

Electricity Saving Fund

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Synopsis

Establishment of a Electricity Saving Fund financed by a per kilowatt-hour fee. The purpose is to support electricity savings in the households and public sector.

Abstract

Several analyses have shown that investments in electricity savings are more advantageous than investments in electricity production from an economical, as well as environmental, point of view.

Furthermore analyses have shown that from a socio-economic point of view one of the most advantageous initiatives to reduce electricity consumption and CO₂ emission in Denmark is conversion of electrical heating to district heating or natural gas heating.

In order to strengthen the electricity conservation effort the Danish Government passed a bill concerning establishment of an Electricity Saving Fund in December 1996.

The purpose of the fund is to support socio-economic electricity conservation initiatives in households and in the public sector. Primarily, the goal is to support substitution of electrical heating by district heating or natural gas. A minor part of the financial resources will be used for other purposes, especially regarding, development, market introduction and dissemination of efficient appliances.

The resources for the Fund will be furnished through introduction of a per kilowatt-hour fee of DKK 0.006 (ECU 0.0008), which will be levied on electricity consumption in dwellings and in the public sector and be paid by the consumers.

Under the scheme, tenders for various types of electricity conservation projects will be invited from, for instance, utility companies, district heating and natural gas companies, suppliers and manufacturers of electrical equipment who can bid for projects or submit proposals of their own.

The Fund is managed by an independent board that comprises representatives of consumers, interest groups and utilities as well as experts in energy savings and economics.

1. Introduction

The Danish Government has in December 1996 passed a new bill concerning an Electricity Saving Fund (Danish Energy Agency 1997). This paper describes the background for establishment of the Fund, the construction of the Fund and the expected results.

While the main objective of the fund, especially during the first years, is to support substitution of electrical heating this topic is emphasised.

1.1 Background

Energy savings in end-use have for several years been an important aspect of Danish energy policy along with actions to increase energy efficiency on the supply side. On the supply side emphasis has been laid on renewable energy, such as wind power, and on combined heat and power generation (CHP). Furthermore, Denmark has during the last 20 years worked purposefully towards extension of district heating and natural gas networks. The effort has resulted in that presently almost all power capacity is connected to district heating systems, and that one third of Danish power production plus almost half of the space heating are cogenerated. Also more than 80 % of energy consumption for space heating takes place in areas with collective heat supply (district heating or natural gas net).

In Denmark the CO₂ emission from power plants are very high due to the fact that approximately about 80 % of the electricity production takes place on coal fired plants. The high amount of CO₂ emission from electricity production, combined with the extended use of district and natural gas heating systems, makes conversion of electric heated building to collective heat supply very profitable (Danish Ministry of Environment and Energy 1996). Analyses have shown that from a socio-economic point of view, this is one of the most advantageous methods to reduce the CO₂ emission in Denmark (Danish Energy Agency 1994).

The Electricity Saving Fund is part of the new Danish energy action plan Energy 21. Its aim is to reduce the CO₂ emission in the energy sector and to lessen future problems with resources as consequence of the gradual exhaustion of fossil. An important part of the action programme is to reduce and make more effective the consumption of electricity fuels (Danish Ministry of Environment and Energy 1996).

So far, the electricity utilities were, jointly with the state the most important actor in electricity savings matters. For several years the utilities were involved in DSM (Demand Side Management) activities. For instance, the utilities have since the late 1980s carried out various activities to support the dissemination of compact fluorescent lamps and efficient appliances. This was, and still is a possibility due to the non profit regulation allowing utilities to recover costs for DSM programmes by adding to the electricity price (Danish Energy Agency 1996).

In order to support the process of IRP (Integrated Resource Planning) and DSM the Danish Parliament passed the IRP act in 1994. This act requires all electricity utilities to carry out DSM programmes, and to balance supply side measures - such as constructing new plants - with actions on the demand side (Danish Energy Agency 1996).

In 1996 the Danish electric utilities have concluded their first mandatory DSM and IRP-plans for the period 1995 - 2005. The plans comprise various DSM activities within the households, the public sector and the industry. It appears from the plans that the electric utilities DSM-activities in the future will mainly be concerned with campaigns, consultancy and guidance. Furthermore, it appears that the utilities, to a very small extent, will grant subsidies to promote conversion of electrical heated buildings to collective heat supply.

The end-use of electricity can be reduced substantially in all sectors i.e. the households, the public sector, the industry and the commercial sector, (Danish Energy Agency 1995). However, economic incentives in the form of taxes and subsidies are necessary to achieve the savings.

The Electricity Saving Fund is established in order to strengthen the electricity saving effort in the households and in the public sector and as a supplement to saving activities carried out by the utilities which as mentioned above, primarily are concerned with campaigns, consultancy and guidance.

A subsidy Scheme to promote energy savings in the industry is already introduced due to the green tax package of June 1995. According to this an amount of DKK 1.8 billion (ECU 240 million) is earmarked for investment grants for energy saving measures in the industry in the period 1996 - 1999 (Ministry of Finance 1995).

1.2 Scope

The objective of the Electricity Saving Fund is to promote savings in electricity consumption in dwellings and

public institutions in accordance with socio-economic and environmental considerations.

One of the most important aims of the Fund is to support substitution of electrical heating by district heat or natural gas. However, some of the financial resources will be used for other purposes especially regarding development, market introduction and dissemination of efficient appliances and equipment.

The initiative to convert electric heating to district heating and gas distribution areas is expected to produce considerable electricity conservation and a positive effect to the environment, especially with respect to reduction of emission of CO₂. Furthermore, the subsidies for effective and lasting electricity savings will reduce the need for establishment of new power plants and hence the electricity sector's expenditures for building new plants. In the long run the total bill that electricity consumers have to pay will be lowered.

2. Description of the Electricity Saving Fund

The Electricity Saving Fund Bill introduces subsidies for electricity savings in dwellings and in public institutions. It requires establishment of a special fund, that is to manage the subsidy resources.

2.1 Financing of the Fund.

For 1997 the Danish state allocates DDK 50 million (about ECU 7 million) to the Electricity Saving Fund. In 1998, and thereafter, the Fund will be financed by introduction of a per kilowatt-hour fee of DKK 0.006. The fee will be levied on electricity consumption in dwellings and in the public sector and be paid by the consumers. Totally, this will amount to about DKK 90 million (about ECU 12 million) per year. The funds will be returned to consumers in form of financial incentives for energy efficiency investments as described below.

A new study on electrical efficiency in the EU calls for such initiatives in order to avoid large unnecessary expenditures for electricity services - to be paid by the consumers - over the next two to three decades (IPSEP 1996). The per kilowatt-hour fee should be set at 5 percent of total sales, according to this study.

The fee introduced in Denmark amounts to about 2 % of the electricity production price. However, further resources are allocated to demand side management activities according to the IRP act.

2.2 Management of the Electricity Saving Fund.

The electricity Saving Fund is managed by a board that comprises a chairman and 8 other members appointed by the Minister for Environment and Energy. The board represent the necessary expertise and the interests affected i.e. utility companies, other commercial companies, consumers, municipalities and environmental and energy organisations. The chairman and 2 members are independent of other interests represented on the board and those members ought to be experts in energy saving matters and economics.

The board is responsible for establishment of an independent secretariat to ensure that the fund can function independently within its defined framework

The board shall administer the subsidy resources in accordance with the priorities and goals of Danish energy policy. The Minister of environment and energy may provide regulations with regard to the activities for which subsidies may be granted. The board shall every year draw up an action programme, containing an actual plan for the activities of the following year and perspectives for a 3 years period.

The activities of the Fund will otherwise be evaluated regularly.

2.3 Granting Subsidies

The objective of the Electricity Saving Fund is to promote savings in electricity consumption in dwellings and

public institutions in accordance with socio-economic and environmental considerations, so that the resources granted shall achieve the greatest possible environmental effect.

Grants can be made for installation of central heating plants in electrical heated buildings situated in areas designated for collective heat supply (i.e. district heating and natural gas) and for development, marketing, procurement and utilisation of electricity saving appliances and equipment. Initially the main part of grants will be used for substitution of electrical heating. Subsidies for installation work in buildings are to be given, after application, to the owner of the building.

Socio-economic analyses have shown that a large potential exists for making reduction of the CO₂ emission in the households and the public sectors profitable to society, in particular if electrical heated buildings are converted to collective heat supply. This possibility, however, is not adequately utilised, especially due to private economic obstacles. Thus, it is a necessity to offer subsidies to building owners in order to make conversion of electrical heating profitable for them, like it is to society.

Furthermore, technical and economical analyses have shown that there is a great potential for saving electricity in the housing sector with energy efficient refrigerators and freezers, washing machines, dishwashers and tumble dryers, TV- and video sets and in lighting (compact fluorescent lamps). In the public sector considerable savings can be achieved with lighting, ventilation, large scale kitchens and office equipment (printers, copiers etc.). (Danish Energy Agency 1995)

The subsidies are to create a commercially sustainable market for low energy appliances and equipment. Subsidies may be granted in respect of product development and marketing of the most energy efficient appliance, and to initiatives that ensure potential users actually acquiring efficient appliances. In this context subsidies may be granted for purchase of particularly energy efficient equipment.

2.4 Competition over Price and Quality.

As a matter of principle, the Electricity Saving Fund shall make such electricity saving tasks as it grants subsidies to the object of invitations to tender to supply enterprises and other qualified bidders. The aim of inviting tenders is to a variety of actors the possibility of engaging in electricity-saving activities and give the possibility to compete over price and quality in electricity saving services.

When converting electrical heated buildings to collective heat supply, the relevant supply company (natural gas or district heating company) acquires an increased income basis. Therefore it is presupposed that the supply company in question offers a rebate on connection fees or the like which corresponds to the advantage they gain.

Initially, the Fund shall put out to tender the conversion of electrical heated buildings in areas where relatively large effects can be expected i.e. areas with a large number of electrical heated buildings and district heating areas with combined heat and power production (CHP) based on environmental friendly fuels (biomass, etc.).

As far as it is practicable, the administration of subsidies for conversion of electrical heated buildings shall be transferred to a coordinator, for instance a supply company, a firm of consultanting engineers or an energy office, or several of these together. The job of coordinator shall be put out for a competitive tender. The coordinator shall administer subsidies for individual recipients and enter into agreements about installation work, etc. This way a simplified administration can be achieved, and it will be possible for the work to be done in an economic and efficient manner through main contracts, rebates, etc.

It is expected that the tendering procedures will reduce the total costs for conversion of electric heated buildings.

In evaluating bids, the Fund shall emphasise which of the bids are economically most advantageous in socio-economic and environmental terms.

2.5 Substitution of Electrical Heating.

The use of electricity to produce low temperature heat for room heating is a very wasteful use of a high quality energy source. If the electricity mainly is produced on coal fired power plants like in Denmark it also leads to high amounts of CO₂ emissions, compared to CHP or natural gas heating.

In Denmark about 150.000 buildings are electrical heated (exc. summer cottages). This corresponds to the fact that about 10 % of all heated building are electrical heated. The electrical heating covers 5-6 % of the total energy consumption for space heating and about 6 % of the total electricity consumption in Denmark. About 2/3 or 95.000 of the electrical heated buildings are situated in areas with collective heating (Danish Energy Agency 1994).

In Denmark substitution of electrical heating has been discussed for several years, and a number of actions have been carried out to avoid an increase in the number of electrical heated buildings.

In 1979 the Danish government adopted a bill which made it possible for municipalities to prohibit electrical heating of new houses - with the exception of super insulated houses - in areas with collective heat supply (district heating or natural gas). In 1989 the prohibition was made mandatory and furthermore it was banned to install electrical heat in the existing building stock in 1994. According to these actions a considerable decrease in the number of new houses with electrical heat took place.

In 1995 the state established a subsidy scheme for conversion of electrically-heated dwellings and institutions outside areas supplied with collective heat. In addition, electrical heated dwellings built before 1950 in areas with CHP, may be granted subsidies for conversion to district heating. A large number of electrical heated dwellings and institutions, however, that were built in the 1970's and the early 1980's, are situated in collective supplied areas. Until establishment of the Electricity Saving Fund no subsidy scheme exists for these buildings.

Analyses of the socio-economic costs of conversion of electrical heated buildings to district heating or natural gas heating have shown that the socio-economic costs are low for buildings with a high consumption of electric heat, and higher for buildings with a lower consumption. For buildings with a high consumption of electrical heating the socio-economic costs can even be negative, which means that there will be a socio-economic income in connection with reduction of the CO₂ emission.

Table 2-1 shows the electricity saving potential and the socio-economic cost for reducing the CO₂ emission with 1 ton if all electrical heated buildings, of which the socio-economic costs are below DKK 300 per ton CO₂, are converted to district heating or natural gas heating (a number of 50.000 buildings). The average cost is estimated to DKK 25 per ton CO₂ saved, (DKK 100 per ton CO₂ in areas with natural gas and DKK -50 per ton in areas with district heating), which is much cheaper than initiatives on the supply side. The calculations are carried out under a set of assumptions regarding socio-economic fuel prices, alternative costs for reducing the CO₂ emission, etc. (Danish Energy Agency 1994).

Table 2-1. Results of socio-economic analyses for households and public institutions

Socio-economic potential for converting of electrical heated buildings (dwellings and public institutions) to district heat or natural gas heat.	
Number of buildings converted	50.000
Electricity Savings	800 GWh/year
Saved power plant capacity	200 MW _{e1}
Reduction of CO ₂ emission	0.55 mill ton/year
Socio-economic cost per ton CO ₂ reduction	25 DKK per ton

4. Expected Results

It is expected that the Electricity Saving Fund within a 10 years period will have granted subsidies to conversion of about 50.000 electrical heated buildings. Conversion of 50.000 buildings will reduce the electricity consumption by 800 GWh annually and the CO₂ emission by about 0.55 mil. ton per year. The accumulated savings in a 10 year period will be 3-4 TWh.

Regarding appliances it is expected that the Fund will contribute to increasing market shares of the most energy efficient appliances on the market, and to development of even more efficient products.

Furthermore, it is expected that the subsidies will reduce the need for establishment of new power plants and hence the electricity sector's need for building new plants. In the long run the consumer's total electricity bill will be lowered.

Finally, it may be regarded as positive that possibilities are created for more competition over saving electricity. This is expected to reinforce activities in the area and to create more actors as well as transparency to price and quality.

5. Conclusions

The Electricity Saving Fund has been established, recently. Thus, so far no experiences or results regarding operation of the Fund and implementation of projects exist.

The Fund will be a new actor in the field of electricity savings and it is expected that the new institution will contribute to generation of more competition to price and quality of energy efficient technologies and energy services. The activities carried out by the Fund are intended as supplements to the electricity sector's conservation initiatives.

The Fund will be financed by a kilo-watt-hour fee, and the funds will be returned to consumers in form of financial incentives for electricity saving efficiency investments.

In the first years a special topic will be financial support of the switch from electric heating to district heating and natural gas. This matter has been discussed for several years. Establishment of the fund ensures that all electric heating consumers in Denmark can obtain financial support to convert.

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