ENERGY EFFICIENCY WATCH

Energy Efficiency Policies in Europe



Case Study

The Danish Energy Efficiency Obligation Scheme

Co-funded by the Intelligent Energy Europe
Programme of the European Union

Key facts and figures

Country	Denmark
Name of policy	Energy Savings Agreement
Type of policy	Energy Efficiency Obligation Scheme
Target sector	All energy sectors (overarching EE governance framework)
Actions targeted	All actions leading to energy savings
Duration	Started in 2006, current period runs from 2012 – 2020, agreement is renegotiated every three years
Overall target and/or achievements	Target: more than 2% of total energy consumption measured as the first year savings relative to annual final energy consumption (0.287 Mtoe/yr (12PJ/yr) of first year savings each year
Overall aim of the policy	Promoting cost-effective energy savings in all end-user sectors of the economy
Innovativeness	Combination with energy audits

Policy objectives

The Danish Energy Efficiency Obligation (EEO) represents one of the most important elements of the Danish energy efficiency policy package. The overall aim of the EEO is the promotion of cost-effective energy savings in all end-user sectors of the Danish economy. A further objective is the promotion of Best Available Technologies (BAT) wherever possible (ENSPOL 2015, bigEE 2013). The policy was set up as an agreement between the Danish energy distribution companies and the public authorities (primarily the Danish Energy Agency (DEA)). It allows the targeted companies to choose freely any measure they consider most cost-effective as long as the effect of energy savings can be documented. Most common measures are advice and subsidies to realise energy savings in enterprises and households or a combination of both (ENSPOL 2015).

Prior to the agreement, the main barriers to achieving energy efficiency improvements were (i) knowledge and information barriers; (ii) economic and financial barriers; and (iii) lack of interest and motivation in energy efficiency improvement. They were addressed by a successful combination of (i) information and awareness raising campaigns; (ii) targeted advice and financial incentives to energy company customers, both enabled through (iii) making energy-efficient upgrades a legal obligation for energy network or fuel distribution companies, and (iv) allowing costs for energy efficiency upgrades to be included in the network tariffs (bigEE 2013).

Direct and indirect incentives of the policy to the targeted energy companies are of economic, reputational and environmental nature: The acceptance of the policy is increased through saved energy costs, particularly among those paying premiums on their ordinary electricity tariffs. Also, energy-efficient solutions are usually in line with a company's CSR goals, while environmental protection can be regarded as general motivation of any actor involved (bigEE 2013). The use of weighting factors for savings can be regarded as direct performance incentives to the obligated companies as they recognise the value of energy efficiency measures (IEA 2012).

The EEO was developed against the backdrop that initial energy savings policies were based on generating awareness and information. However, despite Denmark's long tradition in energy saving initiatives, only less than one third of the identified economically feasible energy savings were carried out between the 1990s and early 2000s. As a consequence, focus shifted towards directly supporting the implementation of energy savings (ENSPOL 2015). Allowing freedom of measure as well as trading savings increased the dynamics and flexibility of the EEO market (Bundgaard et al. 2013). Latest market developments are taken into account through the regular adjustment of baselines and standard values (bigEE 2013). Moreover, the policy does not restrict the technological scope allowing for innovative

technologies to be used (ENSPOL 2015). Behavioural measures are no longer eligible with the adoption of the latest revision (bigEE 2013).

Beneficiaries and action targeted

All energy end-use actors implementing cost-effective measures benefit directly. These are predominantly investor-occupiers, investor-users (appliances), investors (buildings) and users (buildings). Indirectly, a number of actors may benefit, including property development companies, engineering consultants, construction companies, and system suppliers.
The policy targets all energy distribution companies, i.e. electricity, district heating, natural gas and oil for heating. They are committed to an annual binding energy saving target (IEA 2012). All actions that aim at improving energy efficiency in buildings, appliances, industrial equipment and processes and certain actions in the transport sector are targeted. However, there are no specific energy efficiency requirements for the actions targeted (bigEE 2013). Additionality of measures are addressed by (i) increasing the activities of the energy companies, and (ii) taking steps to target the actual increase of additionality. This is done against the backdrop that the additionality of energy efficiency measures differs across the sectors: An independent evaluation in 2012 concluded that households only show low additionality as 80% of the measures would have been carried out without the EEO, while this was the case for only 45% of energy savings in businesses. Also, payback time was found to vary significantly ranging from 1 to 3 years in industry and from 5 to 20 years in households (ENSPOL 2015).

Design and implementation

The obligations have been implemented as a voluntary agreement although set within a legal framework (IEA 2012). Important steps of the design and implementation of the Danish EEO started with negotiations with the associations of targeted sectors. It was followed by a Technical Working Group defining more specific rules. The agreement of the EEO was first set up in 2006, however initially without the participation of the district heating association. Gradual improvement of the framework since 2009 finally led to the joining of the district heating association. The current version of the EEO is the Energy Savings Agreement from 13 November 2012 (ENSPOL 2015).
The responsibility for the supervision of the EEO scheme lies with the DEA, while the Danish Energy Regulatory Authority checks the costs. Denmark has a long tradition of working manuals for energy audits and technology-specific guides for energy savings calculations since the 1990s. As a consequence, electricity companies have gained experiences with and knowledge of energy saving measures. A catalogue of standard values for the calculation of energy savings and other provided guidelines ensures consistency across the companies (bigEE 2013).
The design of the policy including targets and overall framework is set by the government after agreement is reached in the Parliament. The policy is implemented by the targeted companies, which are assisted by the respective trade associations (bigEE 2013). No direct funding is provided for the implementation of the policy. Participating companies are however allowed to fund their costs through distribution network tariffs (IEA 2012), while oil companies include them in their competitive prices (bigEE 2013).

The following flow chart summarises the main elements of the Danish EEO.

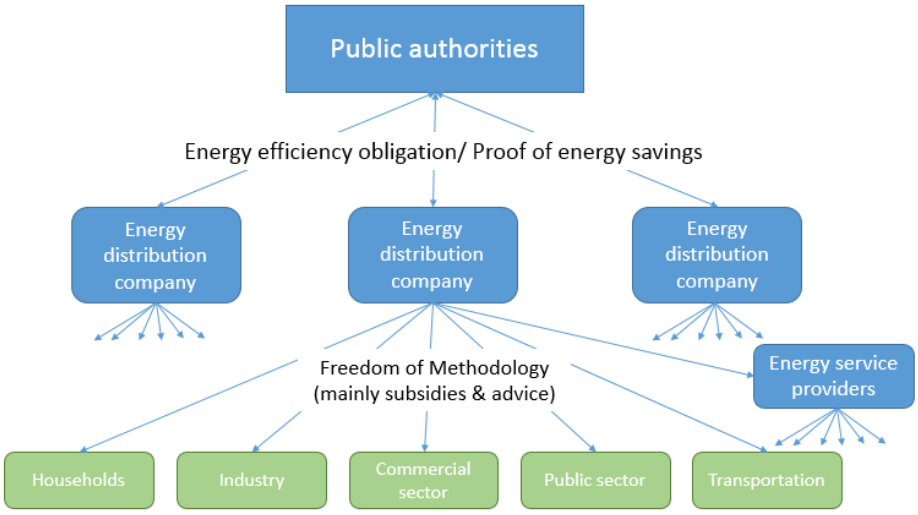


Figure 1: The Danish Energy Efficiency Obligation (Source: Fraunhofer ISI 2014)

All elements of the overall Danish energy efficiency policy package, including the EEO, are aligned to contribute to the overall political target from their respective direction. The EEO was evaluated by an independent party in 2008 and in 2012, which both provided input to the negotiations of the following agreement period (Bundgaard et al. 2013).

The quantified target of the EEO for energy savings is currently set to more than 2% of the total energy consumption measured as the first year savings relative to annual final energy consumption, including consumption in the transport sector (ENSPOL 2015). This target is equivalent to ca. 12 PJ/yr (0.287 Mtoe/yr) of first year savings, to be achieved each year of implementation of the scheme (cf. Figure 2). To calculate the savings, a simple weighting factor is applied, which reflects the savings' lifespan, the impact on primary energy consumption, and the expected CO_2 impact. Compliance is ensured through injunctions and, if necessary, through the issuance of fines: Given the case that a company refuses to be part of the agreement or does not comply with the regulations of the agreement, an injunction will be issued by the DEA. The company is then required to follow the requirements in an Executive Order. If the company does not follow the injunction, a fine can be issued by the DEA, the size of which is not predefined. Theoretically, the company's license for grid operation can be revoked. However, in practice there has never been a case of a company not following the requirements or the injunction, once having entered the agreement (ENSPOL 2015).

Some important side effects were considered during policy design: To provide due incentives for energy efficiency actions with longer lifetimes, weight factors were introduced to reflect the lifetime of saving solutions. Rebound effects were minimised by focusing on technology-specific solutions and advice. Free-riders are included in the obligation target, which is therefore set relatively high, but also the regular adjustment of baselines and standard values minimise free-rider effects (bigEE 2013).

When implementing the policy, a number of small district heating companies experienced difficulties at first in setting up schemes to meet their energy saving targets. This barrier was overcome by integrating the corresponding associations to assist the companies in meeting their targets (similarly to the other sectors) (bigEE 2013).

Policy impacts

The current monitoring system requires companies to submit annual reports on their actual energy savings to the trade associations, which then submit them to the DEA (bigEE 2013). Quality assurance is required to be implemented by the companies to ensure that energy savings are determined and

implemented in accordance with the framework. In addition, DEA conducts an annual spot check across all involved companies. An ex-post evaluation is carried out prior to each new agreement period by an independent source. Total annual energy savings per sector compared to the set annual target are depicted in the graph below (ENSPOL 2015).

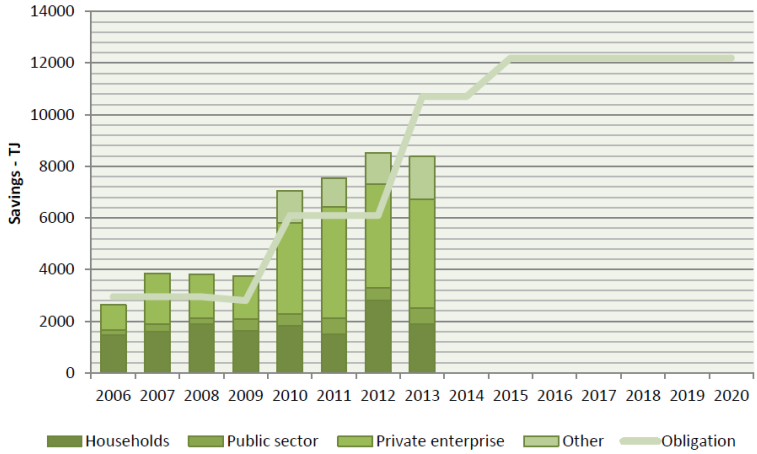
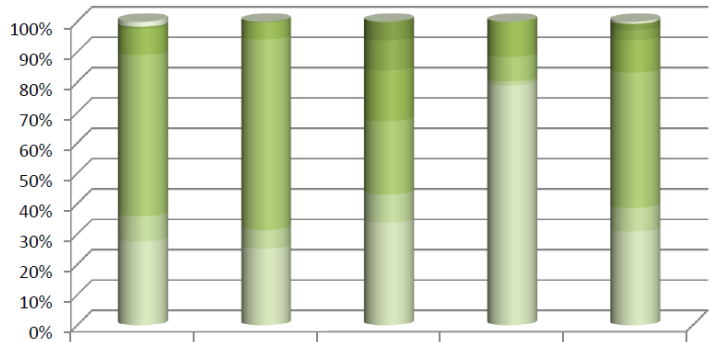


Figure 2: Total annual final energy savings per sector compared to the annual target (Source: Danish Energy Agency, taken from ENSPOL 2015)

Figure 3 demonstrates the distribution of energy savings between the sectors for each targeted party and shows that most energy savings were realised in 2013 in industry (44.42%) across all distribution companies (ENSPOL 2015).



	Electricity DSO	Gas DSO	District heating	Oil companies	All DSOs
Transportation	1.66%	0.00%	0.00%	0.00%	0.68%
Solar for DH	0.09%	0.19%	6.23%	0.00%	2.08%
Savings in grid	0.63%	0.04%	9.81%	0.00%	3.41%
Commercial sector	8.66%	5.67%	16.73%	11.63%	10.64%
Indstry	53.09%	62.98%	24.22%	8.10%	44.42%
Public sector	8.29%	6.18%	9.24%	1.23%	7.84%
Households	27.59%	25.31%	33.76%	79.04%	30.79%

Figure 3: Distribution of energy savings in 2013 between sectors for each obligated party (Source: Danish Energy Agency, taken from ENSPOL 2015)

The figure below illustrates the cost-effectiveness of selected policy measures: If a measure's ratio is under the red line, there is a socio-economic benefit of the measure. It clearly demonstrates that the EEO is among the most cost effective policy measures within the policy package in socio-economic terms at the time (2008), which was confirmed in another evaluation from 2012 (ENSPOL 2015).

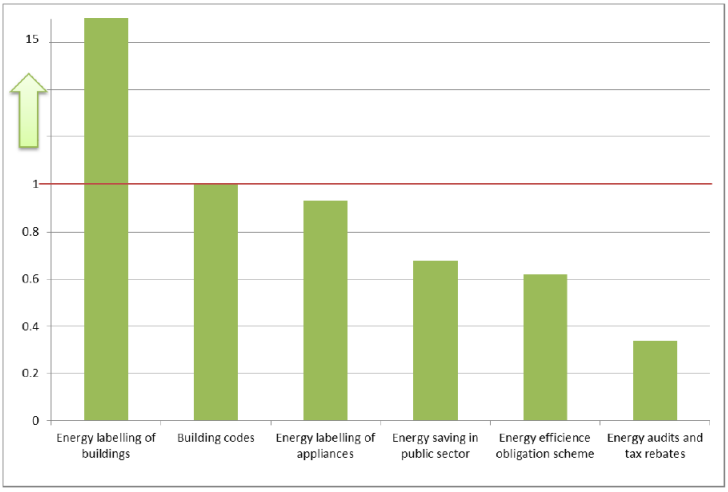


Figure 4: Ratio between socio-economic costs of energy – normalised to 1 – vs. socio-economic costs of energy saving measures (Source: EA-Analysis, taken from ENSPOL 2015)

No specific evidence was found for wider benefits, which may be largely due to the fact that energy saving measures have a long tradition in Denmark as the potential for cost saving was identified at an early stage (ENSPOL 2015).

Policy innovation

The policy is relatively unique in Europe as it sets a comparatively high level of obligation for energy distribution companies from 2013 and 2015 onwards. Targets have been adapted ambitiously over the years and are expected to do so in the future as the obligated parties are still overachieving (Bundgaard et al. 2013).

Most innovative about the Danish EEO is also that companies have the freedom to choose the measure to realise the envisioned cost-efficient energy savings. A precondition for this has been the long history of experience with energy efficiency measure implementation by Danish energy companies and regulators, as well as the high degree of trust in the municipally owned energy companies in Denmark. Furthermore, as part of the 2006 decision, first year's savings were chosen over lifetime to avoid uncertain estimations of a given project's lifetime (ENSPOL 2015). Yet, in order not to put actions with a longer lifetime to disadvantage, lifetime has been introduced in the calculation of savings through weighting factors.

Lessons learnt 1: Success factors

Denmark has a history of energy audits and providing advice to customers by energy distribution companies dating back to the 1990s (Bundgaard et al. 2013). The EEO could therefore pick up on existing methodologies for calculation of savings and standard reporting templates. The combination of setting mandatory targets for the industry at a far earlier stage than other countries and the innovative element of free choice of measures and the corresponding methodologies represents the major success factor of the EEO.

There are several further main factors contributing to the success of this policy. The EEO activated those companies that have already had regular contact with their consumers. This resulted in very low overall costs and high acceptance among the population. The latter has also been enhanced by the municipal ownership of most network companies in Denmark. Administration costs are also low as documentation procedures are relatively simple and the associations of each sector compiles all necessary information at an aggregated level (ENSPOL 2015, bigEE 2013). Cost recovery is crucial to remove economic risks, which supports the choice of energy distribution companies to be the targeted party of the policy (ENSPOL 2015). The specific successful example of the building sector demonstrates

that providing permanent consultancy results in more acceptance and confidence within the population while increasing access to financial instruments (bigEE 2013).
Overall, the clear focus on one primary goal has resulted in a well-performing system by making use of market force and freedom of methodology (ENSPOL 2015).

Lessons learnt 2: factors to avoid and possible further improvements

A few factors were identified that could be avoided if the policy was to be adopted in other countries. Regarding types of measures, additionality is found to be lower if focusing solely on subsidies than if combining subsidies with advice. Saving potential that industry and consumers know of as feasible ("acknowledged potential") might be lost as projects are chosen that are known and no new knowledge is added. If a market based scheme is applied, profit needs to be allowed at the executing level as otherwise needed energy savings will not be delivered (ENSPOL 2015).
Possible further improvements of the current policy include mainly the integration of the above mentioned acknowledged potential. This requires incentives to be balanced in the future, e.g. by (re)implementing advice, energy audits and energy management. More rules for documentation that however are not too complex would help overcome flaws in the scheme (ENSPOL 2015). Minimising or accounting for free-riders through more explicit methodology could increase confidence in the claimed savings (IEA 2012). Lastly, information on costs could be improved (bigEE 2013).

References and further information

- big EE (2013): Policy Guide. Online: http://www.bigee.net/en/policy/guide/buildings/policy_examples/42/. Retrieved 17 September 2015.
- Bundgaard, S.S.; Togeby, M.; Dyhr-Mikkelsen, K.; Sommer, T.; Kjærbye, V.H.; Larsen, A.E. (2013): Spending to save: evaluation of the energy efficiency obligation in Denmark. ECEEE Summer Study Proceedings.
- ENSPOL (2015): Energy Saving Policies and Energy Efficiency Obligation Scheme. D2.1.1: Report on existing and planned EEOs in the EU – Part I: Evaluation of existing schemes.
- Fraunhofer ISI (2014): Kosten-/Nutzen-Analyse von Instrumenten zur Realisierung von Endenergieeinsparungen in Deutschland. Ausgestaltungsoptionen und Bewertung von Instrumenten und möglicher Instrumentenkombinationen für Deutschland. Im Auftrag des Bundesministeriums für Wirtschaft und Energie (BMWi), Vergabe und fachliche Begleitung durch die Bundesstelle für Energieeffizienz (BfEE).
- IEA (2012): Best Practices in Designing and Implementing Energy Efficiency Obligation Schemes. Research Report, Task XXII of the International Energy Agency Demand Side Management Programme. Prepared by: The Regulatory Assistance Project.
- Danish National Energy Efficiency Action Plan (2014). Online: https://ec.europa.eu/energy/sites/ener/files/documents/NEEAP_2014_DK-en.pdf. Retrieved 17 September 2015.
- Low Carbon Transition Unit (2014): Energy Policy Toolkit on Energy Efficiency in Industries. Experiences from Denmark. Online: http://www.ens.dk/sites/ens.dk/files/climate-co2/low-carbon-transition-unit/danish-energy-policy-toolkits/energy_efficiency_in_industriesfinal.pdf. Retrieved 17 September 2015.

Disclaimer

The Project

In 2006, the European Union adopted the Directive on energy end-use efficiency and energy services ("ESD"). The Directive sets an indicative energy saving target of 9 % by 2016 as well as obligations on national authorities regarding energy savings, energy efficient procurement and the promotion of energy efficiency and energy services. It requires Member States to submit three National Energy Efficiency Action Plans (NEEAPs), scheduled for 2007, 2011 and 2014.
The Energy-Efficiency-Watch Project aims to facilitate the implementation of the Energy Efficiency Directive. This Intelligent Energy Europe project tried to portray the progress made in implementation of energy efficiency policies since the Energy Service Directive via NEEAPs screening and an extensive EU wide expert survey.
www.energy-efficiency-watch.org

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List of Abbreviations

EE – Energy Efficiency, **EED** – Energy Efficiency Directive, **EPC** – Energy Performance Certificates, **EPDB** – Energy Performance of Buildings Directive, **ES&A Targets** - Energy Savings and Action Targets, **ESCO** – Energy Service Company, **ESD** – Energy Service Directive, **EU** – European Union, **EEW** – Energy-Efficiency-Watch, **MEPS** – Minimum Energy Performance Standards, **MRV** – Monitoring, Reporting and Verification, **MURE** – Mesures d’Utilisation Rationelle de l’Energie, **NEEAP** – National Energy Efficiency Action Plan, **R&D** – Research and Development

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