

THE DANISH EXPERIENCE WITH EFFICIENCY IMPROVEMENT IN INDUSTRIAL AND COMMERCIAL SECTORS

Mette Dybkjær Hansen

Denmark

The Danish Energy Agency

***Abstract:** In 1996, the Danish Green Tax Package was put into force. The main purpose of the package was to reduce emissions of CO₂ from the industrial and commercial sectors. To cope with the problem of distorting the competitiveness of the most energy intensive companies due to energy taxation, the additional tax revenue attained from the package is retransferred to the sectors affected by the tax. Entering into a binding agreement on energy efficiency constitutes one of the channels through which the tax revenue is retransferred, as the compliance with the agreement entitles the most energy intensive companies to a CO₂-tax reduction. The green tax package was evaluated in 1998/99 and it was concluded that the positive environmental impacts that the elements of the package contribute with are achieved economic efficiently. However, the evaluation pointed at elements of the package that could be improved. As a consequence, the scheme on agreements was adjusted to reduce the cost of entering into an agreement and to reduce the administrative costs of the agreements without reducing the environmental impact. The first reports on the results of the agreements indicate that the ambitious energy management systems and the special examinations of the core processes, which enters in the new agreement scheme, constitute an expedient means of improving the degree of energy efficiency within industry.*

Background

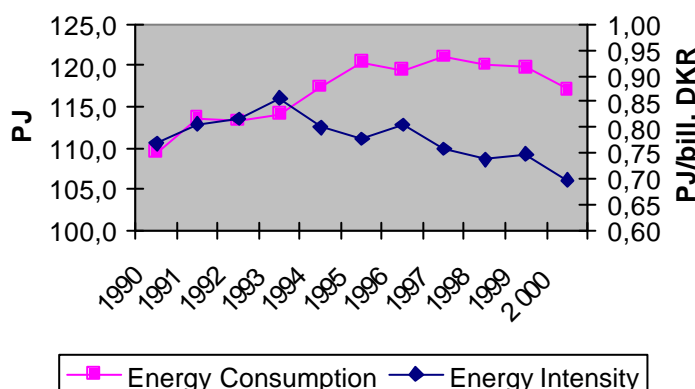
In 1994 an inter-ministerial committee found that it was not possible to reach the Danish national target on reduction of CO₂-emission, without additional measures being taken. The most efficient means of receiving further reductions was found to be to increase taxes on energy consumption in industry and the commercial sector. On that background Denmark decided on a green tax package, which comprised as the main

elements an increased energy- and CO₂-tax and methods to retransfer the tax revenue back to industry e.g., by means of the voluntary agreements.

The green tax package was implemented in 1996 and evaluated in 1998/99 with the purpose of assessing the economic and environmental impacts of the new system of energy taxation. It was found in the evaluation that the tax system ensures a significant environmental effect in an economically efficient manner that simultaneously takes international competitiveness into consideration.

On the basis of the evaluation of the green tax package, the Danish government decided to retain the general structural contours of the tax system decided upon in 1995. It was decisive that the green tax package makes a very important contribution to the fulfillment of the national CO₂-objective and the international commitment to reduce CO₂-emissions. The environmental effects of the energy package lived up to the original expectations as it was found to contribute to reductions of CO₂-emissions by nearly 4 % in 2005 (from the level in 1988). However, the evaluation pointed out some areas where adjustments were found to be appropriate and the Danish scheme on voluntary agreements was adjusted as a consequence.

The development of total energy consumption and energy intensity within Danish industry in the period from 1990 to 2000 is illustrated below.



Total energy consumption has been nearly constant since 1996, while the economic activities within the sector were increasing. This is seen from the development in energy intensity within the industrial sector, which has decreased continuously since 1993 except from an increase in the year of 1995.

The Green Tax Package

The green tax package is designed out of consideration to the following conflicting objectives that had to be taken into account to obtain a feasible solution.

The tax burden should be high enough to have a significant impact on emissions. However, the tax burden should not be so large that the competitive positions of the companies are distorted – neither nationally nor internationally. Especially the competitiveness of energy intensive companies had to be taken under consideration. Secondly, the distribution of the tax burden should be fair but the scheme should not be too complicated to administer.

As stated above, very energy-intensive companies would have difficulties operating in the competitive international market if taxes on energy use were too high. Therefore, the agreement scheme has been developed and provides energy-intensive companies with a CO₂-tax reduction if they enter into a binding agreement with the Danish Energy Agency on energy efficiency.

The Danish Agreements on Energy Efficiency

The energy-intensive companies may enter into an agreement with the Danish Energy Agency and qualify for a lower CO₂-tax rate. The agreement system has been established to ensure that these companies operate energy efficiently, even though they are subject to a lower rate of taxation.

The content of the agreements is based on the following elements:

1. The companies are required to have implemented an energy management system following guidelines, which are defined by the Danish Energy Agency, when entering into the agreement.
2. The companies have to identify potential special examinations of their energy intensive processes. The focus of the examinations is the core processes, as the energy saving potentials are expected to be high in that part of the production. All energy efficient investment projects with an economic payback time less than 4 years, which are pointed out in the examination, have to be carried out.

3. The companies have to carry out every investment in energy efficient solutions with an economic payback time less than 4 years, which are identified in the daily work with the energy management system.

It is required that an independent body certifies the implementation of the energy management system and certifies the continuous work with the energy management system and the fulfillment of the obligation to carry out profitable investment projects before the agreement expires.

Companies, which are comprised by the agreement scheme, submit yearly reports on the progress of the agreements. The reports consist of information on total energy consumption; energy related key figures and investment activities. Furthermore, the companies report the results and conclusions of the special examinations they have undertaken to carry out as part of the agreement.

Impacts of the Adjustment of the Agreement Scheme

The environmental impact of the new agreements on energy efficiency is assumed to be unchanged compared to the former agreement scheme. Investments in energy efficient solutions are supposed to be promoted as efficiently as in the former scheme where concrete investment projects were agreed upon before signing the agreement.

Another main purpose of the adjustment is that the new agreement scheme will be simplified administratively, while the environmental effect is maintained. In the evaluation, particular attention was drawn to the fact that the administrative burden of the agreements was considerable for both the companies and for the Danish Energy Agency. It was found that the costs for the companies of entering into a new agreement and the costs of administration amounted up to 20 % of the tax rebate received due to the agreement. It was considered to be relatively high. Also, the costs of administration in the Danish Energy Agency were found to be considerable. These considerations have been subject to conceptual improvement in the new agreement scheme.

The Extent of the Agreement Scheme

At the present, approximately 300 companies have signed an agreement with the Danish Energy Agency. 220 of these agreements have been entered upon on a common basis within various sectors, which are characterized by having several companies carrying out similar processes e.g., within the greenhouses and the milk condensing industry.

The energy consumption, which is covered by agreements, represents about 60 % of total energy consumption within Danish industry.

Knowledge Gained from the First Company Reports

The following is based on the first reports on the progress of the agreements; hence it is not based on solid data. However, only these first reports are available at present, as the system has been in function for a relatively short period of time, and they do give a preliminary picture of the results of the new agreement scheme.

The Energy Management Systems

Every company that has entered into an agreement on energy efficiency has implemented an energy management system, which comprises e.g., definition of targets on future energy use, plans of action to achieve the targets and defined routines on the daily work with energy related issues in the company. The compliance of the defined procedures and daily routines are documented in the company and will be examined when the verification of the system is carried out.

The verifications have been carried out only for a very limited number of companies. Most of the verifications will be carried out midway in the duration of the agreements, that is at the end of this year and in the beginning of next year, as the systems are still relatively new – most of them have been in place for less than a year.

Special Examinations

The results of the reports on special examinations, which are carried out by the companies, may be divided into four main categories.

In the first category, the reports of the special examination points out potential projects that may be implemented at the short term and will lead to improved energy efficiency of the company. These projects are to be implemented within the duration period of the agreement. The suggested projects do all relate to the core processes of the production in question.

Some special examinations have been carried out in cooperation between several companies with similar processes. Joint examinations provides a possibility to achieve results on a more cost effective way by concentrating the examination to a few production sites, examining relatively more ambitious projects and dividing the costs. Subsequently, all the participating companies are obliged to exploit the results on their

own production sites. So far, such joint examinations have been carried out with successful results within the paper industry and milk condensing industry.

The second category comprises results that point at projects, which are not relevant to implement on the short term. However, the reports contain conclusions, which are potential on a longer term. The purpose of the examinations in this category may be e.g., to examine issues that require substantial investments or changes in the existing process. A part of the examinations are to be seen as a first step in pointing at comprehensive solutions on future development of the process in question. The knowledge gained from the special examination may at the end show out to be part of the solution when an existing process is to be changed.

Some examinations, which have been reported so far, have identified comprehensive projects with economic payback times that exceed the four-year limit where companies are obliged to carry out the investment. However, the projects have revealed other benefits than the energy related and are therefore considered relevant to examine further. Another example is an examination that has elucidated a solution that permits a future extension of the production with minimal additional use of energy.

The reports in third category conclude that the examination did not lead to projects, which are relevant to implement. The rejections are due to various causes as e.g., negligible energy saving relative to the investment costs and energy saving projects, which are prevented by demands of other national acts such as the health and safety at work act.

The fourth category contains results from examinations of a different character than the above mentioned. The special examinations in this category focus on elements such as better practice, benchmarking, etc. The results vary according to the purpose but has in all cases lead to increasing knowledge at the company level on how the energy is employed. Also, these examinations are all characterized by requiring a continuously follow-up by the company in question to ensure the progress.

As mentioned above, it is not possible to state any real conclusions yet, as the assessment above is based on a limited number of reports. However, the results discussed above indicate that the purpose of the special examinations is met. The preliminary results seem to include both identification of projects that will be carried out on the short term and identification of energy efficient solutions on the longer term.

Investment Projects

Investments in energy efficient equipment are expected to be identified as a consequence of the daily work with the energy management system and carried out according to the procedures of e.g., energy efficient design and energy efficient purchase, which are defined in the energy management systems.

In the former agreement scheme, the projects carried out related mostly to the secondary energy consumption in the companies. The focus in the present scheme is directed towards the use of energy in the core processes of the companies. As a consequence, the obligation to invest in energy efficient equipment with payback time less than four years enters as a standard element in every agreement and thus in every energy management system in the present scheme. Hence, the general investments in energy efficient equipment will be examined as part of the verification of the entire energy management system.

It is not possible at this stage to derive any conclusions on the overall investment activity within energy efficient equipment. However, the verifications of the functioning of the energy management systems in the companies will show whether the companies live up to the procedures that they have stated.

Costs of Implementation and Administration

The requirements that the companies have to live up to in the present scheme are less costly to achieve than the requirements of the former scheme. It is – in most cases - cheaper to implement the energy management scheme and have the verification carried out than it was to attain the comprehensive energy audit scheme as required in the former scheme.

Also, the demands to the company on reporting to the Danish Energy Agency are simplified relatively to the former system. The documentation of the compliance with the procedures defined in the energy management systems are to be found in the companies only and are subject to examination when the verification of the functioning of the system is carried out.

The Danish Energy Agency has sought to centralize the agreements at the overall company level for several production sites instead of negotiating agreements at production site level, which could be the case in the former agreement scheme. It implies that the number of agreements is now reduced compared to the former scheme, which in itself reduces the administrative costs of the scheme. Furthermore, a part of the

control requirements will now be carried out by a third party (the certifying body), which also eases the administration at the Danish Energy Agency.

Future development of the agreement scheme

A Danish Standard on energy management has recently been developed and will form the basis of new agreements, which are entered upon from 1 January 2002.

It will influence only on the form of the new energy management systems and not the content. The future requirements to the form of the energy management systems in the agreements are expected to ease the concatenation with existing environmental and quality management systems in the companies and are consequently expected to be a more cost-effective solution for the companies.

Finally, the Danish Energy Agency plans to have an evaluation of the present agreement scheme carried out next year. The evaluation from 1998/99 has proved useful as a tool for further development of the scheme.

References

The Danish Energy Agency. *Green Taxes for Trade and Industry – Description and Evaluation*, June 2000, <http://www.ens.dk/pub/EnergyEff/Green-tax-uk-rap.PDF>

Finansministeriet. *Evaluering af grønne afgifter og erhvervene*. February 1999 (in Danish), <http://147.29.40.164/udgivelser/publikationer/groenne/index.htm>