Subsidy reform – moving towards sustainability

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1 Methodological issues and general considerations

1.1 Definition of subsidies

As explained by Oosterhuis (2001), subsidies have been introduced for a variety of reasons, and there is no 'objective' definition of what constitutes a subsidy and what should be the goals and limits of subsidization. The methodology used in subsidy analyses differs depending mainly on

- the underlying subsidy concept (narrow vs. broad definition),
- the data base used for quantifications (well-known data - e.g. official IEA data like the study by Oosterhuis (2001) or well-known external costs – vs. including further knowledge),
- the focus of analysis (e.g. energy sources, company types or branches), and
- the scope of impacts analyzed (recipients who directly benefit from a subsidy vs. recipients who directly or indirectly benefit; economic, social or environmental impacts, e.g. impacts of tax subsidies on energy efficiency).

Subsidies in a narrow sense are budgetary subsidies, i.e. direct, on-budget monetary support (e.g. grants or payments to market actors), which is a visible expenditure in government accounts. The broad, problem oriented subsidy concept defines subsidies as all measures that have the effect of altering price ratios or that reduce costs for the subsidy recipient (cf. van Beers/de Moor 2001). The government receives no equivalent compensation in return for this economic assistance, but conditions the assistance on a particular performance by the recipient, thereby influencing the related economic behaviour. Table 1 shows the variety of public support. While subsidies are usually defined as arising from active government intervention, Table 1 also includes implicit support which refers to a lack of government policy, e.g. to the non-internalization of external costs.

Because of the variety of subsidy concepts, instead of just calculating the total of subsidies in the energy sector based on a specific, rather narrow definition and only referring to the other kinds of public support at the beginning and end of the study (Oosterhuis 2001), it would be more appropriate to discuss the whole range of subsidization systematically (cf., e.g., INESTENE 1999).

Table 1 Classification of public support

Subsidy concept	Subsidy type	Example
	On-budget subsidies	
narrow	Budgetary subsidies	Direct subsidies to consumers or producers, e.g. grants, deficiency payments, sales premiums
	Tax subsidies	Support through tax policies, e.g. tax credits, tax exemptions, tax deductions, tax relief, preferential tax treatment, e.g. accelerated depreciation allowances (if selective)
	Public provision below cost	Provision of infrustructure and complementary services below long run marginal cost, Research and Development expenditures
	Capital Cost subsidies	Preferential loans, debt write-off, liability guarantees (if drawn on)
	Off-budget subsidies[a]	
	Capital Cost subsidies	Liability guarantees, low rate of return requirements
	Support to other factor inputs	Royalty concessions
	Subsidies through the market mechanism	a) domestic-oriented, e.g. price regulation, quantity controls, market access restrictions, procurement policies (e.g. government brokered sales contracts)
		b) trade-oriented, e.g. import and export tariffs, non-tariff barriers (e.g. quantitative import controls)
broad	Departure from the principle of causation (”Polluter Pays Principle”)	Exemptions from environmental standards, liability limits, allowing insufficient provision for future liabilities

a. The off-budget forms of support may have second order effects on the budget. Off-budget support measures are also often part of larger integrated support policies, and so are often accompanied by other support policies which do have direct budgetary effects. Moreover, off-budget subsidies also impose costs to society as a whole but these implicit costs are typically concealed.

Sources: Adapted from van Beers/de Moor (2001, 5) and OECD (1998, 7).

1.2 The problem of monetizing external costs

External costs are implicit subsidies. However, there is no ‘objective’ method how to calculate external costs. Calculations differ depending mainly on

- the estimation and interpretation of probabilities and the size of possible damages,
- the monetary valuation of a statistical human life or of a year of human life lost, and
- the use and magnitude of a discount rate.

This is why, for example, calculations of external costs of a nuclear accident (worst case scenario) in Germany differ between 0.0003 and 0.022 EUR/kWh (Lechtenböhmer 1999). Instead of applying the concept of external costs, another reference point could be taken to systematize implicit subsidies: the principle of causation (”Polluter Pays Principle”). In

this way, the problem of monetizing external costs recedes into the background. On the contrary, the new priority for policy is to decide upon common goals and standards to avoid external costs and to find out in how far the market actors causing a damage or risk could be held responsible.

1.3 Problem oriented analysis - Subsidization and sustainable energy paths

There is an international consensus that the development of the energy sector – like other kinds of economic activity – should be oriented towards sustainability. In order to meet sustainable development goals, European policy has to set clear, consistent and harmonized rules and targets to the Member States, but leave them as much freedom as possible on how to achieve the targets in co-operation with their industries. Useful combinations of integrated policy mechanisms are needed on the European, the national and the local level, which create a supportive framework enabling energy companies and energy service companies to follow a sustainable energy path. Subsidies in a narrow sense can be one of the policy mechanisms. However, subsidization should follow clear and transparent rules to minimize unwanted side effects. Most important, an evaluation of existing and planned subsidies is needed to find out what role they play in the whole policy-mix, and in how far these policy measures contribute to a more sustainable development.

Besides analyzing in how far subsidies contribute to sustainable development, it has to be evaluated in every specific case

- if subsidies are the right instrument to achieve the harmonized sustainable development targets (most public subsidies – particularly implicit off-budget subsidies – are ineffective in serving their purpose or are even counterproductive), and
- how effective and efficient they are in pursuing the sustainability objectives (many subsidies are economically inefficient and attain their objective only at a high cost).

The decisive question is not, which primary, secondary or end-use energy sources get subsidised, but if these subsidies are appropriate in achieving sustainability objectives.

Subsidies should only be allowed if they are ‘profitable’ from a social point of view, i.e. if the benefit from contributing to sustainable development objectives (e.g. ‘measured’ according to specific sustainability indicators) exceeds the costs. In some cases, explicit or implicit subsidies can function as an important instrument within market transformation programmes, accelerating urgently needed steps to a more sustainable development of the energy sector, finally achieving – often quantifiable – benefits (e.g. increased tax receipts, reduction of unemployment and environmental damage) which exceed their costs.

1.4 Market actors oriented analysis – Which companies benefit most?

The analysis by Oosterhuis (2001) shows that the total amount of subsidy that the EU and its Member States give to renewable energy is substantially lower than the amount of subsidy to fossil fuels, and probably in the same order of magnitude of the subsidies to nuclear alone. However, the study has not yet analysed which market actors have received the subsidies, i.e. which companies or company types are the direct or indirect recipients. It is supposed that especially the big electricity and gas utilities have been benefiting from explicit and implicit subsidies in the energy sector, which in turn has reduced the prospects of small and medium utilities and of new entrants to the liberalized market, thereby increasing market concentration.

1.5 Inconsistencies and insufficiencies of the survey part about the accession countries

As mentioned by Oosterhuis (2001, 60) himself, the information about energy subsidies in the accession countries in his study is incomplete. Furthermore, the description suffers from some inconsistencies. Therefore, it is recommended to leave out this part of the survey in the final publication or to add more comprehensive research.

1.6 Interdependent markets – Widening the focus of analysis

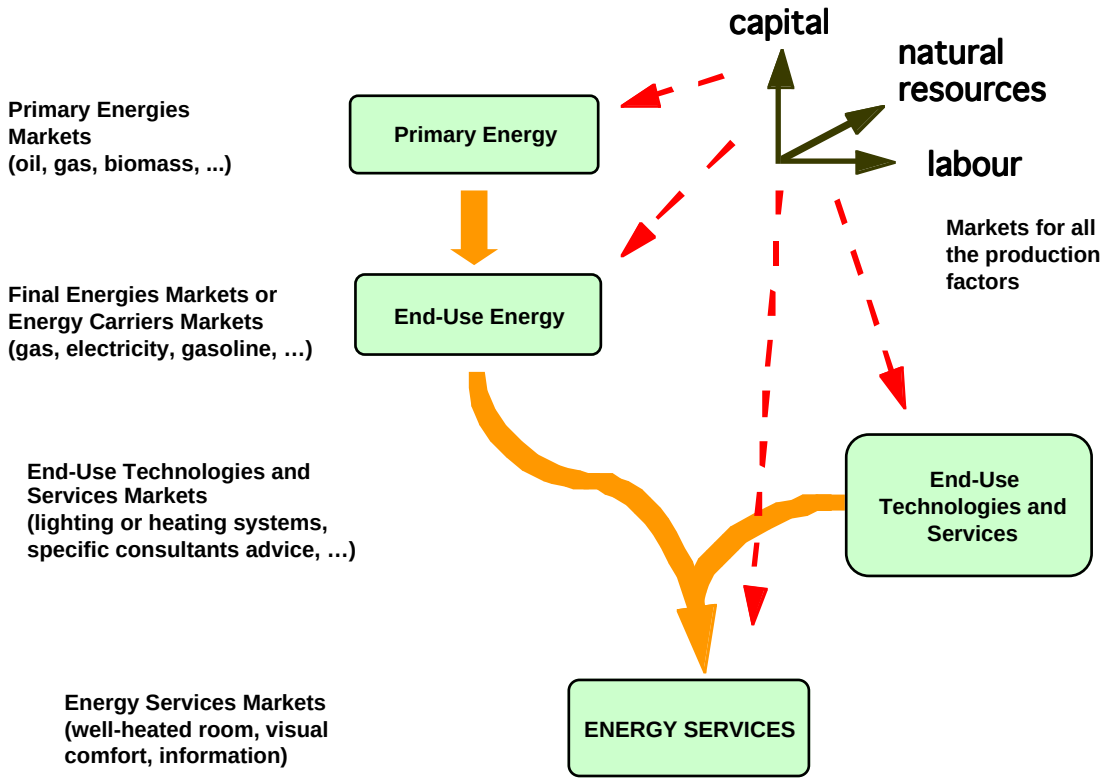
Finally, to analyse competition and subsidies in the energy sector, it is necessary to bear in mind that energy is not the final product, but only an intermediate product. Final consumers in industry, the private and public service, and the residential sector do not benefit from end-use energy directly, e.g. from gas or electricity, but from energy services, e.g. properly lit and heated rooms, ”hot pizza and cold beer”.

Therefore, it is not sufficient to limit the analysis to only a part of the market by stopping at end-use energy. Only the optimization over all stages of the production process of (physical) energy services leads to efficient allocation, i.e. to a least-cost provision of energy services. Thus, when analysing subsidies in the energy sector, an integrated consideration of public support to specific inputs, processes or outputs of the markets for

- the basic factors of production,
- primary, secondary and end-use energy,
- energy efficiency technologies and services which are used to transform end use energy into energy services, and
- energy services themselves

is needed, paying attention to the interdependence of the markets (Figure 1).

Figure 1 The final product: energy services, provided by interdependent markets



Source: Wuppertal Institute, et al. (2000, 7).

2 Explicit and implicit subsidization of nuclear energy

2.1 Subsidization of all stages of the nuclear fuel process

The nuclear power plant operators have been considerably benefiting from past and present, explicit and implicit subsidies to all stages of the nuclear fuel process. Moreover, there would be no commercial use of nuclear power without implicit subsidization.

The most important past or present, national or European public support measures having an impact on one or more steps of the nuclear fuel process (uranium mining, milling and transformation, conversion/enrichment, fuel fabrication, power generation, intermediate storage, transport, reprocessing, conditioning and final disposal) are the following:

- R&D funding
- Preferential loans and credit guarantees
- Subsidies to cover stranded investments (e.g. the Fossil Fuel Levy in the United Kingdom until 1996)

- Unfunded decommissioning liabilities (stranded costs, e.g. the THTR in Germany)
- Liability limits
- Insufficient implementation of existing safety regulations
- Access to the funds for decommissioning and waste management
- Provision of infrastructure and complementary services (e.g. roads, police and military forces to protect plants and transport)
- State-owned companies: low rate of return requirements, oversized R&D expenditures, investments in nuclear power plants at times of overcapacity to protect national manufacturers, contracts for reprocessing with a national reprocessing unit although the reprocessing costs are significantly higher than the costs of direct final disposal (cf. Wuppertal Institute/Öko-Institut 2000, Charpin/Dessus/Pellat 2000), debt restructuring.

In the following, two of these support measures will be discussed in more detail, the limitation of liabilities and the access to the decommissioning and waste management funds.

2.2 Limited liabilities

In general, companies are fully liable for damages they cause. Therefore, a solar power plant operator usually effects a third-party insurance. For example, for a 43 kW photovoltaic system on a roof of a school, the insurance might cover third-party damages up to 2.5 Million EUR for which the operator has to pay a yearly premium of about 70 EUR. However, damages caused by nuclear energy are usually excluded from such a contract. The risks associated with the use of nuclear energy (accidents, 'regular' operation, waste impacts, transport, proliferation, terrorism) are socialized because the producers are not fully liable for the damage and risks caused by their activities (cf. Oosterhuis 2001, 10, for international conventions limiting the liabilities; furthermore, there are different national liability limits).

Ewers and Rennings (1992) estimated the total damage of a reactor meltdown in Germany at 5,469 billion EUR. Given a probability of 1 meltdown per 33,000 reactor years and 0% discount rate, this leads to external costs of 0.022 EUR/kWh. Oosterhuis (2000, 10f.) has explained that – when applying this figure to the EU as a whole – total external costs from nuclear accident risks for the EU add up to an implicit subsidy of almost 20 billion EUR per year, and that including external costs of other parts of the nuclear fuel process would imply still higher figures.

However, the decisive question is not: "How much are the uninternalized external costs per kWh?", but: "Is European society (the politicians, present and future generations) willing to bear the risk of a reactor meltdown which might lead to a total damage of 5,469 billion EUR and to an unimaginable human tragedy?".

Oosterhuis (2001, 11) has suggested to launch a study to answer the following question: ”If energy producers and users were fully liable for the damage and risks caused by their activities, and if this liability had to be (and could be) covered by insurance, how much would the insurance premium be?”.

With respect to the nuclear accident risks in Germany, this question can be answered as follows:

1. There will be no private insurance company covering the full potential damage caused by a reactor meltdown. If the damage occurred (which might happen just the day after having signed the contract), the insurance company would go bankrupt.

2. In the fictitious case that an insurance company could be found which insures such a high risk, the insurance premiums would cost between 0.215 EUR/kWh (Lüttke 1996) and ca. 0.5 EUR/kWh (Sauer 1991) depending on the assumptions made.

3. A risk fund, accumulated within 20 years of nuclear power plant operation to cover a potential damage of 5,113 billion EUR, would cost about 1.84 EUR/kWh (Moths 1992).

Therefore, without the limitation of liabilities (i.e. without this kind of implicit subsidy), there would be no commercial use of nuclear power.

2.3 Decommissioning and waste management funds

There are significant differences in the operation and accessibility of decommissioning and waste management funds in Europe. The diverging standards for these funds have already been mentioned in the Second Report by the European Commission (1999) to the Council and the European Parliament on Harmonization Requirements as an important reason for substantial market distortions (cf. also European Commission 1998). According to Hensing et al. (1997) these differences explain a significant part of the power price differences between France and Germany. The funds differ according to:

- The technical methodology of dismantling and/or storage of waste (differences depending mainly on the geological situation and the safety concept, i.e. the degree of risks borne by present and future generations)

- The methodology of estimating the respective costs (value of liabilities)

- The accounting method of setting up the accruals (time of starting and ending the accumulation, setting up the accruals in regular instalments or according to the burn-up, discount rate used to assess the level of original funds required – e.g. what interest rate will be assumed for the fund from the time of starting the collection to the time of having collected the provisions fully)(cf. Wuppertal Institute/Öko-Institut 2000)

- The accessibility of the utility to the funds concerned (during the time from starting the collection to its use – during dismantling of the facility, transport, reprocessing, intermediate storage, conditioning and/or final disposal).

The value of the decommissioning and waste management funds is huge – e.g. in France about 5.8 billion Euro for decommissioning only in 1997 (Holberton/Buchan 1997), in Germany about 30 billion Euro at the end of the year 2000 for decommissioning and waste management, probably decreasing during the last year and the next years, then increasing to an estimated 43 billion Euro in 2018, finally decreasing to 0 Euro in 2064, i.e. when the funds will be used up for their original purpose (Wuppertal Institute/Öko-Institut 2000). Access to the funds during these decades can have a significant impact upon the economic performance of the utilities. It is a key factor in both the attractiveness of a utility to outside investors and the opportunity of a nuclear utility to expand. Across the EU this varies significantly (cf., e.g., OECD NEA 1996):

- Funds set aside are at the disposal of the utility, e.g. in France and Germany. The provisions for accruals are part of the cash flow and reduce the utilities' costs of financing other activities in the energy sector and in other branches (Kroll 1990, Irrek 1996, Bürger 1998).

- Some utilities have separate funds, but can still access them for acquisitions, e.g. utilities in Finland.

- In other instances, – e.g. in Spain – access by the utility to the funds appears to be limited or non-existent.

It must be noted that not all of the investments made by the utilities using decommissioning and waste management funds are successful (e.g. some investments of German utilities in the telecommunication and in the IT sector, and probably some investments of EDF in Latin America). Without referring to the Enron case, it can be stated that nobody knows or can guarantee that the funds at the sole disposal of a utility will still be there in a few decades when the money has to be used for its original purpose.

In Germany, access to the huge funds is not the only advantage of the nuclear power plant operators. Accumulating the provisions reduces the taxes due. According to Meyer (2001) these tax reductions add up to more than 800 million EUR. The European Commission investigated if the rules in force in Germany on provisions for decommissioning and final waste disposal constituted prohibited state aid within the meaning of Article 87 (1) EC Treaty. The Commission decided that the German rules under which the nuclear power plant operators constitute such reserves do not derogate from the common system and do not form an exception to the benefit of certain undertakings, to the application of the generally applicable tax system. Thus, there is no violation of Article 87(1) EC Treaty. Some of the German municipal utilities ("Stadtwerke") which forced the European Commission to investigate this matter have now decided to bring an action against this decision.

3 Conclusions and recommendations

Analyzing explicit and implicit subsidies in the energy sector is a comprehensive, complex task which requires large-scale studies. There is no 'objective' definition of what constitutes a subsidy. And probably the biggest share of public support is implicit, and – therefore – difficult to quantify. Thus, the study by Oosterhuis (2001) in concentrating mainly on budgetary and tax subsidies only tips the top of the iceberg. However, some important aspects of implicit subsidization of nuclear power plant operators – e.g. the limitation of liabilities and the access to decommissioning and waste management funds – can yet be clearly identified. Without implicit subsidisation, there would be no commercial use of nuclear power. A subsidy reform is needed to remove such subsidies which do not contribute to a sustainable development of the energy sector at all, or which are not effective and efficient in their contribution. For further research and EU policy actions, the following is recommended:

Further research

- Problem oriented analyses of the whole range of explicit and implicit subsidies are important to find out which role the different kinds of subsidies play in the whole policy-mix, and how effective and efficient they are in contributing to a more sustainable development, thereby identifying and analyzing important implicit subsidies and their economic, environmental and social implications more clearly.
- Market actors oriented analyses of the whole range of explicit and implicit subsidies are needed to find out which companies or company types are the direct or indirect recipients, and in how far subsidization alters market concentration.
- Thirdly, it is also important to study the impact of rent-seeking on the amount of subsidies to find out in how far political positions and decisions are influenced or even dominated by the recipients.
- Finally, it is desirable to study how a subsidy reform which is oriented towards sustainability objectives could be implemented.

EU policy actions

- The transparency of existing support measures should be increased.
- International organizations should be strengthened in their role as independent observers and arbitrators.
- The existing liability limits should be raised step-by-step.
- Common environmental standards for all stages of the nuclear fuel process are important. Radioactive contamination does not stop at national borders.
- The Member States should be required to set up separate funds for decommissioning and waste management with centralized control, following, for example, the principles of the decommissioning fund in Switzerland (cf. also Irrek 1996). The International

Atomic Energy Agency (1999) and the EKRA (2000) have recommended to Switzerland to set up such a fund not only for decommissioning, but for waste management, too. The nuclear power plant operators should not receive any access to these funds. At least, the access should be strictly limited.

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