CONCERTED ACTION
ENERGY EFFICIENCY
DIRECTIVE

Article 15.2 Infrastructure efficiency potential assessment

Executive Summary 3.4 and 7.4

Metering and Billing, Demand Response and Grid Issues
Efficiency in energy supply

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Date: 26 November 2014

1 Summary

Article 15.2 of the Energy Efficiency Directive (EED) requires all Member States (MS) to assess the potential for energy efficiency improvements in energy grids (electricity and natural gas) and to specify measures to improve efficiency.

A survey has been undertaken to assess the regulatory setup within MS and the level of implementation of art.15.2. The survey shows that the regulatory regime varies somewhat across MS regarding mandates to define and implement the assessment: there are also variations in the definition and implementation of relevant measures.

Only a couple of respondents to the survey seemed (in June 2014) to have undertaken or started undertaking the assessment.

Although few MS have made the comprehensive potential assessment prescribed in art. 15.2, several reported initiatives undertaken to improve grid efficiency. On average, MS consider the potential to be distributed quite evenly across a range of measures such as grid re-enforcement, demand response, dynamic tariffs and improved access of distributed generators.

A session to facilitate the exchange of experiences in how to assess the energy efficiency potential of the gas and electricity infrastructure in MS was convened.

The joint session between Core Theme 3 and Core Theme 7 looked into the experiences of and challenges facing MS with regards to the implementation of article 15.2. Sweden presented findings of a study on energy efficiency improvement potential in their country, while Denmark presented the status of implementation in terms of a research outline.

2 Conclusions

The implementation of art. 15.2 is complex in terms of data gathering and analysis. Several MS report a lack of available research and data: most MS respondents seem to need the analysis to be undertaken in order to assess the potential.

Implementation is also challenging at an institutional level, not least because it involves several stakeholders including the national authorities, the regulators, the Transmissions System Operators (TSOs) and the Distribution System Operators (DSOs). The mandates and authorities of these institutions vary across MS.

There seems to be a need for more exchange of experience, methodologies and case studies for the implementation of art. 15.2. Also, future research should deal with the actions which MS should take following the potential assessment at MS level (article 15.2 b).

Conclusions from this research include:

MS can be divided in three groups according to the status of implementation of 15.2:

- MS at an advanced stage
- MS in progress
- MS still struggling

The following areas for major energy losses should be considered:

- Long distance electricity transmission (remote wind and hydro)
- Electricity distribution grid (more losses than at transmission level)
- Compression/decompression of gas

The tapping of energy efficiency (EE) potential in infrastructure should be taken into account when:

- Normal investment decisions are taken, e.g. in transmission lines and in transformer replacement – however other priorities are determining factors
- Regulatory issues are reviewed: incentives for EE in grid operations should be integrated in regulation

3 Practical examples

The examples below were presented in October 2014. Please find the power point presentations at the following websites: http://www.ca-eed.eu/good-practices/member-state-presentations/chp and http://www.ca-eed.eu/good-practices/member-state-presentations/chp/article-14.1-national-and-instalation-level.

3.1 Energy efficiency potential for infrastructure for electricity and gas - Sweden

Total losses in the Swedish electricity grid are estimated to be about 13TWh in 2020 and to 14TWh in 2030. Losses are therefore expected to increase: the losses in 2012 were estimated to be 9TWh. Losses are predominantly expected to come from an expansion of wind power in northern Sweden. The study, produced by the Swedish Energy Agency, emphasises the impact that the geographical location of grid connections to new production sites has on losses.

The technical energy efficiency potential in 2020 is estimated to be 472GWh/year and 820GWh/year by 2030. The lion's share of this potential can however only be realised if there is a change in the location of the electricity production. Such a change is outside the responsibility of the grid companies, and also outside the scope of the study. The potential that is achievable through measures conducted by the grid companies themselves is around 175GWh/year by 2020 and 400GWh/year by 2030. In relation to total losses, these potentials are quite small: 4% by 2020 and 7% by 2030.

A model for regulating grid operations, proposed by the Energy Markets Inspectorate (the Swedish energy regulator), will probably increase incentives for investments in energy efficiency measures. Coupled with improved technology this could have a noticeable effect. Transformers in particular have a relatively large potential for reducing losses, which the Ecodesign Directive requirements may contribute to.

Investments should however not be made only in order to reduce losses in the grid as that can lead to sub-optimal solutions. It is important to employ a systems approach for energy efficiency.

The Swedish Energy Agency does not suggest new measures to be implemented in order to reduce losses, partly because the grid potential for efficiency is rather small but also because the Swedish Energy Markets Inspectorate is working on indicators for grid losses that will provide incentives for reducing losses.

Concerning the efficiency potential in the natural gas grid, losses are considered limited and therefore not subject to any measures.

Main conclusions from this presentation include:

- The energy saving potential in grid infrastructure is relative low, although not to be neglected
- Standards for new transformers through the Ecodesign Directive will push for higher EE
- A model for regulation of grid operations is expected to increase incentives for investments in EE

3.2 Energy efficiency and grid optimization, Energinet.dk (The Danish TSO)

The Danish energy system is facing a significant transformation due to the Danish goal of energy supply based on clean, renewable energy (wind power to meet 50% of electricity consumption in 2020) and due to a political decision to apply underground cabling to the entire Danish 132/150kV transmission grid, as well as to parts of the 400kV transmission grid, in the period up to 2030.

The ongoing transition planning from overhead lines to a fully cabled 132/150kV transmission utilises the opportunity to restructure and optimise the transmission network in relation to the current conditions.

Originally, the structure of the existing overhead lines was based on centrally located generation plants with power transported to the consumption areas. With this starting point, the transmission network has continuously evolved to fit several international connections and more and more wind power, both on land and at sea. Now the planning of the future cable network is based on a system with a significant amount of renewable energy capacity in addition to the centrally located power plants and many international connections.

As system operator and owner of the overarching gas and power system in Denmark, Energinet.dk has a key role to play in this transformation of the total energy system. Energinet.dk presented their approach as well as two examples concerning energy system transition and energy efficiency for preparation of art. 15.2:

Example 1: Danish Power system with AC Cables
In the context of Cable Action Plan from 2009, Energinet.dk established DANPAC (DANish Power system with AC Cables), a dedicated development and innovation project attempting to reap optimisation benefits from nationwide cabling, while at the same time avoiding expensive, system-critical errors.

DANPAC aimed to identify and implement potential savings associated with the undergrounding of the 132/150kV network. Part of the project has been to evaluate future network structure and optimise this with particular respect to losses. The losses for possible alignments has thus been included in the analysis of what the future 132/150 kV grid should look like.

Example 2: Automatic voltage control
The need for Automatic Voltage Control (AVC) is driven by the overall development of the power system, where the number of dynamic components is declining due to the closure of power stations. Meanwhile, foreign exchange and transit is increasing due to the expansion of international connections and increasingly strong coupling to the surrounding markets.

AVC aims at full automation of voltage regulation in the transmission system, through automatic optimisation and use of the available reactive components. By keeping the voltage as high as possible in the transmission system Energinet.dk expects to reduce transmission losses over time.

Main conclusions from this presentation include:

- Example 1: Danish Power system with AC Cables – energy loss aspects have been included in the economic cost optimisation of transmission grid expansion
- Example 2. Automatic Voltage Control - operation at higher voltage can reduce network losses

For more information please email
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Legal Disclaimer

The Concerted Action for the Energy Efficiency Directive (CA EED) was launched by Intelligent Energy Europe (IEE) in spring 2013 to provide a structured framework for the exchange of information between the 29 Member States during their implementation of the Energy Efficiency Directive (EED).

For further information please visit **www.ca-eed.eu** or contact the CA EED Coordinator Lucinda Maclagan at **lucinda.maclagan@rvo.nl**

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