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Lessons Learned from Denmark

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Energy Efficiency Obligation Schemes in the EU - Lessons Learned from Denmark

By Sirid Sif Bundgaard, Kirsten Dyhr-Mikkelsen, Anders E. Larsen and Mikael Togeby*

Introduction

Improved energy efficiency is a valuable means for the European Union (EU) to improve security of supply and reduce greenhouse gas emissions in a cost-effective way thus mitigating climate change. Further, a more energy efficient economy would boost innovative technological solutions, increase competitiveness of the industry and create high quality jobs.

The 'Europe 2020' strategy adopted by the EU in 2010, confirmed the '20/20/20' targets. One of these targets is to save 20% of the Union's primary energy consumption by 2020 compared to projections made in 2007. In other words, to reduce primary energy consumption from 1,842 Mtoe to 1,474 Mtoe in 2020, i.e., a reduction of 368 Mtoe compared to projections. Recent studies have shown that the EU is not on track in reaching the 20% energy efficiency target. To ensure that the target is in fact achieved a new Energy Efficiency Directive (EED) has been adopted [1].

The Energy Efficiency Directive

The new EED is to replace the current Energy Service Directive (2006/32) and the Cogeneration Directive (2004/8). The EED introduces legally binding measures for each Member State to increase energy efficiency. Measures include the legal obligation to establish an energy efficiency obligation (EEO) or alternative policy measures in all Member States. The goal is to drive forward energy efficiency improvements in the household, business, industry and transport sectors. The EED also specifies a savings target for the EEO.

Energy Efficiency Obligation

EEOs and the related tradable white certificates have been used for years in Denmark, France, Italy and United Kingdom. From 2013, an EEO will be in place in Poland. The existing EEOs illustrate the diversity of possible designs. For example,. among the four countires the Danish EEO is the strongest in relation to energy efficiency in industry. This is in contrast to France, Italy and UK where households and the public sector dominate.

Recent analyses have generally found EEOs to be economically attractive [2,3,4], but they may not be the best solution for all Member States. A Swedish report [5] concludes that it would not be cost effective to introduce an EEO in Sweden. The report finds that an EEO will have an unfortunate overlap with the EU Emissions Trading System (EU ETS) and stresses that Sweden has no other policy objectives, such as the desire for smaller energy imports, which could support the introduction of an EEO. In order to accommodate such situations the EED allows Member States to choose an alternative approach to an EEO, however, with the same savings target. Member States are, however, subject to EU approval of such an alternative scheme.

How best to design EEOs, white certificates or other market mechanisms for energy efficiency depends on national characteristics, e.g., the savings potential, other measures being in use and the tradition and experience with energy efficiency. The requirements in the EED pose several design and implementation challenges for Member States such as:

- Ensuring that savings are as cost-effective as possible
- Minimising administrative cost
- How to realise the potential for savings in buildings
- How to effectively ensure third party access and competition, and
- Setting up a system for control, verification, documentation and sanctions.

The following presents some of the lessons learned from Denmark with regards to those challenges. In the EED it is up to each Member State to determine which energy distributors or retail energy sales companies should be obliged to achieve the savings target laid down in the EED. While the obligation must be assigned on the basis of objective and non-discriminatory criteria, the EED suggests that small energy distributors, small retail energy sales companies and small energy sectors be excluded from the EEO to avoid the disproportionate administrative burdens for the regulatory authority and obligated parties.

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The Danish EEO

Energy distribution companies have been involved in energy savings at the end-user level since the early 1990s. Traditionally, their savings effort was limited to advising their own customers. This work was formalised with the first EEO operating from 2006 onwards. The EEO was based on a voluntary agreement within a legislative framework with the distributors of electricity, natural gas, and district heating. The private heating oil companies committed to the obligation voluntarily. With the introduction of the EEO the savings effort was significantly restructured and the energy distribution companies were able to realise energy savings across the country and within all forms of energy. The change meant increased competition in providing competent advice to attract industrial customers [4].

From 2011 onwards first-year savings are weighted with a simple priority factor (with values 0.5, 1 or 1.5), which to some extent reflects the lifetime of savings, gross energy consumption associated with the realised savings cost, and expected CO_2 impact of savings – especially in regards to whether the savings are realised inside or outside the EU ETS area. Negotiation for the upcoming period (2013-2020) of the Danish EEO is still on going. The design parameters of the current Danish EEO can be seen in Table 1.

Design parameter	Denmark
Policy Objectives	To decrease total primary energy consumption by 7,6 % in 2020 compared to 2010.
Legal Authority	Voluntary agreements by obligated parties and the Danish Energy Agency within a legislative framework.
Fuel Coverage	Electricity, natural gas, district heating, and heating oil. The transport is not included.
Sector and Facility Coverage	Residential, public & private business and industry end-users.
Energy Saving Target	2.95 PJ/year for 2006-2009 (0.7% of total final consumption); 6.1 PJ/year for 2010-2012 (1.2% of total final consumption) 10.7 PJ/year for 2013-2014 and 12.2 PJ/year for 2015-2020. The target is in first year savings.
Sub-targets and Portfolio Requirements	None.
Obligated Parties	Distributors of electricity, natural gas, district heating (regulated monopolies), and heating oil.
Measurement, Verification, and Reporting	Distributors verify and report savings; can be calculated or deemed savings. Yearly random sample control.
Compliance Regime	Energy savings must be well documented and they must be verifiable by an independent party if chosen for control
Penalty	None
Performance Incentives	Yearly benchmark of savings and costs for obligated parties
Eligible Energy Savings	Distributors must engage third parties to achieve energy savings outside own distribution area or energy type except for transport
Eligible Energy Efficiency Measures	Many types, including energy audits, subsidies for efficient appliances, equipment and retrofitting; also small scale renewables
Trading of Energy Savings	Energy savings, when realised, may only be traded among obligated energy distributors
Funding	Cost recovery through tariffs

Table 1
Design Parameters of the Danish Energy Efficiency Obligation Scheme [5,6,7].

Goal Achievement

The EED stipulates that the EEO must set a cumulative end-use energy savings target by the end of 2020 "*at least equivalent to 1.5% of the annual energy sales to final customers of all energy distributors or all retail energy sales companies by volume, averaged over the most recent three-year period prior to 1 January 2013*" and permitted exemptions may not reduce this target by more than 25%. Energy used in the transport sector and industrial activities covered by the EU ETS may be partially or fully excluded from the target. The calculation of energy savings should take into account the lifetime of the savings and it is possible to count savings obtained in a given year as if instead obtained in any of the two previous or three following years. Further, savings in transformation, transmission and distribution may be included in the reported savings.

While the cumulative end-use savings target of 1.5% of annual energy sales by 2020 can seem challenging, the experiences from the scheme already operating are encouraging. So far no sector or a group of companies that have been subject to an EEO have failed to fulfil the national savings target. On the contrary, there is a tendency toward overachieving [2,3,9]. In Denmark the target has been raised several times, and the obligated parties are still over achieving. The obligation in 2006-2009 was 2-3 times higher than the savings realised under the previous system. From 2010 the obligation was doubled, and is planned to double again in 2015 (see Figure 1).

The most recent evaluation of the Danish EEO showed that in 2011 the energy companies had realised 140% of the savings required by the scheme [9]. With the increase in EEO target this would more than comply with the requirement under the EED. In light of this, the EU target appears not overly ambitious but reachable and realistic.

Energy Savings in the Production Industry

In many countries the industrial sector represents a challenge for policy makers. Many countries have been hesitating to use taxes or CO_2 quotas to motivate industry to higher energy efficiency for fear of hampering the competitiveness of the industry. Experience from the Danish suggests that EEO or similar measures may be of special relevance in such cases.

In principle, industrial projects are allowed in the Italian and French systems; however, certain requirements on monitoring and documentation prevent these savings from being realised in any sig-

nificant volume. This is not the case in Denmark. As a result of the increased obligation from 2010 onwards in the Danish scheme, there have been significantly more savings realised in industry (see Figure 2).

The instruments used are: Advice given directly by the obligated parties, advice given by consultants as a third party involved, and subsidies given per saved kWh. Savings in industry are considered attractive as they often provide significant savings in other projects and thus reduce administration costs. Furthermore, the 2012 evaluation shows that energy savings in industry under the EEO scheme are profitable, have a high net effect and can be considered a cost-effective measure [9]. The experience from Denmark is that when left to the discretion of the obligated parties the most cost-effective and dominating sector to realise savings is industry. For Member States that are considering establishing an EEO, it is thus worth considering a design that allows and encourages savings in industry.

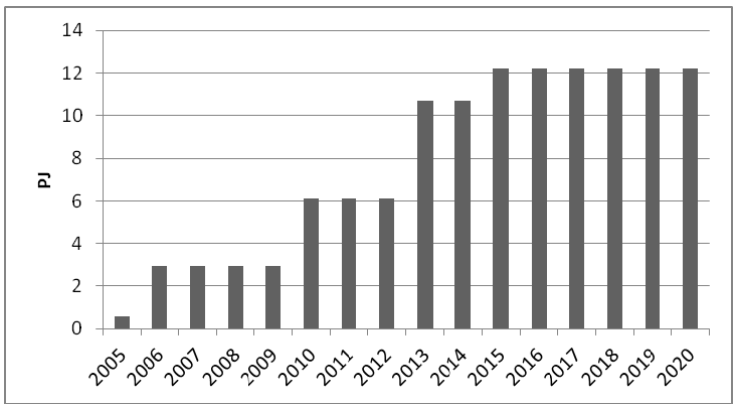

Figure 1
Development in the Danish energy efficiency obligation target. The value for 2005 (0,6 PJ) shows savings from the previous system and is estimated based on reporting from utilities [9].

There are, however, cases where subsidies have been given to projects that are highly profitable even without the subsidy and in a few cases the subsidy is greater than the investment [10]. While not actually against the rules in the Danish EEO design, it is difficult to argue that subsidies exceeding the investment are appropriate. Restriction of subsidies in regards to payback time and the proportion of investment in energy savings, might improve the societal value for the cost of the EEO [9,10].

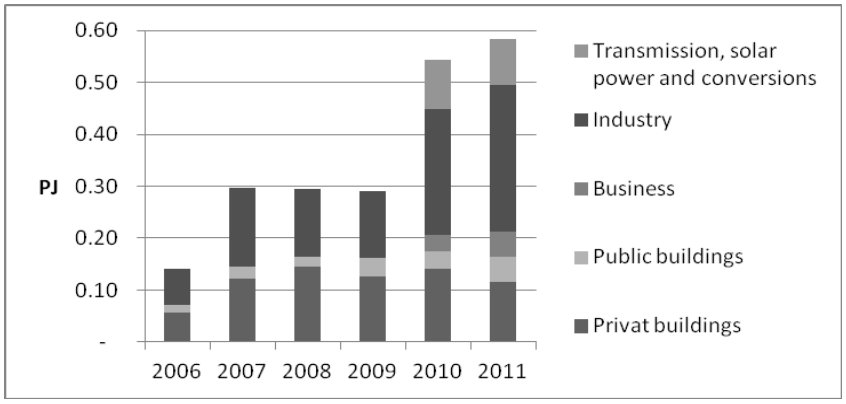

Figure 2: Reported savings in the Danish EEO 2006-2011 distributed on sectors [9]

Another issue is the question whether the EEO provides a reasonable net effect for highly profitable projects in industry, or whether these projects would have been carried out regardless. The Danish EEO takes this into account by requiring that the obligated company – or a third party – must be involved in the energy savings project *before* it is initiated. Recent studies show, however, that the current design might not be enough to ensure early involvement and consequently an acceptable contributing factor of the cost under the EEO [9,10].

Energy Savings in Public and Private Buildings

As opposed to the EEO in the United Kingdom, the Danish EEO does not have a strong focus on fuel poverty nor private buildings. On the contrary the Danish EEO has as objective to realise the set target at minimum costs, regardless of sector and energy form. While the amount of savings realised in private and public buildings has been stable, both the 2008 and 2012 independent evaluation of the Danish EEO showed a very low net effect in these sectors. The 2012 evaluation showed that only 20% of the savings in private buildings could be contributed to the measures used in the EEO as opposed to 45% in industry [9]. Thus, the subsidies or advice provided through the EEO are negligible for realising the savings compared to other determining features. One explanation for this result is that energy renovations of existing buildings are costly, both from a user perspective and a socio-economic perspective.

One of the challenges in relation to socio-economically viable energy savings in buildings is that it is expensive to improve energy efficiency in an existing, medium efficient building which means that the investment cost alone will be high [11,12]; each building has a limited energy consumption, which means that the instrument costs of, for example, obligatory energy audits at the time of sale/purchase quickly becomes too high, and that Denmark already has a very high level of taxation on energy used for heating in buildings. This gives a strong incentive to realise energy savings even without the EEO, making the savings not already realised less attractive from an economic perspective [13].

The cost of energy saving is much lower, if implemented, when the buildings are to be renovated

anyway. Therefore, focus must ensure that buildings become more energy efficient when the renovation decision is already taking place, thus advocating *energy efficient renovation* rather than *energy renovation*. But how can the general measures designed hit this particular time?

The experience from the Danish scheme is that an EEO may not be the best instrument to realise the energy savings potential in existing buildings. If the renovation is already decided, one may argue that it implicitly is difficult to achieve a high contribution factor. However, the dilemma is that the energy saving potential in existing buildings cannot be ignored if climate change and energy security objectives are to be achieved. Thus it is important to supplement the EEO with other instruments such as building standards. It can be argued that measures aimed at market transformation, i.e., impact on the entire value chain, can be effective. If suppliers and craftsmen are trained and motivated to save energy, then this knowledge would be present when buildings are being renovated [13]. Also the measures in the EED covering energy saving in public buildings – that 3% of total floor area owned and occupied by central government bodies should be renovated every year to meet minimum energy performance requirements – will address the challenge of realising energy savings in existing buildings.

Involvement of Third Parties

In the EEO design outlined in the EED, Member States may permit the obligated parties to include certified energy savings achieved by energy service providers or other third parties in their reported energy savings. The challenge for the Member States that permit this is to ensure a clear and transparent approval process open to all market participants, while minimising the costs of certification.

The Danish EEO encourages the use of third party involvement by requiring the obligated companies to include a third party in order to realise savings outside their own distribution area or energy form. As such the use of third parties is widespread. In the Danish EEO, the third party does not have to be a part of the contract chain, but may receive a payment directly from the end-user. The recent evaluation found the EEO adequate in this area and that there is a general satisfaction with the system amongst the stakeholders. This is especially true for the small stakeholders such as builders and plumbers.

Control Measures

According to the EED the energy savings achieved by each obligated party, or each sub-category of obligated party, shall be published once a year. The EED emphasises that a measurement, control and verification system must be put into place to ensure that at least a statistically significant proportion and representative sample of the energy efficiency improvement measures put in place by the obligated parties is verified. Furthermore, this verification must be conducted independently of the obligated parties.

The Danish EEO fulfils the EED requirements within the area of control, verification and documentation. Independent random sampling tests are conducted each year and independent evaluations of the EEO are carried out routinely. With regards to penalties applicable in case of non-compliance the Danish design is insufficient [10]. The only consequence of deliberate or involuntary faults or omissions discovered in the annual random sampling control is that the overall energy sector must provide extra savings the following year equivalent of the savings that were deemed faulty. As the risk of being caught is small, this system gives incentives for over reporting of savings.

The obligated parties in Denmark have monopoly status and the cost incurred as a result of their EEO activity is financed over the energy bill. Only the total costs are reported by the obligated parties and in essence the Danish Energy Agency (DEA) and the Danish Energy Regulatory Authority (DERA) do not know what the money is spent on. Nor is the energy consumer informed of how much they contribute to energy savings financed over the energy bill. The system is designed in this way in order to minimise administration cost.

Within the Danish system there is probably a certain amount of self-discipline and potential shaming effect if caught. It can, however, be argued that the system does not sufficiently encourage cost-minimisation [10] and that credibility currently rests on the generally low corruption level in the country; that the obligated party have experience in providing energy savings for end-users and, therefore, have highly skilled employees; and that the obligated parties supports and agrees with the target. If these circumstances are not in place the credibility of a cost recovery system with a minimum of control might not be appropriate.

Concluding Remarks

The Danish EEO can give inspiration as to how to design an EEO that meets the requirements and target of the EED, encourages cost-effective savings in industry, effectively includes third parties and

implements a solid verification and measurement system. With regards to cost recovery, fault in reporting and penalties, Member States should carefully consider whether the obligated parties and the society structure provides credibility for a similar design. Lastly, the Danish EEO highlights the necessity of supplementary instruments to realise the potential savings in existing buildings if public and private buildings are not the only target are of the EEO.

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