programme also includes the construction of a pipeline to supply Spata airport from refineries located in the Elefsina-Corinth area. The project is regarded as vital in order to ensure a sufficiently flexible supply to the airport. It will also make it possible to improve safety conditions by greatly reducing transport by road tankers.

The EU cofinances these projects with a contribution of 12.1% of the public expenditure on priority 7 of the programme, representing a maximum of €26 million.

5.2.3. *Aid linked with EU employment and social policies*

According to the Commission, EU measures connected with social policy, particularly those under the European Social fund, are not targeted at specific sectors. A cross-sectoral approach to labour market problems is adopted, particularly involving general measures to reintroduce people into the labour market, general measures in support of training, etc. It is not therefore possible to identify specific measures or specific effects in a given sector.

6. CONCLUSION

The aid granted by the Member States to support EU coal production is clearly the most significant aid to this energy source. The grant of this aid is linked not to a temporary economic crisis but to the structurally loss-making nature of the bulk of coal mining activities in the coal-producing Member States. Under the ECSC aid scheme, attempts have been made, through various measures imposed upon the Member States, to circumscribe the effects of this aid to the coalmining sector. The measures were used to prevent distortions of competition being created between coal users and, first and foremost, between electricity producers. The rules of the new post-ECSC aid scheme have been drawn up in the same spirit. It should be noted, moreover, that the volume of coal production and that of aid to coal production have for several years been steadily decreasing. To this must be added the fact that intra-EU trade in coal is now extremely limited.

Furthermore, several Member States have established mechanisms to support electricity produced from solid fuels (peat, lignite, coal). These measures are indirect aid to solid fuel in that they are likely to influence fuel choice to the benefit of solid fuels.

With regard to oil, EU legislation makes provision for exemptions from or reductions of excise duties in relation to the minimum level of taxation applicable in principle. These measures are, however, a very indirect form of aid to oil and are mainly intended to grant an advantage to an economic sector by reducing the tax burden or promoting more environmentally friendly products.

Note should also be taken of the marked reduction since 1998 in EU funding of coal and oil research. EU research programmes are increasingly focussed on new and renewable energies which should benefit from public funds in order to promote their penetration on the energy market.

7. ANNEXES

7.1. Decisions authorising State aid to the coal industry - 1999 to 2001

7.2. EU aid for technological developments in hydrocarbons (oil and gas)

Annex 7.1**Decisions authorising State aid to the coal industry - 1999 to 2001**

(million €)		Aid to current production		Aid to cover exceptional costs	Total	Grand Total
		Operating aid	Aid for the reduction of activity			
1999						
Germany	Decision of 22 December 1999 [OJ L117, 5.5.1999, p. 44]	2 665	1 646	3 88	4 700	6 754
Spain	Decision of 4 May 1999 [OJ L 177, 13.7.1999, p. 27]	327	399	344	1 070	
France	Decision of 20 September 2000 [OJ L 29, 31.1.2001, p. 45]	-	354	630	984	
United Kingdom	None	-	-	-	-	

(million €)		Aid to current production		Aid to cover exceptional costs	Total	Grand Total
		Operating aid	Aid for the reduction of activity			
2000						
Germany	Decision of 21 December 2000 [OJ L127, 9.5.2001, p. 55]	2 003	1 604	1 086	4 693	6 968
Spain	Decision of 13 December 2000 [OJ L 58, 28.2.2001, p. 24]	293	406	423	1 122	
France	Decision of 20 September 2000 [OJ L 21, 23.1.2001, p. 12]	-	389	621	1 010	
United Kingdom	Decision of 15 November 2000 [OJ L 43, 14.2.2001, p. 27]	Commission opinion on the plan for restructuring the coal industry	-	-	-	
	Decision of 13 December 2000 [OJ L 81, 21.3.2001, p. 31]	28	-	-	28	
	Decision of 13 February 2001 [OJ L 122, 3.5.2001, p. 23]	98	-	-	98	
	Decision of 11 April 2001 [OJ L 210, 3.8.2001, p. 32]	17	-	-	17	

(million €)		Aid to current production		Aid to cover exceptional costs	Total	Grand Total
<i>2001</i>						
Germany	Decision of 21 December 2000 [OJ L 127, 9.5.2001, p. 55]	1 790	966	1 401	4 157	6 319
Spain	Decision of 11 December 2001 [OJ L 82, 26.3.2002, p. 11]	275	350	445	1070	
France	Decision of 23 May 2001 [OJ L 239, 7.9.2001, p. 35]	-	349	642	991	
United Kingdom	Decision of 8 May 2001 [OJ L 241, 11.9.2001, p. 10]	41	-	-	41	
	Decision of 25 July 2001 [OJ L 305, 22.11.2001, p. 27]	34	-	-	34	
	Decision of 17 October 2001 [OJ L 35, 6.2.2002, p. 19]	10	-	-	10	
	Decision of 24 April 2002 [OJ L 184, 13.7.2002, p. 37]	6.5	-	-	6.5	
	Decision of 5 June 2002 [to be published]	9	-	-	9	

Annex 7.2 EU aid for technological developments in hydrocarbons (oil and gas)

(million €)	1975-1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	Total
Denmark	12.17		0.53	1.55		0.45					14.70
France	195.64	5.36	8.02	4.79	10.61	14.78	4.79	11.42	7.39	7.69	270.49
Germany	66.30		3.03	5.48	2.67	1.10	3.33		1.09	4.40	87.40
Greece	3.19	1.02				0.21		0.40	1.39	1.13	7.34
Ireland	6.65						0.49				7.14
Italy	80.54	1.03	4.50	6.56	5.43	8.32	1.85		5.68	5.45	119.36
Norway							2.87	1.18	3.37	2.50	9.92
Portugal	1.03		0.14								1.17
Spain	0.59			0.21		0.22	0.30	1.12			2.44
Sweden							0.74		1.84		2.58
Netherlands	28.07	0.41	0.60	2.58	0.69	0.43	0.11	0.63			36.13
United Kingdom	132.28	2.03	6.60	5.55	6.90	11.72	10.44	3.58	4.68	5.27	189.05
Total	526.46	9.85	23.42	26.72	26.30	37.23	24.92	18.33	25.44	29.05	747.72

REPORT ON CURRENT SUPPORT SCHEMES FOR RENEWABLE ENERGY SOURCES IN THE EUROPEAN UNION

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1. EXECUTIVE SUMMARY

As underlined in several Commission documents, the promotion of renewable energy sources (“RES”) is a Community priority. The development of RES reduces the strain which energy generation places on the environment and at the same time eases the Community’s dependence on energy imports. In the past decade the Community’s RES generation capacity has indeed increased substantially, particularly in the wind and biomass sectors.

Today, however, most RES still cannot compete on an equal footing with other energy sources. The reasons for this are: (i) the need to integrate RES in an energy system that originally developed around conventional energy sources (coal, oil, natural gas and nuclear energy); (ii) the competitive advantage which conventional energy sources enjoy through not having to cover their external environmental costs. The need for State support has therefore been acknowledged by the Commission, and both the Community and the Member States accordingly provide support for the development of RES. Such support, however, has to comply with the Commission’s guidelines on State aid for environmental protection.¹

Member States support the development of RES through: (i) various direct price support schemes, such as quotas, certificates, tenders or fixed prices; (ii) capital investment aid; (iii) tax measures; (iv) R&D support; and (v) support for the enhancement of sources, meaning biomass incentives. At the same time, the Community helps the development of RES via (i) its regional policy funds; (ii) Altener, the Community programme for RES promotion; (iii) R&D; (iv) indirect support for biomass sources. Despite several attempts, the Community still lacks a common tax instrument for promoting RES.

Since RES is still a relatively recent policy field, it is very hard to quantify the amount of support flowing in this sector. RES generation is by nature diverse and decentralised; therefore national support is spread across several projects, often without a single common administrative framework. In their national programmes and in Community programmes administered by them, Member States often use different calculation methods, and statistical data giving a breakdown for RES are not usually available. Community regional policy and agricultural funds present the same difficulties. As regards aid from the Structural Funds, data are only available on global measures, whereas a detailed breakdown for RES would require a project-by-project search. As they are not primarily targeted on the promotion of RES, the reports and statistics do not offer data on the amounts spent on RES.

In the light of the foregoing, this report is restricted to an overview of the various sources of national and Community support, followed by an annex listing existing national and Community support schemes. With the level of data available at present, it has not been possible to estimate beyond reasonable doubt the total amount of Community and national support channelled into RES.

¹ See section 3.2.4.

2. PREFACE AND METHODOLOGY

The following analysis is based on facts derived mainly with the help of various internal documents and RES policy survey reports made available by the Ener-Iure project, part of the Altener programme. Finally, with respect to the European Union, the Communication on the Implementation of the Action Plan on Renewable Energy Sources was used.² Readers will notice that some of the data quoted are out of date. This invariably means that no more recent data were available from the sources at our disposal.

Precise data on support for RES is often difficult to obtain, as will be further explained later in the text. Therefore, readers are advised to proceed with caution when consulting this report and its annexes and to take them as no more than a general overview of the sources of public support available in the various Member States and from the EU.

The definition of *public support* underlying this report and the detailed information in the annex is based on economic criteria and not on the legal categories developed under the State aid rules in the EC Treaty. According to the Preussen Elektra judgment,³ the German law requiring electricity undertakings to purchase at fixed minimum prices electricity from renewable energy sources does not constitute State aid under Article 87(1) of the EC Treaty, as it does not involve State resources.

Following recent notifications of State measures in favour of renewable energy sources the Commission is now forced to apply the Preussen Elektra judgement to specific cases, i. e. it must consider whether the notified measures still fall within the scope of Article 87(1). It is therefore possible that some of the direct price support schemes mentioned in this report will be considered not to constitute State aid under Article 87(1) of the EC Treaty in the future.

3. ECONOMIC AND LEGAL FEATURES OF THE SECTOR

3.1. The economic features of renewable energy sources

In February 2001 the Commission published its first report on the progress made towards achieving the objectives set in the White Paper.⁴ The table below, taken from this report, shows that advances are being made, but not at the same speed in each sector of renewable energy technology.

² Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions on the implementation of the Community Strategy and Action Plan on Renewable Energy Sources (1998 – 2000), 16 February 2001; COM(2001) 69 final.

³ Case C-379/98, PreussenElektra, judgment of 13 March 2001.

⁴ Communication on the implementation of the Community Strategy and Action Plan on Renewable Energy Sources (1998-2000), COM(2001) 69 Final of 16 February 2001.

Energy production from RES in EU-15 by sector

	1989	1996	1997	1998	Increase 89/98
Wind	46	417	631	1.037	2154%
Solar	146	294	318	347	138%
Hydro	21.859	24.814	25.452	26.262	20%
Geothermal	2.215	2.747	2.815	2.992	35%
Biomass	39.979	47.777	52.552	54.175	36%
Total RES primary energy (ktoe)	64.242	76.051	84.816	84.816	32%

By far the fastest growing sector of renewable energy at this time is wind energy with an annual growth rate of 55% per year. The target of 10 GW of wind power by 2003 (intermediate target set for the Campaign for Take Off) was exceeded three years in advance, and the wind power industry is now aiming for 60 GW by 2010, which would exceed the subtarget of 40 GW set for this sector in the White Paper by 50%!

The solar photovoltaic (PV) sector is also growing rapidly. The latest market study, conducted by the European PV Industry Association (EPIA) in July 2001, reports that the fastest growing PV market in the EU is for grid-connected systems. This is exciting, but PV electricity prices are still much higher than those of other renewable electricity generating technologies, and so the PV market currently relies very heavily on subsidies, to a considerably higher extent than other renewable energy sources.

EPIA concludes from its market study that the White Paper target of 3 GW by 2010 should be revised upwards to 4 GW. However, until the costs of PV systems are considerably reduced, the future growth rate of the PV market will be determined largely by the extent to which governments are prepared to continue providing subsidies and PV demand will have to be considered artificial demand triggered mainly by favourable subsidy schemes.

The market for solar water heating is growing at a more modest rate of around 14% per annum. There are currently about 12 million m² of solar heating collectors in the EU and this is growing by about 1 million m² per year, mainly in Germany, Greece and Austria. Substantial acceleration is clearly needed on the market if the White Paper target of 100 million m² of solar water heating collectors is to be achieved by 2010.

In the biomass field, progress is also being made at a relatively modest rate. However, contrary to the PV sector the biomass sector is very large and includes a wide range of different resources, technologies and markets. As might be expected, the markets for the different biomass technologies are growing at very different rates in the different EU Member States.

Similarly, progress remains relatively modest in the markets for the other renewable energy technologies including hydropower and geothermal heat and power generation. The reasons for the need for support are linked to the two following economic factors:

According to mainstream economic wisdom,⁵ one big disadvantage of RES at the moment lies in the fact that under the current framework conditions, external costs – socio-environmental damage (e.g. impact on human health, global warming) stemming from the production and consumption of energy - are not internalised, i.e. are not

⁵ See, for instance: European Commission press release of 7 December 2001: "New research reveals the real costs of electricity in Europe".

included in the market price. Therefore polluting technologies with high external costs do not fully pay for the damage they cause. This makes it more difficult for RES (with low external costs but higher internal costs) to compete with conventional sources of energy. Furthermore, as underlined in the Green Paper on a European strategy for the security of energy supply,⁶ RES need significant **initial investment**, as was the case for that matter with other energy sources, such as coal, oil and nuclear energy.

It is reasonable to believe that the cost disadvantage will decrease over time. Prices of electricity production from RES have fallen considerably in the last ten years, because of advances in technology, public support and the bigger scale on which electricity is now being produced from RES, as can be seen from the table below:

Development of cost of production of renewable electricity per kWh (in €)⁷

Technology Area	1980	1985	1990	1995	2000 (forecast)
Wind	0.22 ⇔ 0.57	0.11 ⇔ 0.28	0.067 ⇔ 0.17	0.030 ⇔ 0.077	0.025 ⇔ 0.065
Biomass a) Gasification b) Co-firing c) Steam cycle	c) 0.12	c) 0.10	c) 0.10	a) n.a. b) 0.061 c) 0.083	a) 0.077 b) n.a. c) 0.074
Small Hydro	0.02 ⇔ 0.17	0.02 ⇔ 0.15	0.019 ⇔ 0.13	0.019 ⇔ 0.12	0.019 ⇔ 0.1

Source : ATLAS, Compendium of Technology Modules, Energy Technology Information Base 1980-2010, European Network of Energy Agencies.

The Green Paper on a European strategy for the security of energy supply also highlighted a **structural obstacle** for the sector: “The economic and social system is based on centralised development around conventional sources of energy.”⁸ In terms of infrastructure, renewable energy generators thus face a number of major challenges:

Planning: many projects are held up and finally do not materialise because of lengthy planning procedures. Since electricity from renewable energy sources ("RES-E") is mostly generated on a decentralised basis, the necessary installations often have to be located closer to communities than conventional plants. Simplified and accelerated planning procedures, preferably at local and regional level, that could minimise local environmental disturbances and hence opposition would facilitate further expansion of RES-E. Directive 2001/77/EC addresses that problem by placing an obligation on Member States to review existing legal procedures with a view of simplifying them. However, the Directive falls short of imposing simplification itself.

Grid connection issues: connection of RES generators to the grid presents a number of challenges to transmission and distribution system operators, due notably to their

⁶ COM (2000) 769 final.

⁷ Note that production costs of electricity from conventional sources are extremely difficult to predict, due to constantly changing fuel market prices. Such uncertainties effectively preclude us from offering a clear comparison between production costs from renewable and conventional energy sources.

⁸ COM (2000) 769 final, p.45.

decentralised nature and, compared to traditional generating facilities, their low unit output. In particular, for the same reasons, connection to the transmission grid can be expensive, especially where new lines have to be laid. Directive 2001/77/EC tries to improve transparency in the field by stipulating that costs charged for technical adaptations, such as grid connections and grid reinforcements, must be based on objective, transparent and non-discriminatory criteria taking into account all the costs and benefits associated with the connection of a renewable producer to the grid.

3.2. The legal framework

The European legal framework aims at promoting and supporting renewable sources. This support acts both ways, on the supply and the demand sides alike. The main proposals and legislative instruments are the Green Electricity Directive, the proposal for a directive on the energy performance of buildings, the Commission package for the promotion of biofuels and the Community guidelines on State aid for environmental protection.

3.2.1. The Green Electricity Directive

The new Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market,⁹ which was finally approved on 27 September 2001, sets a legal framework for the future development of the renewable electricity (RES-E) markets in the EU. The Member States are now under an obligation to set national targets for the future consumption of RES-E, and the Directive gives indicative targets in an annex. If the targets are met, the consumption of electricity from RES-E in the EU will rise from 14% in 1997 to 22% by 2010. The Commission will monitor the progress made towards these targets.

The new Directive abstains from proposing a harmonised Community-wide support scheme for RES-E, but requires the Commission to make a proposal for such a scheme if necessary within four years, taking into account the experience gained in the Member States with their different support schemes.

The Directive further requires Member States to ensure guaranteed access for RES-E, to issue guarantees of origin for RES-E, and to ensure that the calculation of the costs of connecting new producers of RES-E and of transmitting green electricity are transparent and non-discriminatory.

3.2.2. Proposal for a directive on the energy performance of buildings

Earlier this year the Commission adopted a proposal for a directive, which aims to promote improvements in the energy performance of buildings.¹⁰

This proposal focuses to a large extent on energy efficiency issues but also has relevance for the supply side. It includes a methodology for establishing integrated energy performance standards for buildings, that takes into account on-site energy production, for example through the use of PV electricity or solar heating/cooling technologies. Implementation of the proposed new directive would provide a valuable opportunity for

⁹ OJ L 283, 27 October 2001, p.33.

¹⁰ COM(2001) 225 final of 11 May 2001. Council agreed on a general position on this Commission proposal by 4 December 2002.

the PV industry to demonstrate to a wide range of building owners and users how PV can contribute to reducing the share of energy consumption in the EU attributable to buildings, which currently stands at 40%.

This proposal for a directive was received favourably by the European Parliament on first reading. The Council adopted its common position on the proposal on 7 June 2002.

3.2.3. *Commission package for the promotion of biofuels*

Last November the European Commission adopted a legislative package aiming at putting into action its new White Paper on transport policy. The package contains a communication and two proposals for directives.¹¹

The communication puts forward a concrete action plan for the promotion of alternative fuels and biofuels in road transport by concentrating policy efforts on the promotion of biofuels, natural gas and hydrogen. Furthermore, the Commission invites relevant industrial and non-governmental organisations to clarify the outstanding issues related to the introduction of natural gas and hydrogen as transportation fuel.

The two proposals for directives aim at promoting the use of biofuels for transport. The first proposal requires that an increasing proportion of all diesel and gasoline sold in the Member States be biofuel, starting with 2% in 2005. The second proposal creates a Europe-wide framework allowing Member States to apply different tax rates in favour of biofuels.

3.2.4. *State aid regulations*

The Commission recently adopted new Community guidelines on State aid for environmental protection providing transparent criteria, indicating under which circumstances it holds “green” State aid to be compatible with the common market.¹²

This is important to the RES sector, as most EU Member States offer subsidies to producers/users of renewable energy in order to create a “level playing field” for renewable energy, in the face of competition from conventional energy sources, for which the external costs are not all passed on directly to the end-user of the energy.

These subsidies may, in many cases, fall under the State aid rules of the EC Treaty and are thus subject to Commission approval. The new guidelines now offer Member States several new possibilities to support renewables while complying with the State aid rules.

3.2.5. *Legal framework - summary*

In the light of the foregoing, it can be concluded that in order to develop positively in the medium term, renewable energy sources will, in principle, require two essential elements: a *price support mechanism* that enables RES producers to enter the market and make a reasonable profit, and a *stable regulatory environment* so that investors can enter the market without concern that the price support mechanism will be modified in a manner likely to make their investment unprofitable. This is also underlined by the Council resolution of 8 June 1998 on renewable sources of energy.¹³

¹¹ COM (2001) 547 final of 7 November 2001.

¹² OJ C37, 3.2.2001, p.3.

¹³ OJ C 198, 24.06.1998, p.1.

The target of doubling the share of RES from 6% to 12% in 2010 forms part of a strategy on security of supply and sustainable development. It needs a major effort, however, including public support in the short and medium term. A particularly big effort will have to be made in the electricity sector to achieve the global indicative target of a 22% share of renewable electricity in 2010 set by Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market.¹⁴

It should be stressed in this context that increased market penetration by renewable energy sources will allow economies of scale, thereby reducing costs. The Commission therefore thinks that it is important to utilise the strength of market forces and the internal market to make renewable energy sources competitive in the longer run.

4. SCHEMES IN THE MEMBER STATES AND AT COMMUNITY LEVEL

4.1. National support schemes

All Member States support RES in one or more ways, via research and development, tax reductions/exemptions, guaranteed prices, investment subsidies and the like.

The magnitude and type of support varies widely between Member States, given the national situations, both in terms of policy priorities and as far as the presence of natural resources is concerned. A detailed overview of support systems is annexed covering electricity, heat and transport applications of RES. To sum up, the main forms of support are:

4.1.1. Member State direct price support schemes

Under **direct price support schemes**, generators of electricity from renewable energy sources receive, directly or indirectly, on the basis of State regulation, financial support in the form of a subsidy per kWh supplied and sold. At present there are essentially two categories of direct price support mechanisms within the EU: (i) quota-based systems, and (ii) fixed-price systems.

- (i) **Quota-based systems** are based on setting the price through competition between RES-E generators for available support following a decision by the Member State in question on the desired level of RES-E. Two different mechanisms presently operate: the green certificate and tendering schemes.
 - In the **green certificate** system, RES-E is sold at market prices. In order to finance the additional cost of producing RES electricity and to ensure that the desired amount of RES electricity is generated, an obligation is placed on all consumers to purchase a certain amount of green certificates from RES-E producers according to a fixed percentage, or quota, of their total electricity consumption/production. Since consumers wish to buy these certificates as cheaply as possible, a secondary market of certificates develops where RES producers compete with one another to sell the green certificates. The system is now being introduced in, for example, Belgium (Wallonia/Flanders Region), the United Kingdom and Sweden. Under a **tendering procedure**, the State places a series of tenders for the supply of the RES-E, which would thereafter be supplied to the local utility on a

¹⁴ OJ L283, 27.10.2001, p.33.

contract basis at the price which emerged from the tender. The surplus costs generated by the purchase of RES-E are passed on to the end-consumer of electricity through a specific levy. This system is used in the Republic of Ireland and was used in the United Kingdom.

- (ii) **Fixed-price schemes**, operating presently in several EU countries, notably Germany, France, Spain and Denmark, set a specific price for RES-E that electricity companies, usually distributors, must pay to domestic producers of RES-E. In such schemes, in principle, no quota or maximum limit is set for RES-E in the Member States. Such a limit or quota is, however, created indirectly by the level at which the RES-E price is set. A variant of the fixed-price scheme is a fixed-premium mechanism, according to which the government sets a fixed-premium or an environmental bonus, paid above the normal or spot electricity price, to RES-E generators. In cases where the fixed prices are related to the market price of electricity there will in reality be little difference between the fixed price and fixed premium schemes. The fixed price or fixed premium may be revised by the government to reflect falling costs.

4.1.2. Member State support for capital investment

Subsidies for **capital investment** or loans for investments are given in some countries. Relatively higher levels of subsidy are given to promote the technological development of the as yet less economic technologies, such as rooftop PV systems. Technologies closer to the market, such as wind, do also receive subsidies in many cases, albeit at relatively lower levels.

4.1.3. Member State fiscal support for consumption of energy produced from renewable sources (tax measures)

Some Member States also support renewable electricity via the **tax system**. This takes the form of (i) exemptions from or refunds of energy taxes where they exist (for example, in the Netherlands where renewable electricity is exempted, in Finland where the electricity tax is reimbursed and in Denmark where the CO₂-tax, which is also levied on RES electricity, is reimbursed), (ii) lower VAT rates on some RES-systems, like solar energy equipment in Portugal, (iii) tax exemptions for investments in small-scale RES-E and (iv) the introduction of SO₂ and NO_x taxes as in Denmark and Sweden which especially favours the development of wind and hydro power. The Commission proposal for the taxation of energy products (COM (97) 30) also provides for tax reductions or exemptions for energy from renewable energy sources.

4.1.4. Member State support for research and development

Government support is given to almost all forms of RES via subsidies for **research and development**. For details of particular RES research and development funding levels in the different Member States, see the annex.

4.1.5. Member State indirect support to sources used to generate renewable energy

Several governments provide such support through afforestation programmes, energy plant or biofuel programmes, thus providing more biomass. Similarly, support schemes for more efficient waste recycling free up additional combustible biomass.

4.2. Community support schemes

EU support for RES focuses on capital investment, available mostly through general development channels, such as regional policy, agricultural policy, research and development programmes. The main sources of EU support are as follows:

4.2.1. *Community regional policy*

The new regulation on the European Regional Development Fund (ERDF),¹⁵ which was adopted in the framework of AGENDA 2000, expressly states that the ERDF should foster the development of renewable energy sources, and the definition of the scope of the fund includes action in support of renewable energy sources.

In the latest guidelines for the Structural and Cohesion Funds,¹⁶ renewable energy is highlighted as a strategic priority, particularly because of its potential to contribute to the development of local resources and to reduce import dependency. Whilst it is not appropriate to establish specific budgets for renewable energy in the regional funds, Member States were nevertheless called upon to guarantee at least 12% of the global budget of their energy sub-programmes for supporting renewable energy sources. This could result in regional investments of around €487 million in RES (2000-2006). Nevertheless, measurement of the precise amount of support would involve searching all such projects for possible RES implications, a task that is beyond the remit of this report.

4.2.2. *Community programmes for RES promotion*

Another source of funding dedicated specifically to renewable energy is the Altener programme. The budget for Altener II (1998-2002) is €15 million per year. This sum is spent mostly on funding know-how and technology transfer, dissemination of information, educational and demonstration projects.

4.2.3. *Community indirect support for the consumption of energy produced from renewable sources (tax measures)*

The Commission proposal for the taxation of energy products (COM (97) 30) also provides for tax reductions or exemptions for energy from renewable energy sources. Although that proposal was not adopted, the Commission is now considering the possibilities of initiating enhanced cooperation between several Member States regarding a common energy product taxation regime.

4.2.4. *Support for research and development*

The Commission has been supporting R&D and the demonstration of renewable technologies for more than 20 years, and continues to welcome innovative proposals for such action through the 5th Framework Programme's¹⁷ ENERGIE Programme, which has

¹⁵ Regulation (EC) No. 1783/1999 of the European Parliament and of the Council of 12 July 1999 on the European Regional Development Fund, OJ L 213, 13.8.1999, p.1.

¹⁶ COM (1999) 344 final.

¹⁷ Decision No 182/1999/EC of the European Parliament and the Council of 22 December 1998 concerning the Fifth Framework Programme of the European Community for research, technological development and demonstration activities (1998-2002), OJ L 26, 1 February 1999, p. 1.

a total budget of €1.042 million (1998-2002). This is usually spent on support for the development and use of renewable energies through research and demonstration activities, with the objectives of providing better and more reliable technologies, delivered at lower costs to the users.

To give an example, the longer term PV research projects have been focused on developing new lower cost PV cells and modules, whilst the nearer term actions have focused more on innovative demonstrations of the integration of PV technologies into buildings and other structures. Recent demonstration projects have also addressed some of the non-technical barriers which are encountered when moving these new PV technologies into the market.

On 3 June 2002 the Council adopted the 6th Framework Programme of RTD (in short "FP6"), after the European Parliament had agreed to it on 15 May 2002. FP6 has a budget of €17.500 million. FP6 covers, *inter alia*, the priority area "Sustainable development, global change and ecosystem", with a total budget of €2,120 million. More than a third of this budget will be dedicated to non-nuclear energy and will address RTD activities to promote clean energy, in particular renewable energy sources and their integration in the energy system, together with storage, distribution and use, as well as alternative motor fuels.

4.2.5. *Indirect support to sources used to generate renewable energy (agricultural subsidies, etc.)*

The most important support in this field is provided through the CAP to certain crops, such as rapeseed, which are, *inter alia*, used as energy crops. However, the amount of subsidies is not easy to quantify, as support is granted for particular crops and not for particular uses. Thus, the exact amount of subsidies could only be established if the exact quantity of crops used for energy generation, either in the form of biomass or in the form of biofuels, is determined.

The CAP also provides support to RES through some of its rural development projects. However, as these programmes are implemented by Member States using different calculation methods, and as most of these programmes are not primarily and exclusively aimed at RES promotion, it is at present not possible to estimate with reasonable precision the order of magnitude of the support offered. In its Communication on the Mid-Term Review of the CAP, the Commission proposes replacing the existing arrangements for support on set-aside land with a specific energy crop payment ("carbon credit").

5. CONCLUSIONS

Renewable energies have already become established in a number of electricity markets and some niche markets, where their added value is already obvious to the end-users. The markets for some renewable energy technologies are now beginning to move into the phase of rapid growth, where purchases are made by imitators, and the Commission is helping to promote such market growth by supporting the promotion of best practices.

In order for renewable energy technologies to move fully into the mainstream of EU energy supplies (mass markets), and to compete on the single European energy market, it is clear that the different legislative and fiscal frameworks should be amended and that targeted national support measures will have to be put in place to provide a more "level playing field". This review is provided for with by the RES Directive. This is why the

Commission has recently embarked on a major programme of legislation (directives) in the renewable energy sector. It is likely that a process will need to be put in place at that stage in order to allow assessment of progress on these Directives in relation to overall renewable energy objectives.

6. ANNEXES

6.1. Subsidies and other public financial support provided for the renewable sector by Member States and by the European Union

Editor's note

The following tables were compiled mainly with the help of the renewables policy survey reports made available by the Ener-Iure Project, supported by the Community programme. Some of the information was obtained from a 2001 report on energy subsidies prepared for the European Parliament.¹⁸ Finally, with respect to the European Union, the Communication on the Implementation of the Renewable Energy Sources Action Plan was used¹⁹

Readers will notice that some of the data quoted in the tables are out of date. This invariably means that no more recent data were available from the sources at our disposal. Furthermore, given that we have used pre-processed data, the exhaustiveness of the tables cannot be guaranteed. This is particularly true of the details of the various support schemes, which are complicated and prone to frequent changes. This must be especially underlined with respect to tax provisions, which tend to be amended on an annual basis.

In the light of the foregoing, readers are advised to proceed with caution and to take the tables below as no more than a general overview of the sources of public support available in the various Member States and from the EU. Readers are also invited to access the Ener-Iure project website (<http://www.jrc.es/cfapp/eneriure/welcome.html>), which offers comprehensive information on legislation in the 15 EU Member States concerning renewable energy sources. Information offered by the Ener-Iure project is updated on a regular basis.

¹⁸ Energy subsidies in the European Union, Final Report; Frans Oosterhuis, Institute for Environmental Studies (IVM), Vrije Universiteit, Amsterdam, July 2001.

¹⁹ Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions on the implementation of the Community Strategy and Action Plan on Renewable Energy Sources (1998 – 2000), 16 February 2001, COM(2001) 69 final.

AUSTRIA

Price support

Eco-power (from renewables or CHP) purchase obligation with minimum eco-power shares	Minimum percentage of eco-power in all electricity delivered: 1 October 2001: 1% 1 October 2003: 2% 1 October 2005: 3% 1 October 2007: 4% Trade in eco-power between distributors is permitted. In the case of non-compliance, an equalisation levy is assessed.	
Purchase Price Regulation	Minimum prices apply to eco-electricity.	Varying by Land, between 0.03 € and 0.07 €
8% of all electricity sold from small-scale hydro-power through green certificates	All Austrian suppliers must reach this level, directly or through certificates. In the case of non-compliance, an equalisation levy is assessed.	

Tax measures

Levy on natural gas and electricity	Channelled to Länder for environmental and energy efficiency funding	Natural gas: € 0.044/m ³ Electricity: € 0.0073/kWh
Mineral oil tax	Favourable tax rate for biodiesel	Biodiesel: € 13 Biodiesel used in agriculture: € 0 (Diesel: € 282)
Personal income tax	Credits for investment in renewable energies	Max. € 7267/year may be deduced
VAT	Reduced rate for certain renewables	Biomass products and biodiesel: 10% (Normal rate: 20%)

Subsidies, loans

Law on Environmental Promotion (UFG)	Investment support for all sorts of environmental projects	Subsidy rate usually between 10 and 30 percent
ERP-Loans	For quality improvements relating to renewables in the tourism industry	Worth min. € 36 336, the credit runs from 5 to 12 years
Domestic investment support	For domestic use of renewables (heat pumps, solar, biomass)	Varying by Land
Environmental Protection Law subsidies	For commercial sector investors for any kind of renewable	1996: 249 projects were awarded €5.41 million altogether (Only for biomass: €0.7 million; only for wind: €2.14 million)
“Sparte 69” agricultural subsidies	For various renewable types to agricultural investors	1997: national: €5.86 million Länder: €3.92 million
Local energy concept subsidies	Planning in general and integration of renewables	€0.2 million/year (1/3 from State, 1/3 from Länder)

Lower Austria	Solar Subsidy Scheme	Direct investment aid for thermal solar, PV and heat pumps	Since 1993
	Environmental Investment Scheme	Interest rate subsidies for fossil fuels substitution	
Upper Austria	Upper Austrian Environment Fund Subsidies	Subsidies for district heating with biofuels, heat pumps, thermal solar and PV	Since 1985
Styria	Solar collectors scheme	Direct investment aid	€0.57 million in 1998
	Biomass/pellets scheme	Direct investment aid	
Tyrol	Renewables Subsidy Scheme	Direct investment aid for PV, heat recovery, renewables for warm water and heating, connection to district heating systems	1996-2000 PV: €1.07 million Renewables in warm water/heating: €5.36 million Connection to district heating systems: €0.71 million
	Solar Energy Subsidy Scheme	Direct investment aid for PV and thermal solar energy for warm water and heating	Since 1992
Vorarlberg	Biomass Subsidy Scheme	Direct investment aid	1998-1999 €1.29 million/year
	Biogas Subsidy Scheme	Direct investment aid	Aid and 50% of the feasibility study costs; guaranteed tariffs for 15 years
	PV Subsidy Scheme		1998-2001
	Thermal Solar Subsidy Scheme	Direct investment aid for the use of thermal solar energy in warm water and heating	1991
Vienna	Solar Energy Subsidy Scheme	Direct investment aid	
R&D		Government renewables R&D spending	Annual average €8.9 million

BELGIUM

Price support

The "green franc" production subsidy (scheme to be reviewed in 2003)	Electricity from renewables, biomass and organic waste is supported in the first ten years of operation with €0.025/kWh. Small hydro and wind receive an additional subsidy of €0.025/kWh. Small PV support continues indefinitely.	Estimated cost in 1999: €2.7 million
3% renewables purchase obligation	Utilities must purchase at a reasonable price 3% of their electricity from renewable sources	Coming up: renewables power generators and consumers will progressively be eligible to choose their supplier, having priority in trading over other electricity
Regional green certificate schemes are to be introduced in 2002, as approved by the EU (and a complementary federal scheme for offshore wind farms)	The above 3% requirement is to be attained through tradable certificates	Non-compliance is sanctioned with fines (e.g. in Flanders: €0.05/kWh)
Reduced transmission fees for renewable electricity (planned)	Yet to be approved by the EU	

Tax measures

Sulphur tax on heavy fuel oil	Renewables are obviously exempt	
Corporate tax	13.5% of renewables investments may be deducted from profits	

Subsidies, loans

Federal investment subsidy		Investments in renewables installations in hospitals and schools	Subsidies up to 20%
Electricity Generation Fund support		For renewables product development and demonstration projects	Total support in 1999: €5 million
Flanders	Investment subsidy	energy demonstration: up to 35% of cost	Subsidies up to 20%
	Renewable Energy Fund (planned)	To provide more funding for various renewables investments	Supported by the fines from the green certificate system
Brussels-Capital	Investment subsidy	For investments in solar boilers for domestic hot water	Subsidies up to 35%, max. €990
*R&D		R&D of renewable energy sources	Average annual spending: €3.5 million

DENMARK

Price support

Feed-in obligation	For electricity from renewables, or from biomass-fuelled CHP plants	
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Tax measures

Energy tax exemption	All electricity from renewables is exempted. (The energy, CO ₂ and sulphur tax are all consumption taxes, not generation taxes)	Estimated subsidy: €126 million
CO ₂ tax exemption	All electricity from renewables is exempted. Producers are refunded.	(The tax is based on the carbon content of coal-based electricity.) Refund: €0.001/kWh
Sulphur tax	A tax paid following the sulphur content of energy products.	(All revenues from the energy, CO ₂ and sulphur taxes are recycled through energy subsidy schemes.)
Personal income tax break	Shareholders in private wind turbine cooperatives can choose a system, where the first €400 of wind power income is tax-free	Extent of use not calculated

Subsidies, loans

Danish Energy Agency subsidies	Investment subsidies for renewables installations and other renewables promotion programs	1995-1999: average €8.9 million/year Subsidies cover between 15-30% of investment, with a ceiling of €132 000
Solar cells subsidies	A five-year investment support programme	Total funding: €27 million/year
R&D	Government spending on support for renewables R&D	€17.2 million/year
Wind industry guarantees	The government can give a guarantee to a company that guarantees Danish wind power projects abroad	Extent of guarantee: €100 million

FINLAND

Price support

Tax measures

Finland has a very advanced and environmentally conscious, complex energy taxation system, which focuses on differentiated electricity taxation instead of fuel input taxation

Electricity consumption tax rebate	CHP generators using certain biomass types, along with small hydro and wind operators are refunded the equivalent of this tax. Industrial consumers pay half the rate of all other consumers, while energy-intensive industries receive tax relief.	Estimated subsidy implied: €144 million/year
CO ₂ /energy tax exemption – to be paid after fossil fuels not used for electricity generation	The tax is made up of two-thirds carbon and a one-third energy content, based on heavy fuel oil. Nuclear and hydropower are taxed comparably.	Renewables are exempt from this tax, while peat pays a preferential rate

Subsidies, loans

Bioenergy support programme (since 1994)	Supports biomass and peat with investment subsidies up to 30% of costs.	Partially EU funded, in 1998: €22.3 million Total subsidies for all these projects in 1998: €22 million
Small-scale hydro and solar projects support	Investment subsidies up to 30% of costs	
Wind energy support scheme	Investment subsidies up to 40%	
Forestry subsidies	Subsidies for the management of young forests and growing wood for energy	(around €2-2.5/kWh) Total estimated subsidies: €31 million
Renewables research	Various projects together (i.e. studies supported by the Bioenergy support programme)	Total funds in 1998: €10.2 million (*Parliament survey: €4.5 million/year on renewables R&D)

FRANCE

Price support

Electricity purchase price regulation	The utility is obliged to buy electricity from renewables at avoided cost	
Eole 2005 wind power supply contracts	A certain supply capacity is put up for tender and the lowest cost bidder may supply. The market and the price are guaranteed for 15 years	Estimated implied subsidy: €2.9 million/year

Tax measures

*Excise exemption	Biofuels receive reductions of excise (recently deemed unlawful by ECJ)	Estimated implied subsidy: €230 million/year
VAT reduction	Firewood is charged a 5.5% VAT rate (other energy products: 19.6%)	Estimated implied subsidy: €36 million/year
Flexible depreciation	Specific depreciation rate for renewables investments	100% depreciation

Subsidies, loans

Biogas programme	Based on a tendering procedure, the programme aims to equip waste dumps with combustion facilities	Estimated subsidy: €1 million
Biofuel-production programme	Scheme to develop investments	Funding: €166.4 million/year
*HELIOS 2006	Investment subsidies for household solar water heating equipment	Funding under €1 million/year
Wood energy projects	Various subsidies for investments or studies	Funding around €10 million/year Maximum subsidy level: 70%
FACE investment funds	Investment subsidies for renewables, mostly for grid investments	Funding: €15 million/year
*Funding of renewables R&D	It is estimated that France spends 1% of its total R&D budget on renewables	Average annual funding: €4.5 million
Solar slab heating subsidy	Subsidies to install solar heating slabs - experimental	Max. funding: €3 000/unit
Solar water heater subsidy (Regional)	Certain regions subsidise the sale of these	Subsidy: €400-600/unit

GERMANY

Price support

Electricity feed-in system	Electricity from renewable sources may be fed into the grid at fixed prices, degressive over time .	Renewable Energies Law of 29.03.2000
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Tax measures

Excise oil tax – biofuel tax exemptions	Rapeseed methyl ester pays €0.76/l less than other fuels	
Income tax deduction	Deductions for certain renewables investments	

Subsidies, loans

*Renewables direct subsidies	Offered as compensation for the electricity tax, assessed also on renewables	Funding: €118 million/year	
*Deutsche Ausgleichsbank loans	These are low-interest loans, specifically for renewables investments	Subsidy not quantified.	
4 th Energy Research Programme	Aims to support research that leads to the reduction of CO ₂ emissions – through savings or with renewables	Maximum funding: €383 million/year	
General Government Renewables Funding	A series of individual renewables support measures, e.g.: installation of solar heaters, heat pumps, small hydro-plants, PV plants, biomass plants, biogas plants	Until 2002: approx. €10.2 million/year	
100 000 Roofs Programme	Photovoltaic roofs are subsidised with a special long-term zero-interest loan	Subsidy level: max 100%, max. €500 000	
250 MW Wind Programme		Subsidy level: max 25%, max. €46 016, plus a production subsidy of €0.03/kWh	
*Renewables R&D spending	Almost 30% of Germany's R&D budget is spent on renewables	Average (1995-98): €85.8 million/year	
<i>Niedersachsen</i>	<i>*Aid</i>	<i>For solar pilot projects</i>	<i>€1 million/year</i>
<i>Baden-Württemberg</i>	<i>Demonstration measures</i>	<i>Renewables model technologies</i>	<i>Up to 40% of costs</i>
<i>Bavaria</i>	<i>Renewables use</i>	<i>Installation of solar collectors and heat pumps</i>	<i>Support limit: €12 782</i>
<i>Hamburg</i>	<i>Renewables support programme</i>	<i>Support for development, installation and demonstration of various sources</i>	
<i>Thuringen</i>	<i>*Subsidies</i>	<i>Renewables and energy conservation</i>	<i>€7 million/year</i>
<i>Rheinland-Pfalz</i>	<i>*Investment support</i>	<i>Various types of renewables</i>	<i>€1.7 million/year</i>

Not all Länder support schemes are listed.

GREECE

Price support

Purchase of electricity from renewables	The exclusive State utility is obliged to buy all renewable electricity (except for large hydro) at a fixed price in the first ten years of operation	The price is expressed as a percentage of the end-user price (around 70-90%).
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Tax measures

Income tax deductions	Cost of purchase and installation of domestic appliances for renewables use may be deducted from the personal income tax base. Legal entities may use a faster depreciation.	75% of the costs may be deducted.
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Subsidies, loans

Development Law – subsidies and reduced interest rates	Framework law on subsidies; renewables are an eligible objective for partial funding of cost, capital or interest.	Maximum subsidy rates apply for the support of electricity generation from renewables or CHP. In other renewables applications, conditions vary regionally (Under this scheme, an estimated €27 million/year was used up to 1999)
EU Operational Energy Programme	Investment support for renewable energy sources development (except for wind projects on Crete) Wind may not receive more than 26% of all funding	Funds estimated at altogether €171 million + EIB loans Investment subsidy limits: Active solar: 35-50% Passive solar and wind: 40% Geothermal and small hydro: 45% Biomass: 45% PV: 50-55%
Renewables R&D (under Joule-Thermie)		€7.8 million

IRELAND

Price support

Alternative Energy Requirement (AER)	Partially EU-funded tendering procedure, where prospective renewables or CHP generators compete for long-term delivery contracts with the national utility. Prices are supported and kept above avoided fuel costs	Four tenders since 1994, ongoing. The present level of AER support is estimated at €10 million/year.
Supported prices for wood gasification projects	Offered separately by the national utility, while prices for other renewables are set through AER.	

Tax measures

Income Tax Credits	Business Expansion Scheme for investors in small businesses – (especially used in small hydro)	Max. € 317 400 may be raised through it
Renewables Tax Relief	On wind energy and biomass investments as approved by the government	Up to 50% of investment costs may be deducted from company profits (max. level of deduction: €9.5 million).

Subsidies, loans

R&D	Government spending on R&D	In 1992: €0.1 million
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ITALY

Price support

Renewables premium price	The national utility is obliged to pay a premium price on renewables. (The premium price decreases after 8 years of operation). Renewables prices are thus at a very high level – ensuring profitability.	Small hydro (up to 3 MW): €0.83/kWh Wind and geothermal: €0.1/kWh PV, biomass, waste: €0.15/kWh After 8 years all becomes: €0.53/kWh
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Tax measures

CO ₂ Tax	Revenues are partially used for renewables promotion.	
Sulphur levies		To €125/t for high sulphur To €62/t for low sulphur
Regional excise levies	Regions may impose levies on fuels to fund, inter alia, renewables projects	
Biodiesel tax exemption	No tax is payable on distribution of up to 125 ktons	Estimated subsidy level: €50.4 million
VAT preferences	Solar systems qualify for reduced VAT	VAT for solar systems is 10% (instead of 20%)
District heating rebate	If biomass is used as a fuel, a tax rebate is available in certain climatic zones	Rebate rate: €0.01/kWh

Subsidies, loans

“10 000 photovoltaic roofs” subsidy programme	Five-years programme intended to have this number of PV systems installed and connected	Up to 75% capital subsidy
Biomass and biofuels programmes	Various forms of help	
National Thermal Solar Energy Programme	Aims to install 3 million m ² -s of solar panels by 2010	
Renewables Subsidies		€52 million (and another €150 million will in part be spent on renewables support)
R&D	Government spending on renewables R&D	Average estimate of funds between 1995 and 1998: 39.3 million

LUXEMBOURG

Luxembourg imports almost all the energy it needs; renewables regulation therefore remains marginal.

Price support

Renewables purchase obligation for CEGEDEL		€0.62/kWh for electricity from PV €0.10/kWh for electricity from small-scale wind €0.02/kWh for electricity from small hydro, biomass, biogas (Total estimated amount of this subsidy: €7.4 million)
Renewables and CHP subsidy premium	For generators who supply during peak load	€111/kW of installed capacity annually
Wind and solar electricity	Extra bonus	€0.02 per kWh
Fixed price for hydro-electricity from CEGEDEL	Obligation to buy hydro-electricity at a price that allows profits for generators	

Tax measures

Flexible depreciation	In the case of environmental and energy-saving investments	Special depreciation may not exceed 60% of the investment cost
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Subsidies, loans

Investment support	Wind turbines under 50 kW capacity, and residential/non-residential renewables investments receive 25% investment support	CHP: €1487/kW _{el} (max. €147131) Wind: support ceiling: €1487 Residential solar, geothermal or biomass support ceiling: €1487 (Non-residential: €37184)
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NETHERLANDS

Price support

Feed-in obligation	Utilities are obliged to accept all alternatively generated electricity	
Sustainable energy certificate system (coming up)	Certain levels of sustainable energy would be required and attained through the certificate system by all gas and electricity utilities	Presently there is a forerunner tradable green-label system among distribution companies

Tax measures

Regulatory energy tax - supporting more climate-friendly and less energy-intensive activities and shifting to indirect taxes.	All renewable electricity and district heating is exempted. Initiating energy-saving projects may also qualify for exemption.	Estimated implied subsidy was €14 million in 1998, but seems to have risen considerably since. The tax itself is budget-neutral – other taxpayers qualify for different relief
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Environmental Fuel Tax and Uranium Tax	Levied only on fossil fuels (half energy-, half carbon-based). The uranium tax is an equalising measure.	
Environmental projects tax deduction	For specific energy conservation and renewables investments, 40-52% of the investment costs may be deducted from the profit/income	Subsidy for energy conservation and renewables together: €163 million (a similar scheme for non-commercial entities means an estimated subsidy of €15.8 million)
Flexible depreciation VAMIL	Enterprises can decide when to depreciate environmentally friendly investments	Estimated subsidy for renewables: €27 million
Green investments income tax exemption	Interest and dividend is exempted from tax in the case of certain major environmental investments	Estimated subsidy: €7 million/year
Excise duty exemption	Bio-ethanol is exempted	Subsidy: €6 million/year

Subsidies, loans

Waste and Biomass programme	Subsidies for the use of biomass and waste, and for demonstration, technology and feasibility projects	Funding: €4.08 million (<i>ener-iure</i>)
Wind Energy Promotion programme	Subsidies for investment, industrial and technical development	Funding: €3.76 million (<i>Ener-Iure</i>)
Photovoltaic Solar Programme	Support mainly for technical development and dissemination	Funding: €12 million (<i>Ener-Iure</i>)
Thermal Solar Programme	Subsidies for installation and technological development	Funding: €1.8 million (<i>Ener-Iure</i>)
Active Solar Heat Systems Subsidies	To stimulate solar heat systems	Funding: €3.6 million (<i>Ener-Iure</i>)

PORTUGAL

Portugal is in a unique situation, as its domestic energy production comes exclusively from renewable energy sources.

Price support

Buy-back tariff and purchase obligations	The State distribution company purchases all renewable electricity generated in plants smaller than 10 MW at regulated prices for a certain time after start of operation.	The tariff is set according to the avoided cost of building a gas power station and transporting electricity. A premium is added to this cost. The buy-back tariff is set by the Parliament
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Tax measures

Reduced VAT levels	For renewables equipment (e.g. solar panels)	5% (normal rate: 17%)
Personal income tax credit	When buying equipment using renewables	20% of the investment or max € 125 may be deducted.

Subsidies, loans

ENERGIA programme, managed by the Energy Department (ended in 2000, ongoing projects still receive funding)	Partially EU-funded investment support: <i>inter alia</i> , it promotes renewables production in all sectors but the domestic sector. Various support types: - 12-year zero interest loans up to 50% of the investment for mini-hydro, 55% for wind energy, and 60% for biomass grants up to 50% of the investment for small projects (under €0.7 million) - grants up to 60% of investments above €50 000	1994-1999 total funding: €159 million (of which €69 million from EU funds)
R&D	Government R&D spending on renewables About 2/3 of all energy R&D	In 1999 €1.2 million

SPAIN

Price support

Special generators' regime	Autoproducers, CHP generators, or renewables users below a certain capacity are guaranteed access to the grid, and receive the fixed price of 80-90% of the end price.	
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Tax measures

Excise tax exemption	Oils and alcohol-based fuels of plant origin are exempted from the tax	
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Corporate tax credit		Deduction in the case of any investment in fixed assets improving the environment	10% deduction from purchase price when assessing the tax
Balearic Islands	Environmental Tax	Electricity from waste projects is exempted	A 3% tax on the productive value of the property
Extremadura	Energy Tax	On all electrical and telecommunications facilities, but solar and wind facilities are exempted.	A 3% tax on the productive value of the property. Collected revenues are used for environmental purposes

Subsidies, loans

Energy Saving and Efficiency Plan (ECEP)		Energy sources substitution, and renewables demonstration/ dissemination projects are funded. Special consideration is given to SMEs	Max. subsidy per project: €2.3 million. Funding limits: - Small hydro: 15% for SMEs, others: 5% - Wind: 40% for SMEs, others: 30% Thermal solar: €208/m ² PV: max. €7/Wp Geothermal: 40% Biomass: 20% - 40% Subsidies available: €32 million
Andalusia	PROSOL	Renewable energy sources promotion by subsidies – based on “recognised energy cost”, the cost price of a renewables plant	Subsidy types: grants, interest subsidies, failure insurance for machinery. Limits: Solar thermal: max. €247/m ² PV: max. €9 – 12/Wp Wind: max €9/W Available funding: €2.4 million/year
Aragón	Renewables Subsidy Scheme	Funding is awarded for exploitation and promotion of renewables	Funding established annually
Asturias	Renewables Subsidy Scheme	Subsidies are available for: CHP, solar, wind, geothermal and biomass projects	Funding limits: - Solar thermal: €238/m ² (max. €12 000) - PV: €7 – 14.3/Wp (max. €12 000) - Wind, geothermal and biomass: 60% (max. €30 000)
Balearic Islands	Energy Projects Subsidy Scheme	Subsidies for renewables exploitation projects	Funding limits: - Solar thermal plants: below 50 m ² , max €71.4/m ² above 50 m ² , max €119/m ² -PV: €4/Wp -Biomass: 15% -Wind: €1.7/Wp
Canary Islands	Solar panels for water heating subsidy (PROCASOL)	Eligible are solar panels not greater than 40 m ² , regardless of the end use	Funding limits: Above 20 m ² : max €178/m ² Below 20 m ² : max €148/m ²
Castilla y León	Energy Projects Subsidy Scheme	Exploitation and promotion of renewable energy sources	Grants worth €1.5 million/year
La Rioja	Electricity generation with alternative energy sources	Subsidies for small hydro development, biomass plants, CHP	Funding is provided up to 15%, up to a max. of €595 for not more than 3 years
Murcia	Renewables subsidy scheme	Subsidies for any renewables exploitation projects	Funding may not exceed 50%; allowances determined annually
R&D		Government spending	Average: €14.4 million/year

SWEDEN

Price support

Quota obligation based on green certificates, to enter into force on 01.01.2003	Electricity consumers will be obliged to buy green certificates	Will result in general electricity price increase – quota obligation to be set for the years 2003 - 2010
Wind power bonus	Wind-power producers get a deduction on energy tax for electricity generated by them	Subsidy estimated at €11 million/year

Tax measures

CO ₂ tax	Levied on fuel oils, coal, coke, natural gas and LPG used for energy purposes and on domestic aviation fuels. (Nuclear power pays a complementary tax)	€0.039/kg CO ₂ . Manufacturing industries pay only 50%
Energy tax	Paid by households and the service sector (manufacturing is exempted) Small-scale renewables generation is partially or totally exempted	Around €0.01/kWh Deductions are allowed for fuel used for power generation, thus accounting for the tax paid by consumers.
Sulphur tax	Levied on coal, fuel oils, domestic aviation fuels and peat	Rate: €3.16/kg SO ₂ (for domestic aviation fuels: €1.38/kg SO ₂). Rebates offered in case of sulphur control measures
NO _x levy	The levy is recycled in the industry, according to emission levels – thus high emitters are net payers	Rate: €4.2/kg above 25 GWh capacity
Flexible depreciation	Investors in certain environmentally friendly projects may opt for a preferential depreciation scheme	
Biofuels exemption	Biofuels are not charged the above taxes	

Subsidies, loans

Investment support for wind power	Wind turbines over 200 kW	15% of the investment cost
Investment support for biofuelled CHP	The plant owner must guarantee a certain percentage of biofuel use	25% of the costs (max. €316/kWh) The above three programmes have an estimated annual budget of €21 million
National Energy Administration Programmes	Diverse energy reform programmes, including renewables, efficiency, research and development, demonstration, etc.	
*Technology procurement programme	5-year project for renewables production	Annual funds: €2.3 million
R&D	Government subsidies to renewables R&D.	Average spending €10.2 million/year until 1997 (The value is likely to be much higher now)

UNITED KINGDOM

Price support

Renewable electricity obligation (from 2002)	All electricity suppliers must purchase up to 10% of their electricity from renewables	Will result in general electricity price increase – programme to run for 25 years
Non-fossil-fuel obligation (all of UK and NI) – project in exit phase until 2018	Electricity suppliers are ordered to purchase a certain amount of electricity from non-fossil sources for a fixed period (nuclear or renewable)	Since 1989. Funded from a levy on all fossil electricity. See below. Estimated average annual funding until 1998: €10.1 million

Tax measures

Fossil fuel levy (under the non-fossil-fuel obligation)	Consumers pay a levy on their bills on all fossil electricity. The money is paid as a premium to renewables generators to equalise rates.	Levy percentages: England/Wales: 0.7% Scotland: 0.8% Northern Ireland: 1.5-2%
Climate Change Levy	Electricity suppliers collect this from business customers on the basis of CO ₂ content of electricity. Electricity from renewable sources is exempted, except large-hydro.	Current rate: €0.0006/kWh (Complemented by the Enhanced Capital Allowance scheme, which encourages the purchase of efficient products)
Green Fuel Challenge	Reduced duties on bio-diesel and CNG/LPGs	The duty is €0.3/l below the rate for other fuels

Subsidies, loans

Capital grants for renewable energy technologies	Grants for offshore wind, energy crops and small-scale biomass projects	Budget: £140 million/10 years
Biomass production subsidies	Several schemes, including land set-aside and energy crops growing schemes	For biomass producers only

EU

Research, Technological Development and Demonstration

The fifth RTD Framework Programme (1998-2002) was launched in February 1999. Activities focused on energy developments and applications are grouped together under the ENERGIE sub-programme within the thematic programme “Energy, environment and sustainable development”. One of the two key actions under ENERGIE deals with cleaner energy systems, including renewable energies. Following the first call for proposals, launched in March 1999, about 60% of the projects selected were related to the development and market deployment of renewable energy technologies. The Community granted support of around €135 million, representing 67% of the available budget.

Calls in 2000 included specific target actions on RES reflecting the strategic goals set by the White Paper: integration of RES in communities, bio-energy, biogas, etc. For 2001 and 2002 new target actions have been proposed in a revised work programme.

The share of renewables in the budget for the 5th RTD programme was estimated at €98 million per year.

Regional Policy

The amount spent through the Structural Funds on renewable energy in the period 1994-1999 is estimated at €50 million per year. Projects have been supported in Greece, Spain, France, Ireland, Italy, Portugal, Austria and the United Kingdom, focusing notably on wind, solar and biomass. For the period 2000–2006, an amount of €354 million has already been approved for RES.

DRAFT REPORT ON PUBLIC AID TO THE NUCLEAR SECTOR

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1. EXECUTIVE SUMMARY

In evaluating the position with regard to public aid to nuclear energy, two periods in the history of the nuclear power sector should be distinguished.

In the early years of the European Atomic Energy Community (Euratom), aid granted for the construction of nuclear power plants was part of a policy of promoting and developing a form of energy that was still in its infancy. Emphasis was therefore placed on increasing capacity in order to meet an increasing demand for electricity from consumers rather than on the terms for financing the investment necessary. New plants were often prototypes applying new technologies. For most nuclear power plants built in this period the investment has still not been written off. In the second stage, nuclear energy reached maturity. The information currently available to the Commission indicates the following:

- Projects for **investment recently notified to the Commission** under Article 41 of the Euratom Treaty show no public aid.
- Aid to **nuclear research** (RTD) has diminished over many years in most Member States and at EU level. In particular, although aid granted by EU Member States for nuclear technology amounted to \$55 billion in the period 1974-1998 (an average of \$2.2 billion per year for the whole EU), in 1998 it was only \$942 million per year for the whole EU. This research whose aim in the beginning was to promote nuclear energy under the Euratom Treaty, in particular under Articles 2 and 6 thereof, now focuses instead on the management of radioactive waste and nuclear safety.
- While **Euratom loans** are still available¹ to cofinance investment projects for generating electricity from nuclear energy and for fuel cycle installations, they have not been used to build new nuclear power plants in the European Union since the end of the 1980s.
- Reserves/provisions for **decommissioning nuclear power stations and disposing of radioactive waste** have in most cases been set aside by nuclear electricity producers or end-users in order to meet their future obligations in this area. In the nuclear sector, these reserves/provisions are larger than in other industrial sectors because of the obvious specific characteristics of the nuclear industry. These provisions are necessary because of the nature of the nuclear industry, in particular to prevent future generations having to pay the consequences for the current use of nuclear power plants. At its meeting of 6 March 2002, the Commission stressed the importance of ensuring that these funds are allocated directly for decommissioning. To this end, the Commission has undertaken to present proposals for studying the question in the light of the relevant EU rules.
- Upon verification, no instances of public aid for nuclear energy users have been found in the field of **fuel supply**.

¹ These Euratom loans have existed since 1977.

- A **study of tax data** available has not revealed any measures specifically applying to the nuclear sector.
- Measures taken with regard to **civil liability** in the event of an accident are a response to calls to establish safety conditions which will minimise risks to life and health. Such requirements have given rise to international conventions on the subject and national obligations based on Article 98 of the Euratom Treaty, which requires Member States to take all measures necessary to facilitate the conclusion of insurance contracts covering nuclear risks.

The table below is intended to clarify and sum up public aid to the nuclear sector in the Member States and at EU level.

	NATIONAL AID	EU AID
1) Investment		
<i>Investment: Construction of nuclear power plants</i>	<ul style="list-style-type: none"> – No public aid for new investments except for the specific case of radioactive waste processing for a research reactor (Karlsruhe) (see Article 41 of the Euratom Treaty) – Initial aid for construction of nuclear power plants 	<ul style="list-style-type: none"> – The <u>joint undertakings</u> provided for in Chapter V of the Euratom Treaty enable nuclear undertakings to benefit from particular tax exemptions. At present, these provisions and advantages have expired, and there is only one undertaking whose status and advantages have been extended until the end of 2009. One undertaking is still interested in prolonging this status. – <u>Euratom loans</u>: Euratom loans have existed since 1977 for financing investment projects (€2.876 million since 1977). These loans have not been used in the EU since the end of the 1980s.
<i>Investment : Decommissioning and nuclear waste</i>	<ul style="list-style-type: none"> – Considerable variation between Member States in models chosen for decommissioning and nuclear waste. See Table (Annex 1): provisions in the accounts of producer companies and funds 	<ul style="list-style-type: none"> – Euratom loans may be granted to cofinance investment projects connected with the nuclear fuel cycle
2) Fuel supply		
1) Nuclear fuel supply contracts - natural and enriched uranium markets, special fissile materials, secondary sources	Unregulated world markets. No public aid in EU	
2) Fuel-related services - conversion, fabrication and reprocessing markets	Unregulated world markets. No indication of public aid in EU.	
3) Safety and limitation of liability following a reactor accident	3 types of insurance for different thresholds: 1) commercial; 2) per State, 3) global. Differences between Member States.	No aid.
4) Public aid to operation	No aid.	No aid.
5) Research and development	<ul style="list-style-type: none"> – \$55 billion for 1974-98. – \$942 million for 1998. On the decrease. France allocates far more than other countries (€770 million) for 2001-2004. 	<ul style="list-style-type: none"> – See Chapter I, for example. – Fission in sixth framework programme: €480 million, Fusion in sixth framework programme: €750 million, total: €1 230 million.¹ – <u>Total fifth framework programme</u>: €1 260 million, – <u>Total fourth framework programme</u>: €1 281 million

²

The sums relating to fusion are given in this report in order to give a comprehensive picture of the various types of aid. However, with regard to impact on the relevant markets (electricity generation), this aid must be very clearly differentiated from aid to fission. Fusion is not directly linked to nuclear energy generation. Aid to fusion does not have direct and immediate impact on electricity generation and on the electricity production market as the technology is still at the experimental stage.

2. PREFACE AND METHODOLOGY

One of the first objectives of the Green Paper "Towards a European strategy for the security of energy supply" has already been achieved: the debate on the future of energy in Europe has been initiated. The aim of this theme, which is one of the central concerns shared by the authorities of most of the major economic actors on the planet, particularly in Europe, is to determine the factors vital to gearing supply, even temporarily, towards energy sources with some potential in terms of security of supply and the fight against climate change, yet without jeopardising European competitiveness. One of the most important factors cited in the Green Paper³ is the existence of public aid to various energy sources.

To the extent that the relevant information is available, the present report highlights the various measures taken in this domain at both national and EU level to enable an objective comparison of the various forms of energy and identify possible distortions of this aid on the different markets (electricity, transport, heating and industrial markets).

This involves, on the one hand, taking stock of State intervention in order to determine the extent to which nuclear energy benefits from public aid and, on the other hand, evaluating possibilities for distortion in cases where public support entails:

- a direct advantage for the company concerned, or
- a reduction of the operator's financial burden.

The report is primarily intended to provide detailed factual information on public funding to the nuclear sector at EU and national levels. Preliminary investigations did, however, highlight a number of economic factors that can help to assess whether such aid gives rise to distortion, particularly on the electricity market.

It is important to bear in mind that liberalisation has imposed a major change on the electricity sector, rendering it more transparent. The reference date adopted for recording the various forms of aid is the date when Directive 96/92/EC of 19 December 1996 on the opening-up of the electricity market entered into force, i.e. February 1997.

The report is the result of various contributions from the units and departments concerned. Public aid is considered on the basis of various cost elements in the nuclear sector. In all the analyses, the three traditional cost components (covered by the economic operator) are taken into account:

- Investment (including the cost of decommissioning nuclear power plants and managing radioactive waste),
- Fuel,
- Operating costs other than fuel-related.

These cost components are, to a greater or lesser extent, affected by horizontal factors such as:

- Financial costs,
- Taxation.

³ See Part II, Chapter B(2) on "The opaque nature of State aids".

Finally, there are a number of other components to be examined:

- Research and development,
- External factors: impact on health and the environment (with payment, through taxation or pollution rights mechanisms, or without payment, through public savings and accident risk coverage (insurance, mathematical probability assessment of accident costs beyond the ceiling covered)).

3. SPECIFIC FEATURES OF THE NUCLEAR SECTOR

Most nuclear power plants in the Member States were built in the period 1970 to 1990.⁴ At the outset, nuclear programmes were funded from the public purse since they were the result of industrial policies introduced by government.

3.1. Specific features

Each energy sector has its own specific features giving rise to specific costs. Nuclear power unquestionably has significant specific features compared with other sources of energy. The aspects most often highlighted are (i) non-proliferation, (ii) safety aspects of reactors and fuel cycle installations, and (iii) waste (in particular highly radioactive and long-life waste). These specific features entail unique costs not shared by other energy sources.

The technology used to generate energy for civilian purposes may be considerably interconnected with the military sector. An international nuclear non-proliferation scheme has been established. Moreover, strategic decisions about waste options have to be taken at some time in the future. In some countries, these specific features and the public perception that they were not being adequately addressed have led to political decisions to phase out nuclear energy.

3.2. Impact on production costs

The specific features of the nuclear sector affect the cost of electricity generation. In order to have a full overview of the aid granted to nuclear energy in comparison with other forms of energy, it has been deemed necessary to study a few examples of the charges connected with the cases of public financing most often highlighted:

- (1) Strict (no-fault) liability. The risk of nuclear accident is covered by a special civil liability scheme based on the following principles: focusing liability on the nuclear operator (exclusive no-fault liability of the operator), operator liability limited to a specific amount, the obligation to take out insurance. This exceptional arrangement favours the victims, who do not have to prove the responsibility of the operator or investigate the parties that might otherwise be responsible: the operator is the party legally liable. In addition, the obligation to take out insurance ensures that funds are available as compensation for damages following a nuclear accident. In return, a maximum limit is set for the liability of the operator. Despite this ceiling on liability, the nuclear civil liability scheme is not necessarily any more favourable to operators than the standard legal fault liability

⁴ From 1974 to 1989 installed nuclear capacity rose from about 20 to 120 GWe. Capacity has remained more or less stable since then. In 1998 it was 130 GWe. Source: IEA Electricity Information 2000.

system, in which the victim has to prove the fault of the operator as well as the causal link between the damages suffered and the operator's activities. This type of liability, although theoretically unlimited, is limited in practice by the resources of the undertaking responsible and the amount of their insurance cover. Similar liability schemes exist in other sectors.⁵

Nuclear safety requirements are the main reason why the nuclear electricity sector is so capital intensive. Approximately 60% of investment costs (which account for about half of nuclear KWh costs) are connected with safety.

- (2) Operators have to set aside substantial reserves/provisions for future expenditure on account of the very long life of waste and because of decommissioning operations (to be covered in a distant future). These reserves thus relate to obligations which nuclear energy producers cannot avoid; they cannot always be fixed with absolute precision as their impact is very long-term and because the lifespan of nuclear power stations may be subject to change. The level of such financial reserves/provisions is particularly high for nuclear operators compared with other forms of energy. However, the precautionary principle imposes caution when considering the scientific uncertainties. This is the approach adopted by the Commission which, at its meeting of 6 March 2002, emphasised the importance of ensuring that these funds are directly linked with the objective of decommissioning. The Commission undertakes to present the proposals necessary to examine this matter in the light of the relevant EU rules. In December 2001, the Commission also decided with regard to Germany that, as long as the EC Treaty is applicable, the mechanism of provisions for decommissioning nuclear power plants is not a form of State aid as it is perfectly in keeping with the German direct taxation system.
- (3) As regards other external costs, according to the findings of the Extern-E project supported by the Commission the level of non-internalised external costs is relatively low for nuclear energy.⁶
- (4) The nuclear sector also has to bear the costs required to ensure that its use for civilian purposes does not lead to proliferation of nuclear weapons. This financial burden arises due to the international checks but also the specific investment and staff training necessary.
- (5) Stranded costs come about due to the transition to liberalised electricity markets. They may be particularly high in the nuclear sector because of the very capital-intensive structure of nuclear plant. In the period of transition towards markets open to competition these costs also emerge in the generation of electricity from other energy sources and are not therefore confined to nuclear energy production.

By way of illustration, in most states of the USA where liberalisation has already been in place for a number of years, mechanisms have been established for

⁵ At the conferences reviewing the Paris and Vienna Conventions there is a trend towards significantly raising the amounts covered. This system of strict liability with a ceiling is very similar to the system of liability of maritime transport operators in the event of an oil spill. This limitation is linked to an amount associated with the tonnage of the ship involved.

⁶ This is a result of the limited impact of nuclear power on global warming and the extremely limited likelihood of accidents in EU nuclear power plants.

recovering such stranded costs. The contributions of operators to investment in waste disposal measures - also likely to be considered stranded costs - result from the specific nature of long-life highly radioactive waste.

3.3. Economic characteristics and competitiveness of the nuclear sector in relation to other sources of electricity production

The following cost structure is typical of electricity generation of nuclear origin:

- 57% for investment (60% of which is directly linked to safety and decommissioning),
- 20% for fuel (including fuel fabrication),
- 23% for non-fuel-related operational and maintenance costs.

Being highly capital-intensive, the nuclear sector is extremely sensitive to the cost of capital⁷ and in particular to the discounting rate.⁸ On the other hand, the relatively low share of fuel costs in overall expenditure makes the nuclear sector less sensitive to fluctuations in the dollar price of uranium than technologies generating electricity from fossil fuel.

3.4. Specific legal rules affecting the nuclear market

Economic operators in the nuclear sector are subject to various special statutory provisions affecting their scope for action. Some of these derive from extremely stringent rules under the Euratom Treaty or other international provisions.

At international level, the Non-Proliferation Treaty (NPT)⁹ lays down a general framework to prevent the proliferation of nuclear weapons. Nuclear activities are further regulated by a set of specific provisions produced under the auspices of the International Atomic Energy Agency (IAEA), the Nuclear Energy Agency (NEA) of the OECD and the Nuclear Suppliers Group, concerned in particular with checks¹⁰ on use, physical

⁷ In particular, the accounting costs and, in particular, the anticipated costs of nuclear energy are extremely comprehensive, including decommissioning and waste management.

⁸ Nuclear energy proves to be in a more favourable position than other forms of energy when the discount rate is low.

⁹ Published as document AIEA INFCIRC 140.

¹⁰ Article III of the NPT and a number of agreements for verification on the basis of model protocols in documents INFCIRC 153 and Additional Protocol INFCIRC 540. For the EU there are trilateral agreements, see INFCIRC 193 (non-nuclear countries), 263 (United Kingdom) and 290 (France).

protection,¹¹ transport safety,¹² exports¹³ (of nuclear material and material for dual use), waste and spent fuel management,¹⁴ safety of installations¹⁵ and nuclear liability.¹⁶

For the European Union, the Euratom Treaty confers powers on the EU in various areas: research, protection against radiation, investment, joint undertakings, common market, safety control, and international relations. In most cases, the EU is the driving force and in other cases it receives information and delivers opinions or recommendations on the basis of information submitted by the Member States or undertakings in the nuclear sector.

In view of the objective of this report, to study the aid granted at national and EU level, the following special provisions of the Euratom Treaty were taken as the methodological starting point.

- Chapter 1 (Articles 4 ff.) on promoting research, and in particular Article 5, of the Euratom Treaty in which the Commission invites individuals, companies and Member States to inform it of research programmes on which it delivers a reasoned opinion so as to prevent duplication and direct research towards sectors which are insufficiently explored. The Commission may provide financial support to these programmes without, however, offering subsidies.
- Chapter 3 (Articles 30 ff.) on health protection. Article 33 of the Euratom Treaty provides that Member States must inform the Commission of provisions adopted to ensure compliance with the basic standards laid down at EU level (which may include financial measures). Article 37 provides that each Member State must inform the Commission of the data relating to any plan for the disposal of radioactive waste (which may also include public funding). The Commission makes recommendations and delivers an opinion.
- Chapter 4 (Articles 41 ff.) on investment projects, including decommissioning projects.¹⁷ Article 41 stipulates that individuals and companies in the industrial sectors covered must inform the Commission of investment projects concerning new installations and replacements. Under Article 43, the Commission discusses all aspects of investment projects with the persons or undertakings concerned. It informs the Member State concerned of its views.

¹¹ INFCIRC 274 Convention and INFCIRC 225 recommendations; see also Annex C to INFCIRC 254, part I.

¹² IAEA document ST-1 which in turn is taken over in the transport sector regulations of the IMO (maritime transport), ICAO and IATA (aviation), ADR (road) and RID (rail).

¹³ INFCIRC 254, revised.

¹⁴ Joint Convention INFCIRC 546.

¹⁵ Convention INFCIRC 449.

¹⁶ Paris Convention (NEA) of 29 July 1960 (revised) and Additional Brussels Convention of 31 January 1963, Vienna Convention (IAEA) (INFCIRC 500) and Additional Convention (INFCIRC 567), and Joint Protocol (Vienna and Paris) (INFCIRC 402).

¹⁷ With regard to decommissioning as part of this investment, see in particular Article 1(2) and (3) of Council Regulation (Euratom) No 2587/99 (OJ L 315, 9.12.1999, p.1) and Commission Regulation (EC) No 1209/2000 (OJ L 138, 9.6.2000, p.12).

- Chapter 5 (Articles 45 ff.) on Joint Undertakings. Article 45 provides that undertakings that are of fundamental importance to the development of the nuclear industry in the Community may be set up as a Joint Enterprise. The Commission transmits its reasoned opinion to the Council which makes the final decision on the status of Joint Undertaking and the advantages which are connected with it, as appropriate.
- Chapter 6 (Articles 52 ff.) concerning supplies. The theoretical possibility that public financing may, in exceptional conditions,¹⁸ prove necessary in order to ensure supply in the nuclear sector cannot be ruled out in advance. It is, however, possible for the Agency and/or the Commission to investigate the existence of practices designed to afford particular users a privileged position enabling them to control the market. See in particular Articles 52(2)(a) and 68 which prohibit any practice designed to give specific users a privileged position, counter to the principle of equal access, resulting from the provisions of this Chapter. If the Agency encounters such practices, it reports them to the Commission, which may adjust prices to a level consistent with the principle of equal access. Article 70 enables the Commission to send recommendations to the Member States to further develop prospecting and mining.
- Chapter 9 on the nuclear common market, and in particular Article 98, which obliges the Member States to take the measures necessary to facilitate the conclusion of insurance contracts covering nuclear risks.

4. PUBLIC AID TO THE NUCLEAR SECTOR

4.1. Cost categories

On the basis of these costs and the existing legal rules, possibilities of public funding of nuclear energy at EU and national levels have been studied across the whole range of the following elements¹⁹ of the investment cycle:

- Research and development,
- Financing of investment (including decommissioning and waste processing),
- Fuel cycle,
- Operation, including safety (and limitation of liability resulting from a reactor accident) and possible public aid relating to operation,
- (For the record) External factors (not included in the costs borne by the economic operator).

The Commission is not aware of any direct funding for electricity production.²⁰

¹⁸ An exceptional (and highly improbable) situation could, for instance, be a crisis in the supply of nuclear fuel caused, for example, by a war, *force majeure*, etc., following which the Member States' stocks or the EU's stocks would be made available to users.

¹⁹ Nuclear Power in the OECD (IEA 2001).

²⁰ From 1990 to 1998, the non-fossil fuel levy in the United Kingdom granted a subsidy per kWh produced from renewable energy sources and nuclear energy. Nuclear energy has been excluded from this benefit since 1998.

4.2. Order of magnitude

The following estimates²¹ are given for the three costs categories normally borne by operators, although the actual situation varies from one country to another: 57% for investment, 20% for the fuel cycle and 23% for operation and maintenance. Consequently, where subsidies are provided in one of these categories, these relative orders of magnitude must be taken into account in determining any impact on competition between the various sources of energy.

For electricity generated from fossil fuel (coal and gas) the ratios are reversed: 50 to 70% for fuel, 15 to 25% for investment and 7 to 15% for operation and maintenance.

A comparison of the costs of different sources of energy may produce widely varying results due to the relative weight of production cost components (capital, operation, fuel) which differ greatly from one technology to another (capital-intensive nuclear energy, fuel-intensive gas) and specific differences between the countries concerned regarding price levels and discount rates. However, in OECD studies, nuclear energy is generally well placed (as the least costly source or the least costly but one).

4.3. National aid

4.3.1. Investment

4.3.1.1. Investment relating to plant construction

Until the beginning of the 1990s, nuclear power plants were built in a situation of partitioned markets dominated by legal or de facto monopolies and little progress had as yet been made towards opening up markets, including the introduction of transparent financing methods. The Commission does not have the information on the last twenty years which would enable it to conclude that investment in new electricity generating plant had not been deployed in accordance with market mechanisms. For most nuclear power plants built in this period the investment has still not been written off.

Since the entry into force of Directive 96/92/EC liberalising the electricity market, very few new nuclear power plants have been put into service in the EU (three in France at the Chooz and Civaux sites).

During the latter period, the last 11 investment statements under Article 41 of the Euratom Treaty²² covering the years 1997 to 2001 show that the investment notified has been used chiefly to modernise power plants and replace steam generators in order to increase production. These projects are financed by the private undertakings without recourse to public funds except for the specific case of radioactive waste processing for a research reactor, the latter not being used in any case for electricity generation.²³

In practice, capital yield on investment in the nuclear sector is generally less for public undertakings than for private ones. Moreover, public undertakings are regarded as

²¹ Nuclear energy Agency: Trends in the Nuclear Fuel Cycle.

²² Information on these investments is confidential.

²³ Vitrification of highly radioactive nuclear waste produced from 1971 to 1990 at the Karlsruhe research centre.

involving less risk as they benefit from an implicit guarantee from the government of the country concerned, and the cost of loans available to them may therefore be reduced. This situation is not confined to the nuclear sector but arises wherever public undertakings exist alongside private ones.

The specific case of Finland - Financing conditions for the new power plant

A new nuclear power plant is planned in Finland, with an installed electric capacity of between 1000 and 1600 MW. It is to be located at one of the two existing sites in Finland: Loviisa or Olkiluoto. The technology that it will use has not yet been decided (boiling water reactor or pressurised water reactor). Several constructors are in the running, proposing the latest technology. The investment amounts to 10 to 15 billion Finnish marks (about €1.68 to 2.52 billion).

The information available to the Commission at this stage regarding the financing of the new power plant is that submitted with the request for a decision in principle. The investment is financed by TVO which generates revenue by supplying electricity to its shareholders.

4.3.2. Decommissioning and nuclear waste

Operators of nuclear power plants must accumulate financial resources, in accordance with financial schemes which vary from one Member State to another, in order to guarantee the future decommissioning of nuclear installations and the treatment of waste, and to implement the "polluter pays" principle. The price of electricity generated by nuclear plants therefore includes a levy which is allocated either to provisions in company accounts or to a specific fund. There are variations according to the various legislative frameworks, the scope of decommissioning (state of the site after decommissioning), the level of technical difficulty and the system of waste management. The table in Annex 1 contains information based on data collected in the course of a study financed by the Commission.²⁴

The costs involved and their lack of precision

These costs to be financed are generally evaluated at 15% of total investment.²⁵ The necessary expenditure cannot be specified,²⁶ in particular for the final decommissioning stages and the waste management stage, because of a number of variables:

- the technical characteristics of the facilities,
- the level of decommissioning (a decision depending on the planned future use of the site), which may go as far as the total and unconditional removal of the site in question,

²⁴ Report Eur 18185: Schemes for Financing Radioactive Waste Storage and Disposal.

²⁵ Eurelectric Decommissioning of Nuclear Power Plants and Related Waste. The investment cost is the cost of building the plant plus decommissioning costs.

²⁶ In 1999 BNFL evaluated its decommissioning obligations. The total sum involved was estimated to be £7 billion in excess of the earlier amount, mainly because of a better assessment of the state of the installations and the work required for decommissioning (Source: Managing Nuclear Liabilities by David Warner; Workshop about Radiactive Waste Management and Decommissioning, June 2001).

- a drawn out timetable for the various phases of decommissioning (which may include waiting periods if dismantling is staggered),
- the possibility of stricter standards being adopted in the future.

Operators may wish to delay decommissioning for technical reasons (to allow radioactivity to decrease) and in order to reduce the discounted cost (improved technologies, discounting). Authorities may adopt the opposite strategy to avoid leaving the work to be carried out by future generations. It should be noted that any extension of the life of a power plant reduces the current value of decommissioning by postponing costs further into the future.

In setting aside reserves/provisions, account should be taken of potential uncertainties and the precautionary principle. As matters stand, there is no evidence that current reserves are too high. The national authorities evaluate the situation in this regard at regular intervals.

Provisions as financing for undertakings

Accumulation of resources in electricity company accounts has raised questions as to the benefits which the companies concerned may draw from it. A disproportionate accumulation of resources could generate excess cash flow, thus financing possible industrial acquisitions without requiring capital injection.

On the other hand, this increased financial capacity should be viewed in the light of uncertainty about the costs and risks which the companies assume.

- The idea of setting aside provisions to meet future expenses is no different from that practised in other energy or industrial sectors.
- The provisions are checked regularly by the national authorities.
- It is necessary to ensure that adequate provisions are set aside in candidate countries.

Initial analysis suggests that the provisions set aside are commensurate with the costs which companies will have to bear in the future. The view has always been, however, that setting aside excessive provisions could be a source of distortion, but this must be viewed in the light of the need to maintain the long-term financial health of the companies concerned. It is clear that establishing separate funds for electricity companies is more likely to prevent distortions. One disadvantage of this approach, however, is that it may detract from operator liability.

In deciding, at its meeting of 6 March 2002, to undertake to propose an initiative on decommissioning, the Commission has acknowledged the importance of ensuring the long-term availability of funds for the decommissioning of nuclear facilities. .

Costs of transporting nuclear waste

In some Member States, irradiated fuel and radioactive waste can be transported only if accompanied by very stringent and costly security measures and police protection. It is not expenditure to promote transportation or reduce costs, and the Commission is not aware of public aid for it. It is difficult to describe expenditure on police action as "public aid to the nuclear sector". Rather, such expenditure is incurred to respect the right to demonstrate (following hostile demonstrations) and the need to maintain public order in

the Member States concerned, as is also the case in other sectors (e.g. with regard to airport security measures to enable passengers to pass through hostile demonstrations against noise pollution caused by airports). Such measures belong to the duty of government to maintain public order.

4.3.3. *Public aid connected with nuclear fuel supply markets*

4.3.3.1. Introduction

Nuclear fuel supply markets may be divided into the five main stages of the fuel cycle:

- mining production of natural uranium concentrates (U308),
- conversion of natural uranium to uranium hexafluoride (natural UF6),
- (the most common) enrichment of uranium to its fissile U235 isotope (enriched UF6),
- fresh fuel element fabrication,
- (possibly) after irradiation in a reactor, processing of irradiated fuel and recovery of reprocessed uranium and plutonium.

In addition to the use of sizeable civilian stocks accumulated in the past, some material obtained from the civilian fuel cycle or from military stocks (highly enriched uranium and plutonium) may be recycled (secondary sources):

- depleted uranium obtained as a by-product of enrichment subsequent re-enriched to produce natural uranium equivalent or even mildly enriched uranium (leaving highly depleted uranium as secondary by-product),
- reprocessed uranium, re-enriched,
- civilian or military grade plutonium produced by mixed fuel element (MOX) fabrication,
- highly enriched uranium from disarmament produced by blending with other material to obtain mildly enriched uranium.

The relatively limited share of fuel in the total cost has already been highlighted. In a study based on 1991 prices, the components within a "closed" cycle (i.e. including reprocessing) were estimated at about 75% for pre-production costs (26% for uranium concentrate, 3% for conversion, 30% for enrichment, 16% for fabrication) and 25% for the transportation of spent fuel, reprocessing and storage of vitrified waste (taking account of appropriations for the recovery of usable material). For the "open" cycle, the percentages are 86% for pre-production costs (30% for uranium, 4% for conversion, 34% for enrichment, 18% for fabrication) and 14% for the transportation, packaging and storage of waste.

Although it is a subject often discussed, nuclear fuel markets are not organised and quoted on raw material exchanges (like the London Metal Exchange). Apart from a minor attempt for natural uranium (see below), there is no nuclear trading on the Internet.

Under Chapter 6 of the Treaty, the role of the Euratom Supply Agency varies according to the type of contract involved. Knowledge of the market is therefore not the same for all stages of the cycle. For instance, according to Article 52 of the Treaty, the Agency is responsible for concluding contracts for the supply of natural uranium and special fissile materials (buying, selling, trading, loans) and it therefore keeps abreast of supply conditions. Pursuant to Article 75, processing contracts (conversion, fabrication,

reprocessing) are subject to notification indicating the existence of a contract and specifying general data, such as the quantities involved.

Articles 70 (prospecting for mineral deposits) and 72 (commercial or emergency stocks) enable the Commission, where necessary, to allocate EU aid to supply, though in recent years there has been no such aid.

Nuclear fuel supply markets are global markets with a relatively small number of suppliers. With regard to supply contracts, the Agency has no knowledge of public aid in any form.

4.3.3.2. Natural uranium concentrate

Mining production of natural uranium concentrate is geographically dispersed (Canada, Australia, central Africa, southern Africa, central Asia). The main producers are Cameco (Canada), Cogéma (France), Rio Tinto (United Kingdom/Australia), the state enterprises of Uzbekistan and Kazakhstan and, to a lesser extent, Russia. Over the past ten years, uranium producers have gone through a process of cutting back production and of company consolidation. Global production is slightly more than half of worldwide demand, with the remainder coming from various secondary sources.

On account of the simplified procedures for matching demand and supply, the Agency does not itself issue tenders. In general, users place orders through a tendering procedure but, encouraged to this effect by the Agency, they also strive for security of supply by compiling a portfolio of different suppliers in different geographic areas as well as negotiating spot contracts and long-term contracts by mutual agreement.

The market in uranium concentrate is a global market. Price indexes (expressed in US dollars per pound of U308) are published by market observers and by spot market and long-term market intermediaries.

In most cases, long-term procurement contracts refer to spot prices, and the spot market thus influences long-term markets.

In recent years, uranium price levels have been generally very low and fairly volatile.²⁷

In the distant past, EU aid was reportedly provided by structural funds for reasons of employment and regional development in the uranium mining region of Spain (improving road infrastructure, etc.). This project would have been submitted to the Commission for an opinion in accordance with Article 41 of the Euratom Treaty.

4.3.3.3. Natural uranium hexafluoride conversion

Global conversion capacity is more or less sufficient to meet demand, with secondary sources making up the difference. As BNFL has announced that it will be closing down its facility in 2006, there will be a deficit after that date. Given its relatively low added

²⁷ In July 2001, the spot price was low (€22.25 per kg uranium for Russia and €26.5 per kg uranium for other sources) and the price for new long-term contracts was about €29.5 per kg uranium. In its annual report the Supply Agency published the average price paid for supplies to users over the past year under spot and long-term contracts. In 2000, the average prices were €37 per kgU for supplies under long-term contracts and €22.75 per kgU for spot contracts.

value and the high costs of transporting UF₆ (\$1 per kgU of UF₆), contracts are usually entered into for conversion in the geographic area where the next stage of the cycle (enrichment) is to take place.

The Agency does not conclude conversion contracts but is notified when such contracts are concluded. It does not publish an average conversion price.

Some observers publish conversion spot prices and long-term prices for Europe and the United States (which differ somewhat due to differences in transport costs and capacity). Following BNFL's announcement of the closure of its facility, prices have recently risen slightly to about \$5 per kg uranium (€5.7).

4.3.3.4. Enrichment

The main installations are located in the United States (USEC), France (Eurodif), Germany, the Netherlands and the United Kingdom (Urenco consortium) and Russia (Tenex). Enrichment is expressed in separative work units (SWU).

The overcapacity in enrichment will be lessened following the reduction in capacity announced by the US. Demand not covered by enrichment capacity is covered by secondary sources (especially highly enriched uranium from Russian disarmament).

The Agency concludes enrichment contracts but does not publish an average price. Observers publish spot prices, currently about \$85 per SWU for Russia and \$105 per SWU for the other sources (€97 and €120 respectively). The long-term price published by an observer is \$102 (€116) per SWU.

The USEC enrichment corporation has instituted anti-dumping and anti-subsidisation proceedings in the American courts against Eurodif and Urenco exports, leading to preliminary and final rulings imposing duty payments (at a high rate in the case of Eurodif). The Commission is challenging the allegations of subsidisation and dumping and has strongly protested against the course of the proceedings.

4.3.3.5. Fabrication

Fuel element supplies have traditionally been builders or designers of nuclear reactors. There is a significant overcapacity (about 40%) in the fabrication of these elements.

The Agency does not conclude fabrication contracts but is notified of the conclusion of such contracts.

This market was scrutinised in detail in the framework of the Commission's decision of December 2000 to authorise, subject to certain conditions, the Siemens-Framatome merger. Following major consolidation in the fabrication sector, three large groups have emerged: BNFL-Westinghouse, Siemens-Framatome and General Electric (and partners, including the GENUSA joint undertaking in Spain), with a number of local suppliers in Asia.

Observers do not publish fabrication prices and there is no spot market/long-term market distinction. There has been a downward price trend in recent years and American and European prices have moved closer together (there is still a slight gap). In order of magnitude according to fuel type, prices range between \$150 and \$200 per kg of fabricated heavy metal (€170 to €230).

4.3.3.6. Reprocessing

The only reprocessing plants in operation are located in France (Cogéma, La Hague) and the United Kingdom (BNFL, Sellafield). A reprocessing plant is under construction in Japan.

Only some Member States have opted for reprocessing (France, Belgium, Germany and the United Kingdom) while others have not (Sweden, Finland, Spain). This is a highly political issue (in Germany, for example, where the new law putting an end to the production of nuclear electricity prohibits all reprocessing from July 2005). Outside the European Union, Switzerland and Japan have opted for reprocessing (in Switzerland this option is currently under review). Reprocessing used fuel can both extract materials reusable in nuclear fuel fabrication and optimise radioactive waste management by reducing the volume of waste and presenting it in a stabilised and manageable form.

The Agency does not conclude reprocessing contracts but is notified when such contracts are concluded.

Observers do not publish reprocessing prices and there is no distinction between a spot market and a long-term market. Recently there have been very few reprocessing contracts and the estimated price level is between €500 and €1000 per kg of irradiated heavy metal. Given the limited number of countries opting for reprocessing and the subsequent leveling off of demand, reprocessing operators have had difficulty finding buyers following the initial ten-year period of activity which enabled them to amortise investment in plant.

4.3.3.7. Secondary sources and recycling

The use of old company stock plays an important role in supply but in the European Union (in contrast with the US and Russia) the public authorities do not hold sizeable stocks. Overall, the weight of past production, for decades in excess of demand, means that the precarious supply situation (demand only partially covered by production) and the predominance of secondary sources is likely to continue for some time to come.

4.3.3.8. Conclusion

In its database the Agency has no details of recent public aid (since the entry into force of the electricity market Directive) allocated to nuclear energy users in the area of fuel supply.

4.3.4. Safety and limitation of liability following a reactor accident

The national safety authorities are responsible for verifying safety. In discharging this task, they employ staff of a status guaranteeing their independence and up-to-date technical competence. The cost of safety inspections is charged to operators through licences and regular contributions. Public resources are sometimes allocated for research activities supporting safety inspections.

In addition to the standard forms of insurance of commercial companies, nuclear operators take out special insurance to cover nuclear accident risks. Article 98 of the Euratom Treaty provides that Member States shall take all the measures necessary to facilitate the conclusion of insurance contracts to cover nuclear risks.

The international Conventions of Paris and Brussels set minimum amounts binding upon signatory States. In compliance with these Conventions, companies must be insured to cover the first tranche of damage, the public authorities where the facility is located cover the second tranche, and the third is covered jointly. This combination makes it possible to go beyond the limits of the single insurance contract and provide sufficient insurance cover vis-à-vis citizens. Amounts are fixed for all of these tranches but there are variations from one signatory State to another. With regard to the situation of the EU Member States, the following table, based on information from the OECD (in million IMF Special Drawing Rights, unless specified otherwise, with 1 SDR equal to 1.31 US dollars or approximately €1.31) establishes the limits of liability in the present circumstances.

	AU	BE	DE	D K	FI	F R	GR	IR	IT	LU	NL	PO	SP	SW	UK
Operator liability	(1)	300	(1)	60	175	80	(2)	(2)	5	(2)	300	(2)	120	300	150
Financial security (if different)	400		€ 2.5 billion												

(1) Unlimited liability under national legislation, but fixed guarantee.

(2) No specific legislation.

Under this system, the nuclear operator is legally liable even if he is not at fault (strict liability). Moreover, a dual system ensures coverage of the risks within a secure scheme. Unlimited liability of the company alone could lead to the company being declared bankrupt, which would not be in the interest of the victims of an accident.

The Paris and Brussels Conventions are currently being revised. The amounts involved are being considerably increased and the protection of nuclear accident victims stepped up. These factors will be harmonised towards the highest level, bringing about a homogenous situation in the European Union countries producing nuclear electricity.

Safety rules in the nuclear sector are, quite rightly, extremely strict. Consequently 60% of investment costs are directly connected with safety. These costs are a way of internalising the risks.

The nuclear sector is not the only industry necessitating coverage of risks connected with major accidents. The chemical industry must also cover risks connected with accidents caused by the transportation and handling of dangerous and harmful substances. The convention on these substances seeks to establish a scheme rather similar to that in the nuclear sector, based on the industrial undertaking's covering the accident risks up to a particular limit, with compensation for a second tranche paid from a fund financed by all chemical companies.

4.3.5. *Public aid connected with operation (operation and maintenance costs)*

The Commission is not aware of any recent public aid (since the entry into force of the electricity market Directive) to nuclear energy users for operating costs.

4.3.6. Research and development at national level

According to the OECD, aid granted by EU Member States for nuclear technology amounted to \$55 billion in the period 1974-1998 (an average of \$2.2 billion per year for the whole EU). The amount has fallen since the early 1980s to an annual value of USD 942 million in 1998 for the whole EU. The figures are illustrated in more detail below.

Under the Euratom Treaty, and in particular Articles 5 and 6 thereof, Member States carry out research and the Commission may require that research programmes be notified to it. The Commission's role is to promote coordination and supplement research programmes. In the framework of current research contracts, the Commission may also provide financial assistance except for subsidies.

For 1998, the figures are as follows (in \$ million):

	DE	FR	UK	IT	BE	NL	SP	SW	DK	AU	FI	Total
Non-breeder fission	39	470	3	34	48	13	8	1	3	0	7	626
Breeder and fusion	132	54	21	72	5	7	14	5	2	3	1	316
Total	171	524	24	106	53	20	22	6	5	3	8	942

Source: Nuclear Power in the OECD; International Energy Agency.

The share of nuclear research in relation to the total amount granted for research in the energy sector is as follows:

	DE	FR	UK	IT	BE	NL	SP	SW	DK	AU	FI
Nuclear's share of Energy R&D (%)	56	93	34	44	71	15	43	10	10	9	10

Source: Nuclear Power in the OECD; International Energy Agency.

During the period 1988-98 the amounts appear to have been relatively stable for the four countries of the Union allocating the highest sums to the development of nuclear energy (Germany, France, Italy and the United Kingdom).

In Germany, public aid to the nuclear sector in 2000 was €23 million a year, covering safety and nuclear waste.

In the United Kingdom, public funding for research has been substantially reduced in recent years. In 2000 the budget earmarked for development of nuclear technology was €27 million, essentially for nuclear fusion.²⁸ Public resources are in the main allocated to programmes to decommission research installations.

France allocates far more resources to developing nuclear technology than the other countries. Public research in the nuclear sector is entrusted to the French Atomic Energy Commission (CEA) which has an annual budget in the period 2001-2004 of €770 million for nuclear energy.²⁹

²⁸ Source: Energy Report 2000, DTI.

²⁹ Research in this area comes under the following headings:

- optimisation and assessment of industrial plant,

Research on optimising and developing current industrial plant (€148 million a year for 2001-2004) may in particular clash with the interests of industrial entrepreneurs in the framework of the competitive market. However, the CEA programme provides that:

- short- and medium-term research is mostly carried out at the request of industrial entrepreneurs at their own expense and is as such excluded from public funding;
- the cost of particular activities relating to long-term innovation are borne in part by industrial entrepreneurs. These activities, aimed at ensuring the long-term competitiveness of producers, may lead to French nuclear industry benefiting from public resources through CEA cofinancing. However, a first estimate is that the annual amount is less than the €148 million cited above.

It is necessary to make a clear distinction between research concerning rapid reactors and nuclear fusion energy applied to electricity generation and research into fission processes. Only the latter applies on the short- and medium-term market. Moreover, it should be noted that, with the exception of France, public aid concerns safety and nuclear waste.

4.4. EU aid:

4.4.1. Joint undertakings

Under the Euratom Treaty, the status of 'joint undertaking' within the meaning of the Treaty may be granted to undertakings which are of fundamental importance to the development of the nuclear industry in the Community (Chapter V of the Treaty). These joint undertakings may benefit from certain advantages (in particular tax exemptions) as listed in Annex III to the Treaty. Since the Euratom Treaty entered into force, there have been seven joint undertakings, five in Germany and two in France/Belgium.

Only one undertaking (in Germany) has extended its joint undertaking status, and some of the advantages associated with that, until 31 December 2009, for decommissioning operations.

The resulting advantages for the years to come would seem to be very limited³⁰ as, in the meantime, a number of taxes from which this undertaking was exempt have ceased to apply in Germany, e.g. *Vermögensteuer* (wealth tax). Moreover, this undertaking no longer produces electricity and therefore has made no profit from this activity since September 1988.

-
- waste management and nuclear activity impact control,
 - design of new energy systems,
 - redevelopment and decommissioning strategy.

³⁰ The undertaking in question is HKG. The company itself estimates the advantages of extending joint undertaking status at DM 175 000 (€90 000) a year.

4.4.2. Euratom loans

The European Union grants loans (in principle limited to 20% of total project costs) for constructing industrial power stations and fuel cycle plants in the Member States.³¹ Intensive use was made of these loans until the end of the 1980s (€2.876 million in total) but there have been no further applications since. In the meantime, all the loans granted have been paid back. The Euratom loans programme is available for an indefinite period.³²

4.4.3. Aid to research and development

The EU budget earmarked for research in the sector is as follows (in million €):

	fourth R&D framework programme 1994-1998	fifth R&D framework programme 1998-2002	sixth R&D framework programme 2002-2006
Fusion	840	788	750
Fission	441	472	480
Total	1 281	1 260	1 230

The distinction between aid granted for fusion or fission that was made in connection with national aid (see above) also applies here. Most EU funds are granted for fusion, whose industrial application is not planned before the middle of the next century. The whole picture may be distorted if this aid were included in the public financial resources granted to the nuclear sector. In a sense, nuclear fusion ought to be treated in a way similar to great scientific programmes such as space technology and exploration of the oceans. This situation is likely to evolve in line with applications.

5. CONCLUSION

In evaluating the existence of public aid to nuclear energy, two periods should be distinguished in the history of the sector.

In the early years of the European Atomic Energy Community (Euratom), aid granted for the construction of nuclear power plants formed part of a policy of promoting and developing a form of energy that was still in its infancy. Emphasis was therefore placed on increasing capacity in order to meet an increasing demand for electricity from consumers rather than on the terms for financing the investment necessary. New plants were often prototypes applying new technologies. For most nuclear power plants built in this period the investment has still not been written off. In the second stage, nuclear

³¹ These loans (up to 50% of total project costs) are also intended for particular third countries to improve the level of safety of operational installations or installations under construction and for decommissioning installations that would cause safety problems if they were left in their current state. Countries that have received such loans are, for instance, Bulgaria (loan to Kozloduy totalling €212.5 million) and Ukraine (loan for K2R4 of the equivalent of \$585 million). Council Decision 77/270/Euratom of 29 March 1977, amended by Council Decision 94/179/Euratom of 21 March 1994.

³² An overview of Euratom loans and additional information are available at the Directorate-General for Economic and Financial Affairs website at: http://europa.eu.int/comm/secretariat_general/sgc/aides/forms/ecfin07_en.htm.

energy reached maturity. The information currently available to the Commission indicates the following:

- Projects for **investment recently notified to the Commission** pursuant to Article 41 of the Euratom Treaty do not involve public aid.
- Aid to **nuclear research** (RTD) has diminished over many years in most Member States and at EU level. In particular, although aid granted by EU Member States for nuclear technology amounted to \$55 billion in the period 1974-1998 (an average of \$2.2 billion per year for the whole EU), in 1998 it was only \$942 million per year for the whole EU. The objective of this research was to promote nuclear energy pursuant to the Euratom Treaty, in particular Articles 2 and 6 thereof. The focus of research has now shifted to the environmental impact of nuclear activities, specifically waste management and nuclear safety.
- While **Euratom loans** are still available³³ to cofinance investment projects for generating electricity from nuclear energy and for fuel cycle installations, they have not been used to build new nuclear power plants in the European Union since the end of the 1980s.
- Reserves/provisions for **decommissioning nuclear power stations and disposing of radioactive waste** have in most cases been set aside by nuclear electricity producers or end-users in order to meet their future obligations in this area. In the nuclear sector, these reserves/provisions are larger than in other industrial sectors because of the obvious specific characteristics of the nuclear industry. These provisions are necessary because of the nature of the nuclear industry, in particular to prevent future generations having to pay the consequences for the current use of nuclear power plants. At its meeting of 6 March 2002, the Commission stressed the importance of ensuring that these funds are allocated directly for decommissioning. To this end, the Commission has undertaken to present proposals for studying the question in the light of the relevant EU rules.
- Upon verification, no instances of public aid for nuclear energy users have been found in the field of **fuel supply**.
- A **study of tax data** available has not revealed any measures specifically applying to the nuclear sector.
- Measures taken with regard to **civil liability in the event of an accident** are a response to calls to establish safety conditions which will minimise risks to life and health. Such requirements have given rise to international conventions on the subject and national obligations based on Article 98 of the Euratom Treaty, which requires Member States to take all measures necessary to facilitate the conclusion of insurance contracts covering nuclear risks.

³³

These Euratom loans have existed since 1977.

6. ANNEXES TO THE SECTION ON NUCLEAR POWER

6.1. Table showing provisions in producer company accounts for decommissioning and waste management

	DECOMMISSIONING	WASTE
BELGIUM	<ul style="list-style-type: none"> ▪ In their accounts, operators set aside provisions against future expenditure in the form of a levy on the sale price of electricity. The gas and electricity supervisory committees ensure compliance with these rules. ▪ Dismantling costs have been evaluated by the German firm NIS and accepted by the Belgian authorities. They are revised every five years. 	<ul style="list-style-type: none"> ▪ The ONDRAF national agency is responsible for end-of-cycle management. ▪ Fees are paid by companies when transferring waste into a fund managed by ONDRAF with the assistance of external experts.
<p>NB. Belgium plans to change the current system, transferring provisions to a subsidiary of the electricity producing firms, which will be able to grant them loans.</p>		
FINLAND	<ul style="list-style-type: none"> ▪ Companies are responsible for bringing together the financial resources necessary for decommissioning their installations and disposing of waste. ▪ End-of-cycle management is the responsibility of POSIVA, a company in which the electricity producers are shareholders. ▪ The financial resources levied are transferred to a State-managed fund. They are adjusted every year according to the nominal value of the costs still to be financed. Undertakings may borrow from these funds up to 75% of their contribution. 	
FRANCE	<ul style="list-style-type: none"> ▪ EDF sets aside provisions for decommissioning power plants, waste storage and reprocessing of irradiated fuel. Decommissioning costs are estimated on the basis of the studies of PEON, the consultative committee on nuclear electricity generation. ▪ COGEMA sets aside provisions to cover the costs of dismantling its nuclear facilities and storing the waste from them. 	<ul style="list-style-type: none"> ▪ The ANDRAF national agency is responsible for end-of-cycle management. ANDRAF is responsible for disposing of radioactive waste. The storage costs, however, are borne by the producers of the waste.

GERMANY	<ul style="list-style-type: none"> ▪ Companies set aside provisions for decommissioning and waste. The accumulation period is 25 years. ▪ Nominal decommissioning costs have been calculated for reactor types (1200 MW PWR and 800 MW BWR) and each company determines the appropriate levy accordingly. 	<ul style="list-style-type: none"> ▪ The ultimate responsibility for storage falls to the Ministry of the Environment represented by the BfS (Federal Office for radiation protection). ▪ Depots are run by DBE, a private company in which nuclear undertakings are shareholders. It invoices producers for its activities in accordance with a scheme allotting 93% to power plant operators. ▪ COVRA, a subsidiary of the electricity production undertakings, is responsible for waste management. ▪ It receives a flat-rate annual contribution plus a variable sum depending on waste transport, handling and storage. ▪ UK Nirex Ltd, a subsidiary of the main nuclear operators, is responsible for developing radioactive waste management options that are safe, environmentally sound and acceptable to the public.
NETHERLANDS	<ul style="list-style-type: none"> ▪ Provisions are set aside in company accounts, taking account of the entire service lifespan of the power plant. These provisions cover decommissioning and waste. Decommissioning costs are calculated annually. 	
UNITED KINGDOM	<ul style="list-style-type: none"> ▪ A decommissioning fund was set up when BE was privatised. The company pays contributions into it, at a level reviewed every five years. ▪ In the public sector, the necessary funds are set aside in provisions in the company accounts. 	
NB. The UK Government is investigating the possibility of creating an external fund to finance the end-of-cycle obligations of the public sector.		
SPAIN	<ul style="list-style-type: none"> ▪ ENRESA is a State company responsible for implementing decommissioning and waste strategy. Decommissioning costs are recalculated every year. ▪ The requisite financial resources are transferred on the basis of a levy on kWh sold, covering decommissioning and nuclear waste storage. They are transferred to a fund managed by ENRESA under the supervision of the competent government authorities. 	
SWEDEN	<ul style="list-style-type: none"> ▪ Future costs, including waste and decommissioning costs, are calculated each year. The necessary finance is obtained by a levy on electricity production and transferred to a State-managed fund. This fund is divided into four separate accounts corresponding to the relevant operators. ▪ A firm, SKB AB, was specifically created by the electricity producing firms to manage waste. ▪ The activities of the operators and of SKB are financed from the fund as work progresses. 	

ITALY

- SOGIN is a private company responsible for decommissioning and waste storage and management.
- A fund was set up in the 1980's to develop a decommissioning strategy under which installations are made safe through staggered decommissioning. This fund has been transferred to SOGIN. It is now managed according to criteria established by the Ministry of the Economy, which currently authorises only low-risk investments.
- An additional contribution to the fund is established on the basis of actual expenditure over a period of three years. It is levied on the sale of electricity to the consumer.

Sources: The information in the above table has been taken from the following documents:
- Eurelectric: Decommissioning of power plants and related wastes
- Report Eur 18185: Schemes for Financing Radioactive Waste Storage and Disposal.

DRAFT REPORT ON PUBLIC AID TO THE GAS SECTOR

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1. EXECUTIVE SUMMARY

Natural gas, discovered at the beginning of the 1950s, has taken decades to come to the fore in the energy sector. It has since become a major source of energy. In some countries, there is a rapid increase in the share of natural gas in electricity generation. This share should continue to grow and eventually partially replace other sources of energy (coal) used to generate electricity. The Green Paper on the security of supply noted that by the end of the decade, thermal power stations operating on natural gas should account for about two-thirds of the increase in energy demand. The Green Paper expects that in 2020-30 almost half of electricity will be produced by natural gas, i.e. 45% of the natural gas consumed.

This increase in demand and the increase in intra-EU trade entail a greater demand for transport infrastructure¹ (intra-European and trans-European transport networks, port infrastructures for liquefied natural gas (LNG), and natural gas storage facilities). Gas transport costs vary according to whether pipelines or ships are used. The profitability of both types of transport varies depending in particular on the distance covered. However, in both cases the costs are relatively high, making the gas industry very capital-intensive.

Most of the public aid listed focuses on infrastructure. This aid to the development of transport and distribution infrastructure in regions where no distribution network has been built has been listed at national (State aid) and EU levels (regional and structural funds). Such aid has traditionally been justified (see the Green Paper on security of supply) by the need to have a supply network that is guaranteed to be safe and secure.

Aid for research and innovation (in particular, EU aid under the framework programme for research and development) should also contribute to sustainable development and enhance security and diversity of supply as well as guaranteeing high-quality gas supply at low cost.

From the point of view of demand, Member States have also introduced tax measures (tax exemptions) and various types of aid to speed up the introduction of gas as a source of energy. One example is national aid provided to combined cycle electricity producers² which to a large extent use gas as their source of energy.

Aid for gas exploration has also been noted in a number of countries

2. PREFACE AND METHODOLOGY

Natural gas has occupied an important place in the various debates which have taken place in the energy sector in recent years. This is the case, in particular, in the context of the opening-up of the gas market, which has taken concrete shape through the adoption of Directive 98/30 introducing common rules for an internal natural gas market. Major changes are currently in progress, leading to the abolition of exclusive rights and monopolies and providing non-discriminatory network access for eligible customers.

¹ As explained in the Commission's communication on European energy infrastructure, existing infrastructure should be used as efficiently as possible, in particular by solving current problems of congestion and removing bottlenecks before investing in new infrastructure.

² The combined generation of electricity and heat uses various energy sources, including gas. This point is therefore not discussed in detail in this report but is dealt with in the joint chapter on all sources of energy.

This is also the case in the fields of security of supply and the fight against climate change. Following the Green Paper entitled "Towards a European strategy for the security of energy supply", a large-scale debate has been launched on the internationalisation of energy policy and increasing dependence, in particular with regard to imports. This exercise aims to determine how it is possible to reconcile the fight against climate change with the need for security of supply, i.e. through diversification of sources. In this same context, the question arose as to the existence of public aid granted to various sources of energy.

The main aim of this paper is to compile an inventory of all aid to the gas sector in so far as this information is available. Mention will be made of the various measures both at national and EU level. Eventually, this will make it possible to undertake as objective a comparison as possible of the various forms of energy and any distortions generated by such aid on the different markets.

For practical reasons, the study focuses on recent years, and in particular on the period after the date of implementation of the Gas Directive 98/30/EC, i.e. August 2000. However, changes already occurred on the market at an earlier date, particularly from 1998 on. Consequently, the report will include data from 1998³ onwards where possible. This will also make it possible to discern trends over a slightly longer period.

The study carried out will also make it possible to identify what information is available and how reliable it is. Depending on how detailed the information obtained is, the amounts of aid indicated are overall amounts or are linked to a specific use of gas resources or to an activity in the gas chain.

3. SPECIFIC FEATURES OF THE GAS SECTOR

3.1. Specific economic features and competitiveness of gas compared with other sources of energy

3.1.1. The use of gas

Gas is not exclusively used for generating electricity. Gas is used for the following purposes:

- electricity production;
- industrial use;⁴
- domestic use (heating);
- transport (although this use is still minimal).

The two tables in Annex 1 show gas sales by sector in 2000⁵ and primary energy consumption by source⁶ in 2000.

³ The choice of this period covered by the study in no way excludes the existence of aid before this period.

⁴ Natural gas is used in the industrial sector as an energy source for heating but also for various industrial processes (e.g. in the glass industry).

⁵ Source: Eurogas - Annual report 2000.

⁶ Source: Eurogas - Annual report 2000.

Gas consumption by sector depends on the consumer's decision which itself depends on a number of parameters. In the industrial sector, switching to gas or selecting it for a new activity often has a positive effect: savings thanks to improved maintenance, extended useful life of equipment, no need for storage, etc. In particular processes, the use of gas may even improve the quality of the finished product, in particular in the ceramics, tiles and glass industries, through the direct application of the flame to the finished product. Gas experts estimate that gas has an approximately 10%⁷ advantage over light fuel oils (low sulphur content).

With regard to the domestic sector, the decision-making process is more complex as not everything depends simply on the final decision of the consumer. In any case, elements such as comfort, regularity of supply and the difference between the price of gas and that of a competing source will be taken into account.

The strong points of gas in generating electricity result from the performance of combined cycle technology: high energy yield, lower investment and operating costs, low pollutant emissions and shorter time for realising investments.

Advantages of gas in generating electricity

(Source: Elf 1997)

Source		Coal	Fuel oil	Natural Gas	Nuclear energy	Hydraulic
		(1)	(2)	(3)	(4)	(5)
Investment	\$/kW	1000-1300	900-1100	500-700	1300-2000	1000-3000
Yield	%	38-42	38-42	55-58	35	>90
Emission						
- SO ₂	g/kWh	1-4	1-2	-	-	-
- NO _x	g/kWh	1.5-2	1-1.5	0.5-1	-	-
- CO ₂	g/kWh	800-900	650-750	350-400	-	-
Construction time	Years	5-7	3-5	2-3	6-10	8-15

(1) Vapour cycle, pulverised coal + flue gas desulphuration

(2) Vapour cycle, low sulphur fuel + flue gas desulphuration

(3) Combined cycle

(4) Pressurised water, OECD sites

(5) Major projects (capacity > 500 MW)

3.1.2. The gas chain. Activities connected with the gas sector

Before compiling an inventory of aid to the gas sector, it would seem useful to distinguish a number of activities connected with the sector. This would make it possible to determine whether one segment is more strongly supported than another and to make a comparison with other sources of energy, to the extent that the activities are comparable.

The gas chain may be divided into several activities with varying levels of detail. In very general terms the following may be distinguished:

- prospecting, exploration, production;

⁷ WEO study: Assessment on internal and external gas supply options for the EU, evaluation of the supply costs of new natural gas supply projects to the EU and an investigation of related financial requirements and tools.

- transport;
- distribution;
- end use.

Each of these segments may be further subdivided according to the activities or services involved. For the purposes of the inventory, the activities have been subdivided as follows:

- **production:** exploration, drilling, refining, processing, storage;
- **transport, distribution:** including development of the infrastructure network connected with transport and distribution, and storage facilities;
- **LNG:** liquefied natural gas may be classified under transport but it has a particular infrastructure: liquefaction, transport by methane carriers, and regasification;
- **end use:** it is possible to bring under this heading all measures taken to promote energy efficiency and the rational use of energy.

3.1.3. *Costs of the gas chain*

These costs vary according to the part of the chain identified.

3.1.3.1. Production costs

The range of production costs is wide and varies according to (i) the type of reservoir concerned (onshore reservoir, offshore reservoir, size, composition of gas in situ, etc.) and (ii) location (geographic area).

(i) Types of reservoir

In general, two categories of reservoir can be distinguished, which have quite different production costs:

- commercial onshore reservoirs, production costs \$0.2 to 2/10⁶ Btu.
- offshore, production costs \$0.5 to 2.5/10⁶ Btu.
- low-permeability gas reservoirs and marginal offshore reservoirs, production costs \$2.5 to 5/10⁶ Btu.

(ii) Regional disparities in production costs

Production costs of gas reservoirs vary considerably according to the geographic area where they are located. In the Middle East, for instance, production costs are relatively low compared with other regions of the world due to the size of the reservoirs. In Western Europe, production costs are much higher, although efforts have been made to reduce production costs in the Norwegian part of the North Sea. The following table shows gas production costs according to geographic area.

Gas production costs according to geographic area (Source Cedigaz 1997)

	\$/10 ⁶ Btu
USA * onshore * offshore	0.5 – 2 0.5 – 2.5
Western Europe * onshore * North Sea - easy (south) - north	0.3 – 1 0.5 – 1.5 1.5 – 2.2
Middle East * onshore * offshore	0.2 – 0.5 0.5 – 1
Asia-Oceania	0.3 – 1.2

3.1.3.2. Transport costs⁸

Increasing demand for gas and growing intra-EU trade has led to greater demand for transport infrastructure (intra- and trans-European transport networks, port infrastructure for liquefied natural gas (LNG), natural gas storage capacities). As explained below, gas transport costs vary according to whether gas is transported by pipeline or by ship. Gas transport obviously requires very costly infrastructure to be built in both cases. The profitability of both types of transport varies depending in particular on the distance covered. In the gas sector, the highest costs are in the transport segment of the gas chain. This component will no doubt have a significant impact in terms of public aid to gas. Such aid is in fact concentrated in the transport component of the gas chain.

Gas pipeline investment costs comprise two types of variables:

- physical variables: distance, relief/location/obstacles, diameters/output, pressure, etc.;
- economic variables: lending rate/discount rate, cost of self-consumption at compression plants, etc.

The cost of a submarine gas pipeline is twice as high as an onshore pipeline and even four to five times as high in the case of a pipeline laid at depths of 500 to 600m. Moreover, if an international gas pipeline crosses one or more third countries, transit charges should be added to the technical costs proper.

⁸ On this subject, the abovementioned study compiled for the Commission by the Mediterranean Observatory for Energy proposes calculating transport costs on the basis of a number of parameters (discount rate, technology used, difficulty of the terrain, etc.).

3.1.3.3. Costs of LNG chain

The investment necessary to establish a new LNG chain consists of production (on-site collection, pipelines), liquefaction (plant, port terminal), methane carriers and regasification (storage, port terminal). Liquefaction and transport account for about 70% to 75% of the total costs of the chain.

By way of example, the cost of the LNG chain for a capacity of $7 \cdot 10^9$ m³/year over 5 000 to 6 000 miles can be broken down as follows:

	\$/Mbtu	Principal parameters
Production and collection	0.5 – 1	Costs of production and collection, producers' revenue
Liquefaction	1.2 – 1.6	Local factors: construction costs, existing infrastructure, capacity
Transport	1.4 – 1.5	Distance, size of methane carriers
Regasification	0.4 – 0.5	Handling and storage capacity (infrastructure, safety and environmental standards)
Total	3.5 – 4.6	

If this option is compared with the costs of building a gas pipeline, the following data are arrived at:

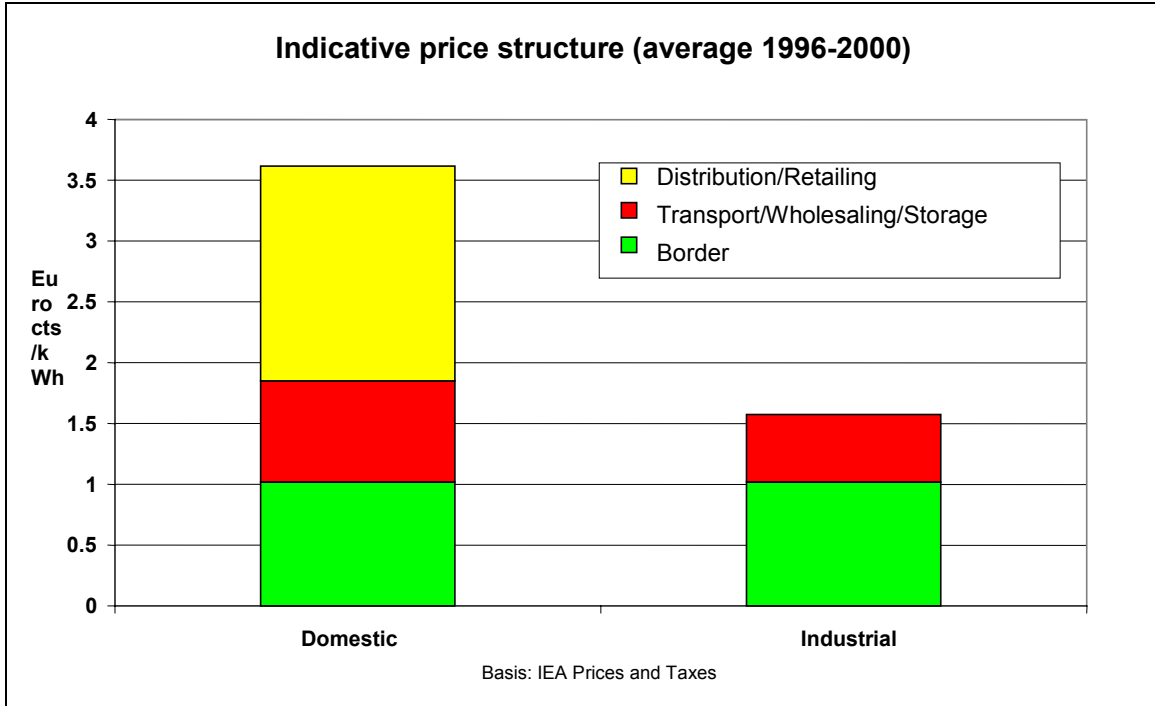
	Middle East/Europe	Middle East/Europe
\$/Mbtu	6 000 to 6 500 km	8 000 km
	Gas pipeline	LNG
Production	0.5	0.5
Liquefaction (1)	-	0.9 – 1.6
Transport	2 – 2.2	1.1
Transit	0.9	0.12 (2)
Regasification	–	0.4
Total	3.4 – 3.6	3 – 3.7

Source: Cédigaz 1997.

(1) Capacity 6 to $12 \cdot 10^9$ m³/year.

(2) Suez Canal.

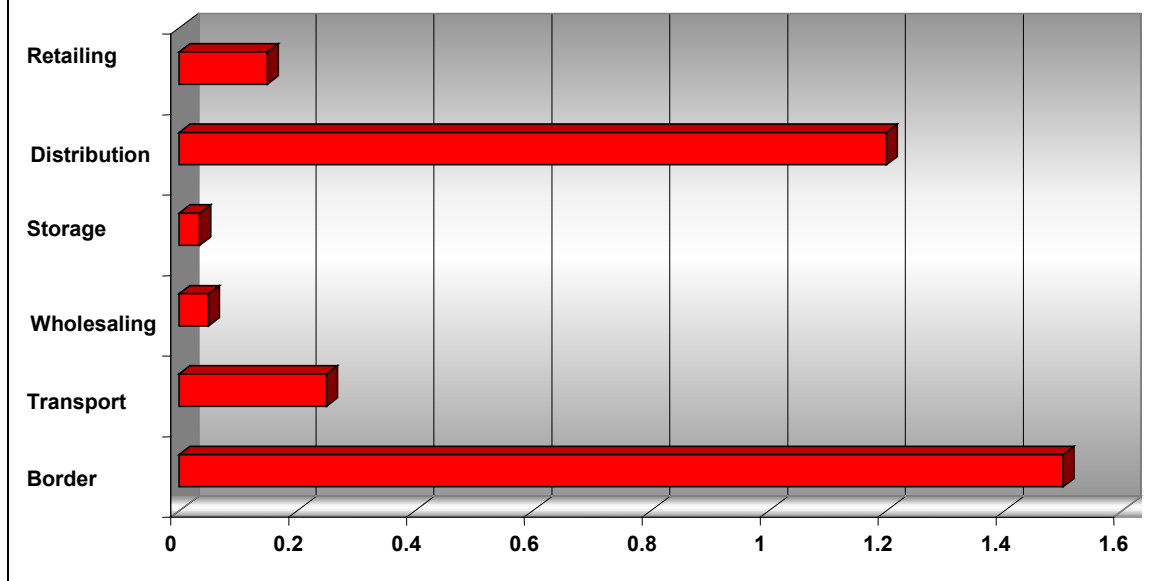
The following tables also give an idea of the cost structure and the share of distribution, transport and gas delivered up to the border, for the domestic and industrial sectors.



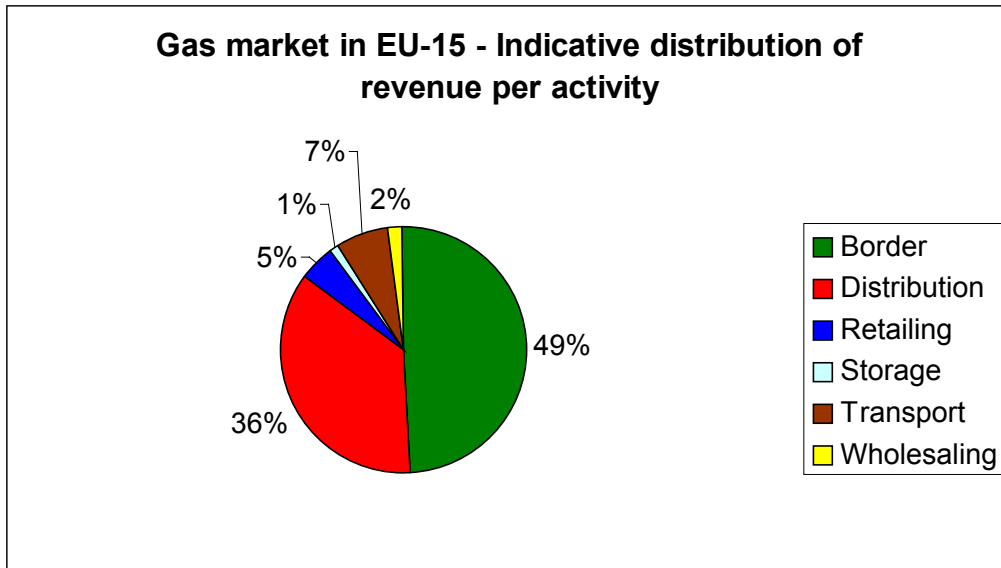
Source: DRI-Wefa study.

Average costs of final price components based on total gas sales

N.B. As the situation may vary according to country and over time, this diagram should be regarded as indicative.



Source: DRI-Wefa study.



Source: DRI-Wefa study.

3.2. External costs

3.2.1. Level of external costs in the gas sector

Even if they are lower than in other sectors, there are external costs linked with the use of gas. However, the advantages which gas may have in electricity production should not be underestimated (cf. section 3.1.1).

In a study (ExternE) cofinanced by the Commission, an attempt was made to evaluate the real cost of electricity generation in Europe. For this purpose, the external costs connected with each energy source were evaluated. The report concludes that the cost of generating electricity from gas would rise by 30% if external costs were taken into account such as the damage caused to health and the environment.

In the report, two methods are proposed for taking account of these costs and "internalising" them:

- by levying a tax on the most polluting fuels and technologies, which would lead to a significant increase in the price of energy.
- by subsidising or promoting cleaner technologies.

The external costs of electricity production are shown in the following table:

External costs for electricity production in the EU (cents/kWh)

Country	Coal & lignite	Peat	Crude oil	Gas	Nuclear energy	Biomass	Hydro-electricity	PV	Wind energy
A				1-3		2-3	0.1		
B	4-15			1-2	0.5				
D	3-6		5-8	1-2	0.2	3		0.6	0.05
DK	4-7			2-3		1			0.1
E	5-8			1-2		3-5			0.2
FIN	2-4	2-5				1			

F	7-10		8-11	2-4	0.3	1	1		
GR	5-8		3-5	1		0-0.8	1		0.25
IRL	6-8	3-4							
I			3-6	2-3			0.3		
NL	3-4			1-2	0.7	0.5			
NO				1-2		0.2	0.2		0-0.25
PT	4-7			1-2		1-2	0.03		
SE	2-4					0.3	0-0.7		
UK	4-7		3-5	1-2	0.25	1			0.15

Source: European Commission press release of 20 July 2001 "New research reveals the real costs of electricity in Europe".

3.3. Specific legal rules applying to the gas sector

The main rules of EU law applicable to the gas sector stem from the EC Treaty. The main sources are as follows:

- European Parliament and Council Directive 98/30/EC of 22 June 1998 concerning common rules for the internal market in natural gas.

This Directive provides the basis for opening up gas markets to competition and introducing new rules. The markets are opened up progressively, initially to eligible customers with access to networks which is either regulated or negotiated.

The Directive should be transposed into national legislation by August 2000. This process is guided by the Madrid Regulators Forum whose aim is to harmonise the rules so as to develop a single market rather than 15 liberalised markets.

A new Commission proposal amending the Directive is currently under discussion. Its objective is to further harmonise the functioning of the market and speed up the full opening-up of markets.

- Council Directive 91/296/EEC of 31 May 1991 on the transit of natural gas through grids. This Directive was amended by Commission Directive 95/49/EEC of 26 September 1995 updating the list of entities covered by Directive 91/296/EEC.

The draft amendment of the electricity and gas directives provides for the abolition of the transit directive. In this case, transit will be treated as access by third parties to the network which will itself be regulated on the basis of published tariffs.

- Commission Decision 97/548/EEC of 11 July 1997 defining the specifications of projects of common interest identified in the sector of the trans-European energy networks by Decision No 1254/96/CEE of the European Parliament and of the Council.

The projects connected with this Decision are set out in detail in section 4.2.1.1.

4. PUBLIC AID TO THE GAS SECTOR

4.1. National aid

Throughout the gas chain, the sector may benefit from various types of aid: (i) aid to investment to improve infrastructure (transport and distribution); (ii) aid to investment to support exploration and production; (iii) aid to research; (iv) indirect aid to the gas sector through aid to consumers.

4.1.1. *National aid to investment to improve infrastructure: State aid examined by the Commission*

On the basis of the information at the Commission's disposal, it seems that national aid to the gas sector mainly takes the form of State aid for investment in the gas chain (transport, distribution, etc.). The countries whose State aid has recently been analysed by the Commission are Spain, Greece, Ireland and Denmark.

The table in Annex 2 shows details of State aid recently analysed by the Commission in connection with the provisions on State aid laid down in the EC Treaty. This aid mainly takes the form of subsidies or direct aid and in some cases tax relief. It is often granted to gas transport and/or distribution companies to improve infrastructure in underdeveloped regions or in regions without a distribution network. Aid levels vary considerably but apart from rare exceptions they do not exceed 50% of investment costs. At times, this infrastructure is also cofinanced by European funds (see, for instance, the project for developing a distribution network in the Spanish region of Andalusia; State aid N 483/98).

The criteria laid down by the Commission for acceptance of this aid are as follows:

- promoting the economic development of a region where the standard of living is low, and creating jobs;
- extending a gas network may guarantee security of supply and extend the use of an energy source whose combustion generates fewer emissions than burning coal or oil;
- the project should be in line with EU policy, in particular with regard to developing trans-European networks;
- introducing a new energy source (as is the case in Greece) may enhance competition and lead to lower prices for the consumer.

4.1.2. *Aid to investment to support exploration and production*

Gas-producing countries such as the United Kingdom, the Netherlands and Denmark grant aid to production.

In the United Kingdom, taxes levied on new gasfields developed since 1993 are lower than in the past. This constitutes an incentive for investment, especially for smaller gasfields or fields where exploration is difficult.

Denmark has abolished the payment of royalties on gas and oil production.

The pre-exploration tax scheme in Ireland is one of the most attractive.

On the other hand, strict and long procedures for obtaining an exploration licence may inhibit the development of new gasfields (e.g. in Italy and the Netherlands).

Mention should also be made of the existence of economic compensation with a view to achieving particular public service objectives. This is the case, for instance, for the Dutch policy on small gasfields. The Dutch government, striving for security of supply, has decided to aid the development of small gasfields which *a priori* are economically less profitable in order to keep the Groningen gasfield going.

4.1.3. Support for research and development

On the basis of the information which is currently at the Commission's disposal, it is not possible to identify in detail the existence of national public aid to gas-related research and development. In most cases, such types of aid form part of more general aid to research and development, and gas and oil cannot be separately distinguished within these research programmes.

4.1.4. Aid to the gas sector through aid for consumers (national tax schemes and/or direct subsidies to users)

The gas sector may also benefit from aid for gas consumers. The information available to the Commission shows that each Member State has its own aid scheme that is difficult to compare with that of a neighbouring country. In several Member States there are implicit subsidies resulting from a reduction in CO₂ tax rates.

With regard to taxation, it should be noted that natural gas usually benefits from a lower rate than liquid fuel (mineral oils) or is even exempt from tax.

Some Member States have also developed mechanisms for aid to the use of gas (domestic use) as purchasing subsidies or subsidies for installing a new, more powerful gas boiler.

4.2. EU aid

4.2.1. Aid to investment

4.2.1.1. Trans-European energy networks programme (TEN-Energy)

The role of the European Union in connection with the trans-European energy networks programme is to encourage and support initiatives by operators in the electricity and gas sectors. To this end, common interest projects are identified. The TEN programme promotes the implementation of these common interest projects by cofinancing feasibility studies. Under the guidelines for 1996-2001, 90 common interest programmes for electricity and gas were identified. Priorities relating to gas were identified, in particular:

- (1) introducing natural gas into new regions (priority 1);
- (2) connecting separate gas networks (priority 2);

- (3) developing capacities for receiving liquefied natural gas (GNL) and for storage of natural gas (priority 3);
- (4) developing gas transport capacity (priority 4).

Projects in progress that correspond to these priorities may be summarised as follows:

(1)	Priority 1: Introducing natural gas into new regions: Spain (west of the country), Portugal, Greece.
(2)	Priority 2: Connecting separate gas networks: United Kingdom - Continent via Belgium; Luxembourg - Germany; Portugal - Spain; France (connecting south-western and southern networks); Austria - Hungary; Austria - Slovakia (connecting Austria to the underground reservoir in Slovakia); Austria (internal connection).
(3)	Priority 3: Developing capacities for receiving LNG and storage of natural gas: France (extending the LNG terminal at Montoir).
(4)	Priority 4: Developing transport capacity: Norway - France (arrival at Dunkirk); Algeria - Spain - Portugal; Algeria - Tunisia - Italy; Russia - Belarus - Poland - EU; Bulgaria - Greece; Belgium - Germany.

The contribution for each priority in budgetary terms (thousand €) involves the following sums:

	1995 – 1999	2000	2001	Total 1995-2001
Priority 1	4 654.5	-	1 043.5	5 698.0
Priority 2	3 620.5	911.4	-	4 531.9
Priority 3	35 604.9	1 502.6	9 392.0	46 499.4
Priority 4	8 179.0	3 886.0	-	12 065.3
Total Gas	52 058.9	6 299.9	10 435.5	68 794.3

Source: Report from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions on the implementation of TEN priorities for the period 1996-2001.

In the following table, the contribution of the TEN-Energy Programme to the electricity and gas sectors is compared for the period 1995 to 2001. Overall, the share earmarked for gas is higher than that for electricity.

	1995 – 1999		2000		2001		TOTAL	
	million €	%	million €	%	million €	%	million €	%
Electricity	38.1	42	7.5	54	8.4	47	54.0	44
Natural gas	52.1	58	6.3	46	10.4	53	68.8	56
TOTAL	90.2	100	13.8	100	18.8	100	122.8	100

The breakdown of TEN-Energy budgets per Member State is therefore as follows:

BREAKDOWN OF TEN-ENERGY SUPPORT PER COUNTRY (NATURAL GAS)**1998-2001**

COUNTRY	ACTIONS	SUPPORT thousand €	EN %
AUSTRIA	2	962	2.24
BELGIUM	1	3391	7.90
DENMARK	4	7040	16.41
SPAIN	7	16778.8	39.10
FINLAND	1	1000	2.33
FRANCE	2	5778	13.47
GREECE	4	3123.5	7.28
IRELAND	2	825	1.92
PORTUGAL	1	934.5	2.18
UNITED KINGDOM	1	75	0.17
SWEDEN	2	3000	6.99
TOTAL FOR 27 ACTIONS	27	42907.8	100.00

From examining these figures, therefore, it can be concluded that the countries that have benefited most from this programme in recent years are Spain, Denmark and France.

The TEN-Energy guidelines are currently under review. The aim of this exercise is to take account of developments that have taken place since 1996 on the energy market, in particular the implementation of directives opening up the electricity and natural gas markets, the trend towards increased external energy dependence for the supply of natural gas, and the setting of higher objectives for renewable energy penetration. Another objective is to have a wider definition of common interest projects (10 thematic projects instead of the current 90 detailed projects). It is also proposed to raise the cofinancing percentage from 10 to 20%.

4.2.1.2. Aid to investment through structural funds and EIB funds

Other substantial European contributions have supported these TEN-Energy projects in 1996-2000. They come mainly from **structural funds** (about €2 billion in the form of subsidies) and from the **European Investment Bank (EIB)** (about €3 billion in the form of loans).⁹ With the data collected, it is not always possible to distinguish funds assigned to the electricity sector from those specifically assigned to the gas sector. While account is taken of TEN priorities and lists of projects, each instrument also operates in accordance with its own criteria.

In other words, these programmes are cumulative and endeavour to respect identical priorities even if terms and conditions of implementation vary.

However, it is possible to quantify the amounts from structural funds benefiting gas. These amounts are shown in the table below:

⁹ Report from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions on the implementation of TEN priorities for the period 1996-2001.

Contributions from structural funds for gas 1994-99

Country	Operational programme	Contribution (million €)
Greece	Introduction of natural gas	354.6
Greece	Athens: gas-driven bus and natural gas station	37.4
Italy	Energia Metanizzazione	60.0
Portugal	Infrastructure supporting development: sub-programme for energy (*)	322.0
Portugal/Spain	Interreg II : Gas infrastructure	220.0
Spain	LNG plant, Huelva	7.3
Spain	Gibraltar-Cordoba gas pipeline	99.0
Spain	Valencia-Cartagena gas pipeline (first stage)	23.8
Total		1124.1

(*) includes funds for renewables and conservation: the amount may therefore be overestimated.

The forecast figures for ERDF-Objective 1 interventions for the period 2000-2006 amount to +/- €1.5 billion for commitments already made in March 2002. Annex 3 contains a detailed analysis of these commitments.

4.2.2. EU aid for research

The fifth framework programme (1998-2002) reflects the European Union's main priorities for EU actions in research, technological development and demonstration. It focuses on a limited number of research fields and key actions.

The first action covers a thematic programme relating to energy, the environment and sustainable development with an overall budget of €2 125 million for 1998-2002. The energy part has a budget of €1 042 million. This part follows up the Joule and Thermie programmes under the fourth framework programme.

The appropriations for the energy component of the programme are earmarked for financing actions to set up sustainable energy services and systems for Europe and to contribute to global sustainable development, taking the form of securing and diversifying energy supply through the provision of low-cost high-quality energy services, enhanced industrial competitiveness and reduced impact on the environment.

This part is divided into various key actions including:

- economic and efficient energy, with targeted research including the following: rational and efficient use of energy, energy transmission and distribution, macro- and micro-level storage technologies, fossil fuel exploration, extraction and production technologies, energy supply and demand scenarios and their economic and environmental interactions;
- clean energy and renewable energy sources, with the following areas of targeted research: clean generation of electricity and/or heat (improving gas turbine output);
- the city of tomorrow and cultural heritage: integrated approaches to sustainable urban development and rational resource management.

In the light of the current classification of these funds, it is extremely complicated to distinguish the component exclusively dedicated to the gas sector. Until 2000, oil and gas

projects were mixed together. Moreover, the research programme is divided into several units. If one had to divide up the allocated budget between gas/oil research projects according to sector, an acceptable apportionment¹⁰ would be 80% for oil and 20% (at the most) for gas.

No data are available for separate Member States. In other words, it is not possible to distinguish the part which each Member State has benefited from because the projects are multinational. There are several partners and the share of each partner is not usually specified. Moreover, a significant part of the projects is subcontracted out.

In the light of the energy component of the fifth framework programme, the following information should be highlighted:

- 1999: one project
- 2000: none
- 2001: gas turbines: €7 million
dissemination: €800 000.

5. CONCLUSION

Natural gas, discovered at the beginning of the 1950s, has taken decades to come to the fore in the energy sector. It has since become a major source of energy. In some countries, there is a rapid increase in the share of natural gas in electricity generation. This share should continue to grow and eventually partially replace other sources of energy (coal) used to generate electricity. The Green Paper on the security of supply noted that by the end of the decade, thermal power stations operating on natural gas should account for about two-thirds of the increase in energy demand. The Green Paper expects that in 2020-2030 almost half of electricity will be produced by natural gas, i.e. 45% of the natural gas consumed.

This increase in demand and the increase in intra-EU trade entail a greater demand for transport infrastructure¹¹ (intra-European and trans-European transport networks, port infrastructures for liquefied natural gas (LNG), and natural gas storage facilities). Gas transport costs vary according to whether pipelines or ships are used. The profitability of both types of transport varies depending in particular on the distance covered. However, in both cases the costs are relatively high, making the gas industry very capitalist.

Most of the public aid listed focuses on infrastructure. This aid to the development of transport and distribution infrastructure in regions where no distribution network has been built has been listed at national (State aid) and EU levels (regional and structural funds). Such aid has traditionally been justified (see the Green Paper on security of supply) by the need to have a supply network that is guaranteed to be safe and secure.

Aid for research and innovation (in particular, EU aid under the framework programme for research and development) should also contribute to sustainable development and

¹⁰ Apportionment determined by the use that has been made of the programme in the past.

¹¹ As explained in the Commission's communication on European energy infrastructure, existing infrastructure should be used as efficiently as possible, in particular by solving current problems of congestion and removing bottlenecks before investing in new infrastructure.

enhance security and diversity of supply as well as guaranteeing high-quality gas supply at low cost.

From the point of view of demand, Member States have also introduced tax measures (tax exemptions) and various types of aid to speed up the introduction of gas as a source of energy. One example is national aid provided to combined cycle electricity producers¹² which to a large extent use gas as their source of energy.

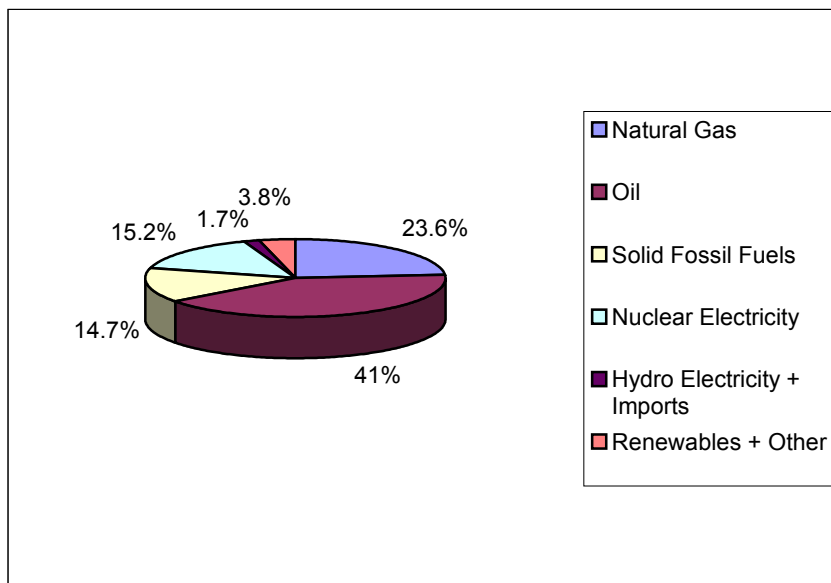
Aid for gas exploration has also been noted in a number of countries

¹² The combined generation of electricity and heat uses various energy sources, including gas. This point is therefore not discussed in detail in this report but is dealt with in the joint chapter on all sources of energy.

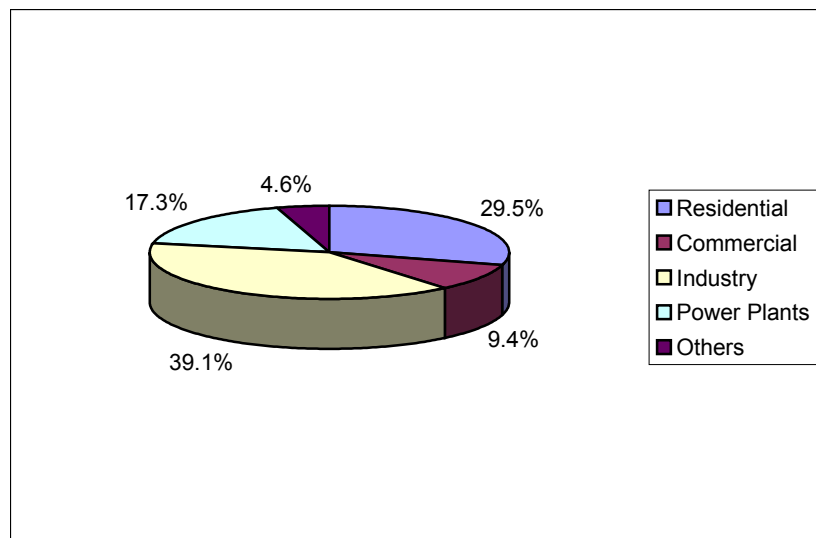
6. ANNEXES

6.1. Annex 1: Primary energy consumption and gas sales per sector

2000 Primary energy consumption per fuel (EU15)



2000 Sales of natural gas per sector (EU15)



6.2. State aid to investment in infrastructure development

STATE AID 1996-2001							
No	COUNTRY	SUBJECT	FORM	BENEFICIARY	LEVEL	PERIOD	BUDGET
449/97	Denmark	Natural gas sector	Tax relief			1997-2000	
704/97	Ireland	Natural gas network extension	Direct subsidy	Bord Gais Eireann (Irish Gas Board)	Between 37% and 54% gross	20 yrs	IEP 57 million (1999 price) subject to +/-15% = €72.3 million
483/98	Spain (Andalusia)	Promoting gas distribution In Malaga province	Direct aid	Gas Natural	20.5% of investment costs	1998-2000	17 168 674 € (1)
90/2000	Greece	Regional gas distribution network development (Attiki-Thessaloniki-Thessalia)	Subsidy and tax reduction	Distribution companies	17% Attiki 11.3% Thessaloniki 25.9% Thessalia	7 years for subsidies 10 years for tax reductions	max. €88.2 million for subsidies
676/2000	Spain (Valencia)	Gasification plan in small- and medium-sized towns: extending the distribution network	Subsidy	Repsol Butano S.A	34.63%	2000-2006	€9.32 million
84/01	Spain (Bilbao)	Regasification plant (2)	Subsidy	Bahia de Bizcaia Gas (newly established company)	10% gross	2000-2003	€23.2 million
124/2002	Northern Ireland (3)	Gas pipeline					

(1) 40% of this amount financed by the EU Regional Development Fund.
(2) Connected with the construction of a combined-cycle heating plant.
(3) In progress - open procedure.

6.3. Commitments already made, in March 2002, under measures in the field of energy infrastructure, included in the programme supplements for the Objective 1 regions for the period 2000-2006.

EU contributions to energy infrastructure				
Programme supplement for Objective 1 for 2000-06				
Member State	Number of programme supplements	Basic infrastructure Subjects covered	ESFD contribution in million €	% of total
Belgium	1	33 Energy infrastructure (production, supply)	4.71	7.37 %
		332 Renewable energy sources (solar, wind, hydroelectric, biomass)	1.89	40 %
		333 Energy efficiency, co-generation, energy control	2.82	60 %
Germany	8	33 Energy infrastructure (production, supply)	11.68	0.21 %
		332 Renewable energy sources (solar, wind, hydroelectric, biomass)	11.68	100 %
		333 Energy efficiency, co-generation, energy control	0.00	0 %
Greece	24	33 Energy infrastructure (production, supply)	418.72	3.54 %
		330 Energy infrastructure (production, supply) (not allocated)	1.80	0.43 %
		331 Electricity, gas, oil, solid fuel	315.93	75.45 %
		332 Renewable energy sources (solar, wind, hydroelectric, biomass)		

				37.49	8.95 %
		333	Energy efficiency, co-generation, energy control	63.50	15.17 %
Spain	22	33	Energy infrastructure (production, supply)	292.82	1.64 %
		330	Energy infrastructure (production, supply) (not allocated)	7.59	2.59 %
		331	Electricity, gas, oil, solid fuel	170.59	58.26 %
		332	Renewable energy sources (solar, wind, hydroelectric, biomass)	74.85	25.56 %
		333	Energy efficiency, co-generation, energy control	39.79	13.59 %
France	6	33	Energy infrastructure (production, supply)	30.89	2.95 %
		330	Energy infrastructure (production, supply) (not allocated)	7.62	24.67 %
		331	Electricity, gas, oil, solid fuel	3.81	12.33 %
		332	Renewable energy sources (solar, wind, hydroelectric, biomass)	19.30	62.48 %
		333	Energy efficiency, co-generation, energy control	0.16	0.52 %
Ireland	6	33	Energy infrastructure (production, supply)	43.42	3.37 %
		333	Energy efficiency, co-generation, energy control	43.42	100.00 %
Italy	12	33	Energy infrastructure (production, supply)	261.84	4.80 %
		330	Energy infrastructure (production, supply) (not allocated)	3.10	1.18 %
		331	Electricity, gas, oil, solid fuel	76.68	29.29 %
		332	Renewable energy sources (solar, wind, hydroelectric, biomass)	142.64	54.48 %
		333	Energy efficiency, co-generation, energy control	39.42	15.05 %
Netherlands	1	33	Energy infrastructure (production, supply)	0.73	2.33 %

		332	Renewable energy sources (solar, wind, hydroelectric, biomass)	0.24	32.88 %
		333	Energy efficiency, co-generation, energy control	0.49	67.12 %
Austria	1	33	Energy infrastructure (production, supply)	4.45	26.68 %
		332	Renewable energy sources (solar, wind, hydroelectric, biomass)	4.45	100.00 %
Portugal	19	33	Energy infrastructure (production, supply)	472.78	5.56 %
		330	Energy infrastructure (production, supply) (not allocated)	443.96	93.90 %
		332	Renewable energy sources (solar, wind, hydroelectric, biomass)	28.82	6.10 %
Finland	2	33	Energy infrastructure (production, supply)	6.82	15.01 %
		331	Electricity, gas, oil, solid fuel	0.00	0.00 %
		332	Renewable energy sources (solar, wind, hydroelectric, biomass)	6.82	100.00 %
		333	Energy efficiency, co-generation, energy control	0.00	0.00 %
Sweden	2	33	Energy infrastructure (production, supply)	3.13	2.96 %
		330	Energy infrastructure (production, supply) (not allocated)	3.13	100.00 %
United Kingdom	4	33	Energy infrastructure (production, supply)	46.80	4.49 %
		330	Energy infrastructure (production, supply) (not allocated)	5.44	11.62 %
		331	Electricity, gas, oil, solid fuel	13.92	29.74 %
		332	Renewable energy sources (solar, wind, hydroelectric, biomass)	26.34	56.28 %
		333	Energy efficiency, co-generation, energy control	1.10	2.35 %

EU TOTAL	108	33 Energy infrastructure (production, supply)	1598.79	3.02 %
		330 Energy infrastructure (production, supply) (not allocated)	472.64	29.56 %
		331 Electricity, gas, oil, solid fuel	580.93	36.34 %
		332 Renewable energy sources (solar, wind, hydroelectric, biomass)	354.52	22.17 %
		333 Energy efficiency, co-generation, energy control	190.70	11.93 %