CONCERTED ACTION
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Current state of Article 9 implementation

Executive Summary 3.8

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1 Summary

Since the implementation of Article 9 in 2012, several issues have been addressed with regard to metering and billing. This report presents a review of the current state of EED Article 9 implementation, including Article 9.3 which has a deadline of the end of 2016. The review includes an assessment of the benefits and challenges in short and medium term. However, it is important not to lose sight of future developments and consider their positive or negative impact.

The Member States (MS) are proceeding with the roll-out of meters that will provide information on accurate energy consumption and actual time of use, as described in Article 9.1. The pace of the roll-out varies, and MS have different challenges. Roll-out of electricity meters is ahead, and in most MS the Distribution System Operator (DSO) have been given the responsibility of installing the meters. However, the roll-out of gas meters has been a little slower. For district heating and hot water, about half of the MS claimed that competitively priced individual meters that accurately reflect the final customer's actual energy consumption are offered to consumer groups.

When implementing smart meters, various obligations apply under Article 9.2. One of these obligations is the ten common minimum functionalities for electricity smart metering systems: these are only met by half of the MS countries (European Commission Recommendation 2012/148/EU). Subjects like "clarity of time period", "actual time of use", "easiness" and "cost effectiveness" are, not surprisingly, more developed for electricity and gas, while for district heating and cooling and domestic hot water there is less progress. At this moment, it is possible to say that there are several projects already implemented that show evidence between of 1% to 3% of energy savings as a result of information on actual energy consumption of electricity and gas. Security and privacy are addressed by most of the MS, and actions have been taken to meet the recommendations.

Metering of thermal energy in multi-apartment and multi-purpose buildings is subject to discussions and challenges. Feedback from MS shows very different situations regarding the type of metering (meters and heat cost allocators). A lot of MS have implemented rules for cost allocation, and have accompanied the rules with guidelines.

Another important topic for discussion was Article 9.3, where EED requires that individual meters should be installed by 31st December 2016 at the latest, except if it is not technically feasible and economically justifiable. More than half of the CA EED participants predict that they will meet the deadline. However, it appears that there is some uncertainty about the outcome of technical and/or economic studies in those MS.

In general, MS state that it depends on the local or specific situation whether the installation of individual metering will be technically and economically feasible in existing buildings. By default, however, it is not considered to be so. Only in the case of deep renovations might there be a positive business case for introducing individual metering in existing buildings.

In this context, the calculation of cost effectiveness in metering thermal energy consumption in multi-apartment and multi-purpose buildings is demanding and challenging. MS are concerned about how to map and decide on costs, and how to estimate the potential for energy efficiency. However, EED Articles 9, 10 and 11 are subject to revision by the European Commission, so future changes and challenge will come.

2 Conclusions and Recommendations

Mapping of the status in implementation of Article 9 shows that:

In general, Article 9.1 ('Introduction of individual meters on actual energy consumption') can be considered as an effective promoter for the introduction of smart meters, bearing in mind that its 'success' also follows the impact of its predecessors: the Energy Services Directive (ESD) (Article 13) and the 3rd Energy Package (80% smart meters by 2020). Most MS report that they are rolling out meters for electricity and gas: 17 to 20 MS for electricity, and 7 to 18 MS for gas. (Variations are due to the use of source; a Joint Research Centre (JRC) report shows lower figures than what is reported by MS in a CA EED questionnaire.)

However, if MS introduce smart meters, the implementation of the requirements listed in Article 9.2.a to 9.2.e, shows more mixed results. This is due to different MS opinions regarding which objectives and which benefits to final customers should be taken into account when introducing smart meters. As a consequence, many MS have different levels of (legal) arrangements regarding the minimum functionalities for energy efficiency and consumer benefits (Art. 9.2a), respect for privacy and security (Art. 9.2b), the supporting of product and market developments (Art. 9.2d) and providing advice and meter reading management (Art. 9.2e). Only the requirement to allow exporting electricity into the grid from final customer premises (Art. 9.2c) seems to be standardised in smart meters in most MS.

On district heating, cooling and hot water, the EED implementation seems to present a more substantial (and sometimes challenging) development due to the technical and physical necessity when installing individual meters or heat cost allocators to obtain the consumption of a single end-user. Metering of thermal energy in multi-apartment and multi-purpose buildings is challenging. There is uncertainty with regard to several issues, especially on costs and saving potential.

Recommendations:

- The roll-out of individual metering of **electricity and gas** customers still needs some focus. Some follow up should be done by the Concerted Action with MS.
- MS need support on issues regarding individual metering of **district heating and cooling and hot water**. Examples include legal challenges, privacy and security, consumer benefits, and good information to end users. This topic seems to need continuing focus and support from CA and EC.
- **Cost effectiveness** in the implementation of individual metering of heating, cooling and domestic hot water in multi-apartment and multi-purpose buildings will need focus and support.
    - MS need more information and evidence of the potential of energy efficiency. More studies should be mapped and shared.
    - More information on examples, case studies, solutions and costs should be mapped and shared.
- **Behavioural issues** can be addressed more: a smart meter itself does not save energy. Saving energy is a change in behaviour and lifestyle of users. Show how knowledge on behaviour can be used to create changes.
- **Privacy, security and consumer protection**: There is controversy on subjects relating to privacy, security and consumer protection. More in-depth work could address those issues. MS need guidance, clarifications and answers.
- **Revised EED** and revised Article 9 will bring up new questions and discussions. Issues should be addressed and challenges should be discussed and elaborated. Good practices should be shared.

3 Practical Examples

Two MS (Spain and Slovakia) provided practical examples that demonstrated that Article 9 implementation is already a reality, especially if the main topic is smart metering. During a CA EED plenary meeting in Bratislava, participants visited a smart neighbourhood and the Smart Meters laboratory, where it was possible to look at technical issues relating to the monitoring of electricity, gas, hot/cold water, heating and cooling. Spain provided a comprehensive presentation about Article 9 implementation in their country. A summary of these good examples can be found below.

3.1 Implementation of Article 9 and the roll-out of electricity smart meters in Spain

The **implementation process of smart meters in the MS** started before the approval of both Directive 2009/72/EC (Internal Electricity Market) and Directive 2012/27/EC (EED) with the publication of a complete regulatory framework:

- Royal Decree 809/2006 of 1st July 2006, in which it was established that from 1st July 2007 new electricity meters for customers of a contracted capacity below 15 kW shall allow differentiation of consumption in different time periods and remote management.

- In Royal Decree 1110/2007 of 24th August, it was indicated that all household electricity meters shall be smart meters and the functionalities of the smart meter's system were also defined.

- Subsequently, the Ministerial Order ITC/3860/2007 of 28th December, established the roll-out plan of remote managed electricity meters (smart meters) indicating that 100% of household electricity smart meters would be deployed before 31st December 2018. This Ministerial Order was amended by the Ministerial Order IET/290/2012 of 16th February, which modifies the milestones of the smart meter roll-out plan, establishing the following deadlines: 35% before 31st December 2014, 35% before 31st December 2016 and the remaining 30% before 31st December 2018.

The above described legislation and in particular the specifications established in the Royal Decree 1110/2007 allow the fulfilment of the objectives of the Energy Efficiency Directive (EED). Smart meter functionality for household electricity meter permit registers for different time periods (6 time periods can be programmed), including registers of active and reactive energy, and maximum demanded power every 15 minutes. Moreover, it is possible to programme registration periods of a maximum interval of 1 hour. It is important to clarify that all data are integrated in a remote management and metering system.

The consumption data of the electricity consumers are registered by the meters and then collected by a secondary concentrator that is owned by the DSO. The next step is the main concentrator that is managed by the system operator, which manages Spain's metering system. This data, once completed and revised, is used for two different processes:

- Billing of electricity consumers (retail level)

- Settlement of both generation and demand in the electricity market (wholesale level)

The functionalities of remote management system in this MS included a set of characteristics of remote reading of active and reactive energy, power and quality parameters; remote parameter setting of metering equipment; activation of power control mode; remote periodic synchronisation with the system; power remote control and load management capacity.

Billing in Spain is based on real (and actual) meter readings from smart meters. These measurements are accumulated in different periods, depending on the type of contract (some contracts allow hourly energy accumulation, other contracts split the accumulation periods depending on the time of the day). For example, for the Voluntary Price for Small Consumer's contract, billing is done by considering both the actual consumption in each hour and the hourly price of the electricity market. Consumers can access their hourly consumption data via the DSO's website, according to the procedures and formats set in the legislation. Hourly prices allow electricity consumers who have an installed smart meter to receive price signals, which allows consumption of electricity in

periods when prices are cheaper, although potential savings in household electricity could be limited. Therefore, an ex-ante analysis of consumption patterns and habits to detect the potential for savings is needed, in order to avoid an excessive cost by setting metres functionality far beyond the state-of-play of the electricity markets, which are hourly at present.

3.2 Monitoring Heat2go SPP building, Slovakia

Heat2go is a monitoring system to control the energy consumption and to acquire a complete overview of heat, water, electricity and gas consumption in multi-apartment and multi-purpose buildings.

Its modularity allows Heat2go to achieve a full report and evaluation of energy consumptions for the whole building by installing heat meters, heat cost allocators, water meters, electricity meters and gas meters. It can observe and measure heat consumption in individual rooms of the apartment, as well as the consumption of an entire building. It also monitors the consumption of electricity, gas, hot and cold water for each apartment and the total for the entire building.

The overview of all energy consumption allows monitoring and measuring devices in a single system. Thus, useful information on energy consumption can be obtained, providing the basis for changing consumer behaviour in order to achieve energy savings.

Output measured data is transparent and is established based on the requirements of customers. An important tool is the web interface, which permits to export readings in tabular or graphical reports. An additional very important feature is the ability to create multiple and different levels of platform users, allowing the possibility to create users only to view the final consumption or users with administrator permission that might act more effectively in real time on final consumption. The main advantages for administrators include:

- Improved energy management of the building
- Requires no PC installation or licenses
- Information on the consumption of heat, water, electricity and gas is always online
- Automatic accounting of energy consumptions for each user
- The modernisation of services provided with an overview of consumption on the internet

The functionality for users are:

- Overview of all energy consumption available online
- No access to the apartment is needed for reading energy consumptions
- Over-compensation and waste alerts to a PC or mobile phone
- Consumption monitoring of heat for every room of the apartment
- Clear and accurate allocation of costs with graphs and consumption charts

3.3 Smart Meter laboratory in Bratislava

Within the activities programmed for the CA EED meeting in Bratislava, there was a site visit to a smart meter laboratory in the Engineering School of the University of Bratislava. Initially, two presentations by members of the laboratory were attended. The first presentation was focused on the concept of smart grids and some aspects that were studied in the laboratory. The second one was a very specific and detailed explanation of the impact of demand response on the networks.

It was possible to visit the facilities of the laboratory in which research and innovation activities are implemented with regard of testing smart meters and their functionalities, mainly focused on Power Line Communication (PLC) and different types of meters.

PLC is mainly used for telecommunication, tele-protection and tele-monitoring between electrical substations through power lines at high voltages, such as 110 kV, 220 kV and 400 kV. This can be used by utilities for advanced energy management techniques such as smart metering infrastructure, demand side management and demand response. One of the major PLC advantages is that, by using the electricity network, any "power connection" is a potential data network point, i.e. there is only the need to connect the connectivity equipment (usually a modem) to the power connection so the electricity network can act as a data network. In addition, this technology supports high transmission rates, reaching up to 200Mbps at various frequencies between 1.7 MHz and 30 MHz.

However, despite the apparent advantages, the electricity network is full of electronic equipment that causes noise in the frequency range used. By using PLC for smart metering there is a risk that the quality of communication and data transport is diminished. For this reason, it is essential that a single protocol is developed for smart meter data transmission using PLC to ensure exclusive use on the above mentioned frequency range. With this measure, it will be possible to reduce the influence of certain equipment on the performance of this type of communication (i.e. LED street lighting where often the drivers are of poor quality).

In this context, it was possible to verify how the smart meters communicated in both upstream (with the DSO system or other meters) and downstream (inside a house, for example). Some tests were conducted in order to show how meters react to different types of remote orders and frequency signals.

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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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