

EN34 Energy Subsidies

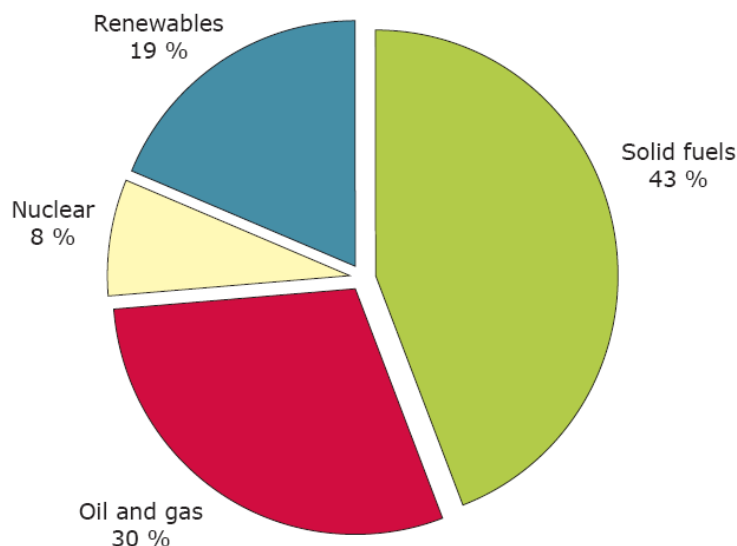
Key message

Energy subsidies in the EU-15 have been estimated to amount to over EUR 29 billion in 2001 with almost three quarters oriented towards the support of fossil fuels, despite the pressures and threats that these fuels place on the environment. However, there has been a significant increase in the subsidies and support mechanisms available for renewable energies. Total funding for energy research and development has increased by approximately 5% over the period 1995 to 2005.

Rationale

Energy subsidies can be either beneficial or damaging to the environment. Damaging subsidies are those that lower the price of behaviour that is detrimental to the environment, for example encouraging excessive energy consumption, or making the cost of more environmentally harmful fuels lower relative to those that are less harmful. In contrast, subsidies that are beneficial to the environment improve the competitiveness of environmentally sound practices by reducing their price relative to those that damage the environment.

Figure 1: Indicative estimate of the distribution of energy subsidies in the EU-15, 2001

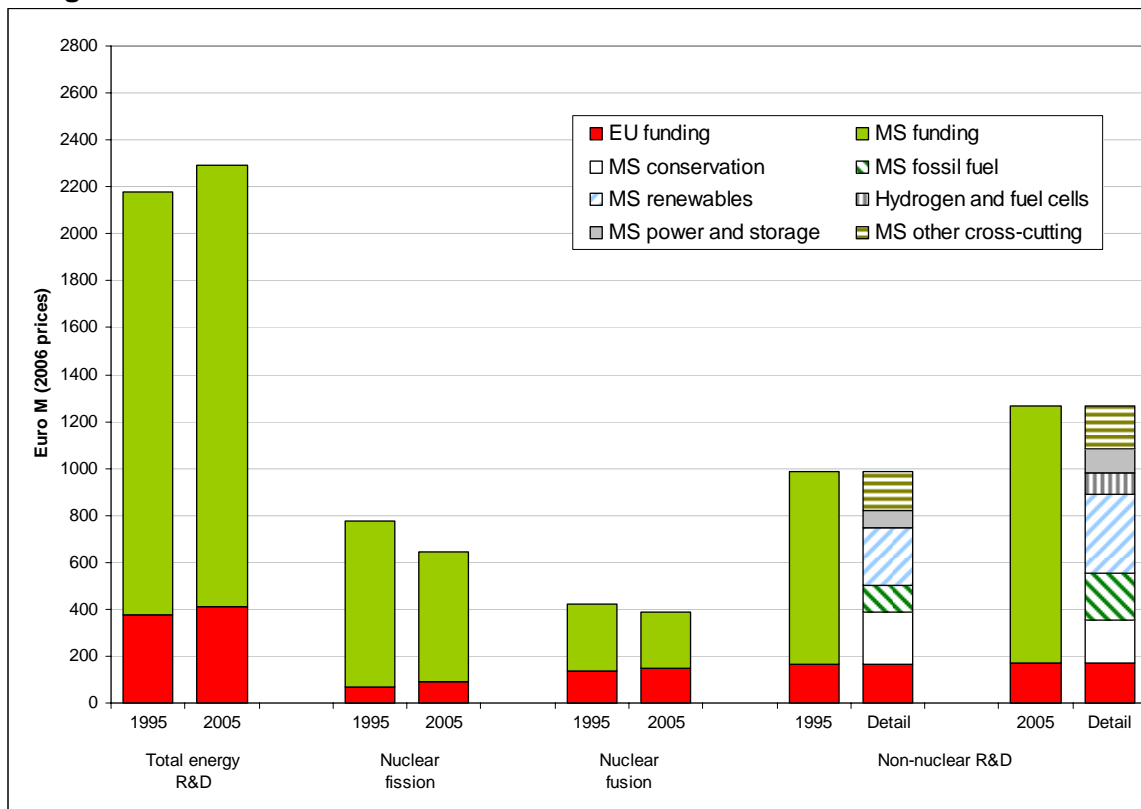


Source: Energy Subsidies in the European Union: A Brief Overview, European Environment Agency, 2004
http://reports.eea.eu.int/technical_report_2004_1/en, Eurostat

Notes: These figures are based on a synthesis of existing reports and data. Subsidies to electricity generation and consumption have been allocated to individual fuel sources on the basis of Eurostat 2001 data on primary energy inputs in the generating mix.

There is no agreed definition of energy subsidies among Member States. The most transparent way of understanding them is to identify those that appear 'on budget' and those that are 'off budget'. On-budget subsidies are cash transfers paid directly to industrial producers, consumers and other related bodies, such as research institutes, and appear on national balance sheets as government expenditure. Grants may be given to producers, mainly to support commercialisation of technology or industry restructuring, and to consumers. On-budget subsidies also include low interest or reduced-rate loans, administered by government or directly by banks with state interest rate subsidy. Off-budget subsidies are typically transfers to energy producers and consumers that do not appear on national accounts as government expenditure. They may include tax exemptions, credits, deferrals, rebates and other forms of preferential tax treatment. They also may include market access restrictions, regulatory support mechanisms such as feed-in tariffs, border measures, external costs, preferential planning consent and access to natural resources. Quantifying off-budget subsidies is complex, in some cases impossible. It often requires that the benefit be calculated on the basis of differential treatment between competing fuels, or between the energy sector and other areas of the economy.

Figure 2: Total energy Research and Development expenditure, EU-15 Member States and EU level funding



Source: IEA (Member States); data for European funding are planned expenditure figures from the 6th Framework Programme.
Note: Figures are in 2006 constant prices. MS means Member States. Framework programme expenditure has been estimated as an annual average over the duration of the programme (2002-2006). Non-nuclear research includes renewable energy, energy conservation, fossil fuel production, power production and storage technologies and cross-cutting research. Where 2005 MS data is not available the most recent figures available have been assumed: Czech Republic, Netherlands = 2003, Greece = 2002, Luxembourg = 2000, Belgium = 1999.

1. Indicator assessment

The European Environment Agency (2004) has undertaken a detailed analysis of energy subsidies for a single year, 2001. The review indicates that total 'on-' and 'off-budget' subsidies (excluding external costs) are estimated to be in the order of 29 billion Euro a year for the EU-15 (the definition of 'on-budget' and 'off-budget' subsidies is defined in the note to Figure 1 and also in the Metadata section). This figure is indicative, due to the lack of consistency of data across countries and of assumptions made.

In general, there has been a slight trend in reduction of 'on-budget' subsidies in the EU, mainly following processes of deregulation, privatisation and the opening of energy markets to competition. However, this has been balanced by an increase in 'off budget' subsidy support as governments have used fiscal measures rather than direct capital grants to support energy production and consumption.

Figure 1 shows the on- and off-budget subsidies by fuel. For that purpose, subsidies directed to the production and consumption of electricity (EUR 6.7 billion) was attributed to the fuels used to generate electricity according to their shares in production. Solid fuels then received the largest share of total subsidies in 2001, with EUR 13 billion evenly split between 'on-' and 'off-budget' subsidies. Oil and gas received in excess of EUR 8.7 billion, of which approximately 97 % was in the form of 'off-budget' subsidies. Renewable energy received the third largest off-budget subsidy of EUR 5.5 billion, while nuclear power received approximately EUR 900 million. Some support was provided to energy conservation; however, the degree of influence on the improvement in energy consumption intensity is difficult to identify.

Total public expenditure on energy Research and Development increased by 5 % between 1995 and 2005 (including EU level funding under the 6th Framework Programme averaged over 5 years from 2002 to 2006). The role of the private sector in R&D is also significant, especially in the development and commercialisation phases of new technologies, but has not been included in the indicators due to a lack of reliable data. EC funding for energy-related activities under the 7th Framework Programme¹, running from 2007-2013 will rise to around €1016M euros per year from €424M of which €388M is for non-nuclear energy research (all figures are in constant 2006 prices).

Fossil fuels were the main beneficiaries of energy subsidies in 2001, despite the pressures that these fuels place on the environment. EU average annual subsidies for fossil fuels accounted for almost 75 % of total EU energy subsidies. On- and off- budget support to the coal industry is the single most important funding regime in the EU-15. State financing to coal mines was commonplace throughout the last century, and exists today in a more rationalised form to protect high-cost domestic industries from competition with cheap foreign coal imports. On-budget subsidies continued in 2001 to the coal industries in Germany (over EUR 4 billion), Spain (over EUR 1 billion), and the UK (circa EUR 0.1 billion), whereas subsidies in other countries, such as Belgium, France, Ireland, the Netherlands and Portugal have more or less ceased.

Expenditure on oil and gas subsidies is predominantly in France, the Netherlands, and the United Kingdom whereas expenditure on coal production is highest in Finland, Germany, the Netherlands, Spain and the United Kingdom. There is little aid to investment in the oil sector, reflecting the fact that the bulk of oil reserve development is occurring outside Europe. The industry across Europe is largely privatised and receives no on-budget aid for oil production, transport or storage. Italy, the Netherlands and the United Kingdom provide the highest level of support to the oil and gas sector. In the Netherlands, preferential tax treatment under the regulatory energy tax for medium and large users of gas is significant (estimates range from EUR 0.9 to 2.4 billion). The United Kingdom supports oil and gas with reduced rates of VAT (5 %) on domestic oil and gas (circa EUR 1.4 billion), while Italy allows reduced VAT rates (10 %) on domestic gas (circa EUR 0.9 billion). The amount spent on R&D associated with fossil fuel production has almost doubled from 1995 to 2005 (excluding EU funding), and its share has increased from 5% to 9%.

(1) <http://ec.europa.eu/research/press/2005/pr0704-2en.cfm>

In 2001, **nuclear power** was the least subsidised form of energy, accounting for 8 % of total subsidy support. The on-budget support to nuclear energy comes from R&D grants by Member States (mainly France, Germany and Italy) and the European Community. These figures exclude the potential cost of not having to pay for full-liability insurance cover for a critical nuclear accident or fuel incident since commercial and state liabilities are limited by international treaty and such risks are too large to be commercially insurable. However, there are difficulties with producing an estimate that reflects accurately the risks associated with nuclear power. The estimate also does not include external costs associated with the nuclear fuel cycle. In 2005, nuclear R&D expenditure still accounted for approximately 45 % (in constant 2006 prices) of EU total energy R&D spending, despite a decline since 1995 where it accounted for 55 %. France has the highest absolute expenditure on nuclear Research and Development and the largest share of spending, 62 % in 2005 (constant 2006 prices).

Support for **renewable energy**, which is on balance considered environmentally beneficial, has increased steadily between 1990 and 2001, through the introduction of regulatory support mechanisms, such as fixed feed in tariffs, competitive tenders and purchase obligations. Support for renewable energy is now well established across the EU-15, as indicated by the estimate of it taking 19 % of all on and off-budget subsidies in 2001. Every Member State provides a combination of price support through feed-in tariffs, obligations or competitive tender, together with a range of capital subsidies and fiscal mechanisms. In 2001, total levels of support were greatest in Germany and Italy, where over EUR 1 billion was provided, mainly in the form of feed-in tariffs. France provides tax exemptions for biofuels from oil excise duties. It can be expected that subsidies for the renewable industry will fall as costs decline and the technologies mature (with the exception of large hydro, which is already considered mature). R&D expenditure on renewables has risen substantially (by 37%) between 1995 and 2005, increasing its share of total funding from 11 % to 15% (excluding EU funding).

R&D expenditure on **energy efficiency and conservation** (not including combined heat and power) declined by approximately 19 % in absolute terms between 1995 and 2005 (in constant prices), leading to a drop in share from 10% to 8% in total R&D (excluding MS funding). High shares of expenditure (>25% of total MS spending) are seen in Austria, Finland, Ireland, Portugal and Sweden.

Biofuel support only accounted for a small component (<6%) of the 2001 estimate of renewables subsidies in Figure 1 (e.g. minor tax exemptions in France and the Netherlands). Support for biofuels has been increasing rapidly in more recent years given Directive 2003/30/EC on Promotion of the use of biofuels and other renewable fuels for transport, and will likely increase further in future given the proposed biofuels target of 10% by 2020 in the new climate package (COM(2008)16, 17 and 19). A recent study (GSI, 2007) of EU Member States involved in the production of ethanol and biodiesel estimated that total support in 2006 was around €3.7 bn covering a range of on- and off-budget subsidies. The authors considered that this was likely to be an underestimate.

Table 1: Support for ethanol and biodiesel in the European Union in 2006

	Units	Ethanol	Biodiesel
Total transfers	€ millions	1,290	2436
Support per litre consumed	€/ litre	0.74	0.50
Support per gigajoule (GJ)	€/ GJ	35	15
Support per litre of petrol of diesel equivalent	€/ litre equivalent	1.10	0.55

Source: GSI (2007)

In addition to future R&D funding for energy projects under the 7th Framework Programme mentioned above, another significant source of future subsidies is via the **Structural Funds of the EU's Cohesion Policy**². This was enshrined in the Treaties with the adoption of the Single European Act in 1986. It is built on the assumption that redistribution between richer and poorer regions in Europe is needed to progress further economic and social integration. Through four generations of Structural and Cohesion

(2) http://ec.europa.eu/regional_policy/funds/2007/index_en.htm

Funds programmes (the latest running from 2007-2013), the EU has invested around €480 billion in the ‘less favoured’ regions since 1988. Funding related to energy over the latest period is ‘earmarked’ to a number of broad categories as indicated in Table 2 below, with estimated annual funding of around €1.5bn per year. The majority of funding related to electricity, natural gas and petroleum products is linked to the development of infrastructure rather than subsidies for production, with around 38% of this going to support the development of TEN-E (Trans-European Networks – Energy).

Table 2: ‘Earmarked’ Structural Funding for energy project

Type	Total 2007-2013	Estimated Annual
Electricity	561	80
Natural gas	977	140
Petroleum products	164	23
Renewables: Wind	757	108
Renewables: Solar	1033	148
Renewables: biomass	1697	242
Renewables: hydro, geothermal, other	1081	154
Energy efficiency, co-generation, energy management	4012	573
Total	10282	1469

Source: DG REGIO

Notes: Figures are in constant 2006 prices and show earmarked funding as of April 2008. Approximately 99% of programmes to be funded have been decided.

2. Indicator rationale

2.1 Environmental context

Energy subsidies are of interest because they impact/distort the energy market in terms of the choice of energy types and/or changes in energy prices for consumers. They can be either beneficial or damaging to the environment. As highlighted by UNFCCC (2007) there are a number of common problems with energy subsidies, which link to environmental issues:

- By lowering prices, they can boost overall energy use and emissions (the latter if targeted towards fossil fuels by changing the relative prices of fuels).
- By lowering price to producers a consumption subsidy may cut returns on investment and the incentives to invest in new, more efficient/cleaner technology, which could reduce environmental impacts.
- Similarly, subsidies to producers can reduce competitive market pressures, reducing incentives to invest in cleaner, more efficient technology.
- Subsidies to more specific energy technologies can undermine the development and commercialisation of other technologies that might ultimately become more economically and environmentally attractive.
- Subsidies (for fossil fuels) can drain Government finances, leaving less money available for environmental-related aims. For example, if they increase overall energy use, consumption subsidies may boost demand for imports or reduce the amount of energy available for export.

This harms the balance of payments and energy security by increasing the country's dependence on imports.

Subsidies that are damaging to the environment lower the price of behaviour that is detrimental to the environment, making the activity more competitive and encouraging more of the behaviour than if the subsidy were not in place. On the other hand, subsidies that are beneficial to the environment improve the competitiveness of environmentally sound practices (e.g. renewables and energy efficiency) by reducing their price relative to environmentally damaging practices.

The removal of harmful subsidies can also lead to economic gains independent of reductions in environmental degradation, including release of government resources, greater resource efficiency, and technological and product development. The removal of subsidies is one step towards full cost pricing, to ensure that the conventional costs of production — those often referred to as the private costs to producers and consumers — are fully covered by the final price of the product, good or service. The other aspect of full cost pricing is to ensure that all other external costs (e.g. environmental or health damage costs) are incorporated into the price (see EN35). These externalities are sometimes referred to as implicit subsidies of production but are not dealt with in the definition of subsidies used in this fact sheet.

There is no agreed definition of energy subsidies among Member States:

- The IEA (2007) defines subsidies as: *“any government action that concerns primarily the energy sector that lowers the cost of energy production and raises the price received by energy producers or lowers the price paid by energy consumers”*.
- The recent EU Green Paper on Market Based Instruments (MBI) (European Commission, 2007) for environmental policy adopts the 1998 OECD definition of environmentally harmful subsidies as: *‘all kinds of financial supports and regulations that are put in place to enhance the competitiveness of certain products, processes or regions, and that, together with the prevailing taxation regime, (unintentionally) discriminate against sound environmental practices’*.

These terms may include a wide range of different classifications of subsidy including: cash transfers paid directly to producers, consumers and related bodies, as well as less transparent support mechanisms, such as tax exemptions and rebates, price controls, trade restrictions, planning consent and limits on market access. It may also cover government failure to correct market imperfections, such as external costs arising from energy production or consumption. Subsidies can be classified in many ways. The most transparent way of understanding them is to identify those that appear ‘on budget’ and those that are ‘off budget’ (these are described in the metadata section).

2.2 Policy context

The importance of subsidy removal or restructuring is increasingly recognised by policy-makers, who acknowledge the need to remove environmentally damaging subsidies and restructure subsidies to improve the competitiveness of environmentally beneficial products and services (European Commission, 2007). At the EU level there is a wide range of policies that could directly or indirectly impact on subsidy reform - the EU Sixth Environment Action Programme (COM (2001) 31 final) highlights the impact of environmentally harmful subsidies and state aid. However, any reform will have to take place in the context of EU competition policy.

- Relevant Directives include that on the internal electricity market (96/92/EC). This Directive complements the Acquis Communautaire on state aid (see below) and aims to remove any (national) measures that may impair the development of competition. This has been updated and expanded via Directives on the liberalisation of electricity and gas markets (directives 2003/54/EC and 2003/55/EC). The EU has also recently proposed (DG TREN, 2007) a number of updates and extensions to these Directives including: COM (2007) 0528 Common rules for the

internal market in electricity; COM (2007) 0531 Cross-border exchanges in electricity; COM (2007) 0529 Common rules for the internal market in natural gas.

- The Commission monitors **state aid**³ (a form of subsidy) across MSs as part of the founding Treaties of the European Communities (Articles 87, 88, 89 of the Amsterdam Treaty as well as various other relevant provisions)⁴ to ensure that government interventions do not distort competition and intra-community trade. The EC Treaty pronounces the general prohibition of State aid; however, there are a range of policy objectives for which it may still be used (e.g. environmental objectives). The legal framework for this is regularly reviewed to improve its efficiency and to respond to the call of the European Councils for less but better targeted State aid to boost the European economy. Member States are required to notify the Commission of any state aid before these are put in place.

The Commission has a set of 'Community guidelines for state aid for environmental protection' (OJ C 37, 3.2.2001), that help regulate national subsidies. For example, the EU Directive on the promotion of electricity from renewable energy sources in the internal electricity market (2001/77/EC) makes direct references to these guidelines. These guidelines have recently been updated⁵, with the aim to ensure that "*State aid measures will result in a higher level of environmental protection than would occur without the aid and to ensure that the positive effects of the aid outweigh its negative effects in terms of distortions of competition, taking account of the polluter pays principle*". In particular, this is linked to three key pan-EU objectives on energy and the environment

- Increasing security of supply,
- Ensuring the competitiveness of European economies and the availability of affordable energy,
- Promoting environmental sustainability and combating climate change.⁷

The updated guidelines also link to the newly proposed package on climate change and energy (COM(2008)16, 17 and 19). This package is a bundle of legislative proposals aimed at realising at least a 20% reduction in emissions of greenhouse gases in 2020. It includes an improvement of the EU Emissions Trading Scheme (with a binding target of a 21% emission reduction of greenhouse gases in 2020 vs. 2005 for large sources of CO₂-emissions), targets for Member States for emissions outside the EU-ETS and targets for the use of renewable energy sources. Various forms of subsidy and other policy measure will be required to ensure that these targets are met.

There is also a variety of EU funding or subsidy schemes for research, development and demonstration, such as the Intelligent Energy Europe Programme. The Cohesion policy⁶ is also expected to play a bigger role in its current cycle 2007–2013, with co-funding of measures for renewables, energy efficiency and safe energy supply actions.

Future updates to indicator

On 3-4th July 2008, the EEA organised an EIONET workshop on energy and environment with various Member State representatives, at which the issue of energy subsidies was discussed. It appears that a

(1) http://ec.europa.eu/comm/competition/state_aid/studies_reports/studies_reports.cfm

(2) http://ec.europa.eu/comm/competition/state_aid/legislation/provisions.html

(3) <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2008:082:0001:0033:EN:PDF>

(4) http://ec.europa.eu/regional_policy/index_en.htm

significant amount of information is available in the various countries, but that this is held in different authorities (e.g. environment ministries and/or agencies, economics/finance ministries and other governmental agencies).

The member countries supported the idea of collecting information on energy subsidies in a comparable manner, through the National Focal Points. However, attention should be paid to country specific ways of dealing with energy subsidies. In Germany for instance, feed-in-tariffs for renewables are not considered a subsidy because they do not affect the public budget in any way, all the costs being borne by the market participants (including the end consumer). However, they would still need to be considered as part of the off-budget subsidies described above.

To achieve this member countries supported the proposal that EEA will prepare an updated report (to the earlier EEA, 2004 report) on energy subsidy data in member countries in 2009. They recommended that the EEA prepares a questionnaire to be sent for the purpose of collecting relevant information on energy subsidies. To avoid the issue of definitions, the questionnaire will contain a number of different categories of subsidies, including both on and off budget expenditures. It would be desirable that the categories will be chosen so that the information collected can be used for multiple reporting purposes, also taking into account experiences and recommendations from other organisations such as OECD, UNECE and Eurostat.

References

DG TREN (2007) The EU Electricity & Gas markets: third legislative package September 2007

http://ec.europa.eu/energy/electricity/package_2007/index_en.htm

EEA (2004) Energy Subsidies in the European Union: A Brief Overview, European Environment Agency

European Commission (2007) GREEN PAPER on market-based instruments for environment and related policy purposes COM(2007) 140 final and supporting staff working paper SEC (2007) 388 http://eur-lex.europa.eu/LexUriServ/site/en/com/2007/com2007_0140en01.pdf
http://ec.europa.eu/environment/enveco/pdf/sec_2007_388_en.pdf

GSI (2007) BIOFUELS - AT WHAT COST? Government support for ethanol and biodiesel in the European Union http://www.globalsubsidies.org/files/assets/Subsidies_to_biofuels_in_the_EU_final.pdf

IEA (2007) World Energy Outlook 2007 Edition, and IEA, World Energy Outlook 1999 Insights: Looking at Energy Subsidies – Getting the Prices Right, 1999.

UNFCCC (2007) ENERGY SUBSIDIES: Their Magnitude, How they Affect Energy Investment

Meta data

Technical information

1. Data source: EU Energy Subsidies 2001: Energy Subsidies in the European Union: A brief overview (2004), European Environment Agency http://reports.eea.eu.int/technical_report_2004_1/en
Energy R&D expenditure for Member States: IEA R&D database <http://www.iea.org/Textbase/stats/rd.asp>
Energy R&D expenditure at EU level: European Commission DG Enterprise and Industry
2. Description of data/Indicator definition:
Energy subsidy data in Euro 2001 Prices
R&D funding in constant Euro (2006 market prices):
General subsidies for coal under the ECSC treaty are taken from the European State Aid Scorecard (2003) and from the Commission staff working paper on energy subsidies (European Commission, 2003a). Aid to the oil and gas, and nuclear sectors is based primarily on the European Commission (2003a) and Oosterhuis (2001) Energy subsidies in the European Union reports. Renewables data on direct price support, such as quota and fixed price systems, are taken mainly from the Eurelectric (2004) A quantitative assessment of direct support schemes for renewables report, with cross-referenced information from the EREF (2002) Environmental impact of indirect subsidies and Irish Government (2003) reports. Data on renewables capital investment, taxation support and other aid to related sources is taken from European Commission (2003a) and Oosterhuis (2001). There is no agreed definition of energy subsidies among European Union (EU) Member States. The term may



include cash transfers paid directly to producers, consumers and related bodies, as well as less transparent support mechanisms, such as tax exemptions and rebates, price controls, trade restrictions, planning consent and limits on market access. It may also cover government failure to correct market imperfections, such as external costs arising from energy production or consumption. Subsidies can be classified in many ways. The most transparent way of understanding them is to identify those that appear 'on budget' and those that are 'off budget'.

On-budget subsidies are cash transfers paid directly to industrial producers, consumers and other related bodies, such as research institutes, and appear on national balance sheets as government expenditure. Grants may be given to producers, mainly to support commercialisation of technology or industry restructuring, and to consumers. On-budget subsidies also include low interest or reduced-rate loans, administered by government or directly by banks with state interest rate subsidy.

Off-budget subsidies are typically transfers to energy producers and consumers that do not appear on national accounts as government expenditure. They may include tax exemptions, credits, deferrals, rebates and other forms of preferential tax treatment. They also may include market access restrictions, regulatory support mechanisms such as feed-in tariffs, border measures, external costs, preferential planning consent and access to natural resources. Quantifying off-budget subsidies is complex, in some cases impossible. It often requires that the benefit be calculated on the basis of differential treatment between competing fuels, or between the energy sector and other areas of the economy.

Research and development subsidies paid by Member States to all fuel sources are taken from the IEA R&D database (2008), while those paid by the European Community are taken from European Commission (2003a) and Oosterhuis (2001). Fuel taxation exemptions/differentials represent an updated version of the Oosterhuis report and are calculated using IEA (2003b) energy prices and tax data, and consumption/production figures using Eurostat 2001 data. Data on preferential tax treatment for medium and large users of gas and electricity is taken from Van Beers et al (2002); Electricity consumption subsidies represent updated versions of the Oosterhuis report using more recent taxation and consumption data, and are allocated to individual fuels on the basis of Eurostat 2001 data on primary energy inputs in the generating mix.

3. Geographical coverage: EU-15
4. Temporal coverage: Total energy subsidies given for 2001. R&D data comparison of 1995 and 2005. Where 2005 MS data is not available the most recent figures available have been assumed: Czech Republic, Netherlands = 2003, Greece = 2002, Luxembourg = 2000, Belgium = 1999.
5. Methodology and frequency of data collection:
IEA data collected annually. No regular comprehensive survey of total energy subsidies is available. Data presented is a review and synthesis of available data undertaken in 2005.
6. Methodology of data manipulation:
Data in constant Euro (2006) prices. N.B - For comparison Euro 2006 current prices can be converted to constant Euro 1995 prices by multiplying by 0.78 and Euro 2005 prices by multiplying by 0.97.
Share of individual technologies/fuels as a percentage of total.
Subsidies to electricity production and consumption allocated to primary fuels on the basis of share of inputs to generation, from Eurostat 2001 data on primary energy inputs to the generating mix.

Qualitative information

7. Strengths and weaknesses (at data level): see point 2 regarding the lack of a common definition of subsidies.
8. Reliability, accuracy, robustness, uncertainty (at data level):
The primary area of uncertainty lies in the fact that there is no agreed definition of subsidies between Member States as described above, meaning that the calculation of EU-wide subsidies for this indicator can be classed as 'indicative' only. The use of on and off-budget subsidies has been used to separate out the more certain 'on-budget' figures compared to the far more uncertain 'off-budget' subsidies. However, as indicated in Figure 2 'on-budget' subsidies account for less than a third of the estimated total.
9. Overall scoring – historical data (1 = no major problems, 3 = major reservations):
Relevance: 1
Accuracy: 3
Comparability over time: 3
Comparability over space: 2