Energy Data Innovation Network

GA N. 695916

Deliverable Title	D4.1 Overview of smart metering in Germany, Spain and the United Kingdom
Deliverable Lead:	empirica
Related Work Package:	WP4: Training material preparation
Related Task:	T4.1 Develop training and support materials
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Dissemination Level:	Public
Due Submission Date:	30.04.2017
Actual Submission:	30.04.2017
Project Number	695916
Instrument:	H2020-EE-2015-3-MarketUptake
Start Date of Project:	01.03.2016
Duration:	36 months
Abstract	This Deliverable provides a summary of critical requirements regarding smart metering from institutional organisations such as municipalities. An overview of current legal background on European and national level for Germany, Spain and the United Kingdom (factsheets) is provided.

"This Project has received funding from the European Union's H2020 research and innovation programme under grant agreement No 695916"

Versioning and Contribution History

Version	Date	Modified by	Modification reason
v.01	05.01.2017	Georg Vogt	First draft
v.02	02.02.2017	Georg Vogt	Second draft
v.03	10.03.2017	Georg Vogt	Third draft
v.04	21.04.2017	Georg Vogt	Pre-QA refinement
v.05	26.04.2017	Carl Holland	Peer Review
v.06	28.04.2017	Carl Holland	Final draft

Executive Summary

This Deliverable, *D4.1 Overview of smart metering in Germany, Spain and the United Kingdom*, provides a summary of critical requirements regarding smart metering from institutional organisations such as municipalities.

The focus lies on barriers from or through smart metering (chapter 2). The issues are collected as requirements and critical for those municipalities which have already invested effort in energy efficiency through data collection (AMR) and ICT-based energy management systems. All requirements identified are currently not fully met by national regulation and law in Germany, Spain and the United Kingdom. All requirements are specified and background provided. Where applicable existing or proposed EU regulation is cited as to whether it might remedy the requirements identified. Where applicable remarks and recommendations are made as to what changes might be necessary or helpful. The requirements were collected by the three pilot municipalities in EDI-Net. It is planned to refine the requirements with further authorities (PPAs) implementing EDI-Net.

An overview on European rules driving the deployment of smart-metering, national implementation and data collection is provided (chapter 3). A general overview on progress with smart-metering is provided across Europe with additional figures available for Germany, Spain and the United Kingdom provided in the fact sheets (chapter 4). Due to the lack of available statistics, some data can only be provided for the residential sector. However, as obligation to install smart meters is often based on the amount of consumption, it is a helpful proxy.

The requirements laid out in this document are crucial for municipalities to become smart cities. Without access to very fundamental data without extra cost, it will be hard to integrate public buildings in smart grids despite their great potential to provide, for instance, demand response and flexibility services through cooling and heating systems. Same applies to utilising public parking spaces attached to even smaller buildings including teachers being able to charge their cars at schools. Smart meters are a core element and data access to smart meter data must become reliable and available in near real-time which it currently is not.

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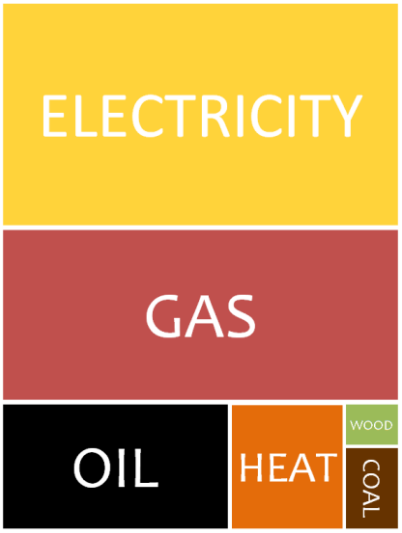
1 Introduction

This deliverable describes key barriers resulting from deployment of smart meters and crucial requirements from the perspective of municipalities. Current activities on European and national level focus mostly on the residential sector, ignoring the potential impact on already existing infrastructure of Automatic Meter Reading (AMR) and energy management systems having achieved savings for over a decade especially by municipalities leading by example. Around 34% of energy used in buildings is consumed in the non-residential sector[1]. German communities consumed 127.7PJ in 2013 of which ¾ where for heat with the share for electricity continuously increasing[2]; in total, cost for energy amount to 4 billion Euro every year.[3]

Figure 1 - Energy sources in non-residential buildings in EU[4]



Chapter 2 describes a brief introduction into the definition of smart meters, the barriers resulting from common practise in the pilot countries and requirements gathered across municipalities which need to be overcome for smart meters not develop into a major barrier for already existing data driven energy management.

Chapter 3 and 4 provide the current legal background on European and national level for Germany, Spain and the United Kingdom (factsheets). It contains basic data on smart meters already installed, the legislation and its history as well as data privacy regulation which is strongly linked with the roll-out of smart meter (gateway).

[1] The remaining 66% are used in the residential sector.

[2] http://www.bfee-online.de/bfee/informationsangebote/publikationen/bfee_berichte_publikationen/merkblatt_bfee_berichte_zur_energieeffizienz_vorbild_oefffentlicher_sektor.pdf

[3] https://www.dena.de/themen-projekte/energieeffizienz/oeffentliche-hand/

[4] empirica, sources Odyssee-Project, eurostat

2 Smart metering barriers in public buildings

This chapter provides a brief introduction of definitions to distinguish between smart meters and AMR as well differences across resources. After a brief overview on general barriers, specific requirements from municipalities are described to ensure energy saving measures can prevail where already conduced and be spread to other cities without major cost utilising smart meters.

2.1 Definition of smart meters

The European Committee for Standardization (CEN) defines a "smart meter" with "*instrument for measuring, memorizing and displaying the consumption of a commodity [...] with additional functionalities one of which is data communication*". The legal requirements to be transposed by Member States are currently fixed in the Energy Efficiency Directive Art 9(2)[5] including "providing information on actual time of use", "security", "customer's right to request data". These broad terms were accommodated by ten "*common minimum functional requirements*" as defined in the "Commission recommendation on preparations for the roll-out of smart metering systems"[6]:

- Provide readings directly to the customer and any third party designated by the consumer
- Update the readings referred above frequently enough to allow the information to be used to achieve energy savings
- Allow remote reading of meters by the operator.
- Provide two-way communication between the smart metering system and external networks for maintenance and control of the metering system
- Allow readings to be taken frequently enough for the information to be used for network planning
- Support advanced tariff systems.
- Allow remote on/off control of the supply and/or flow or power limitation
- Provide secure data communications
- Fraud prevention and detection
- Provide import/export and reactive metering

The Smart Grid Task Force has identified and selected best available techniques to suit the recommendations in May 2016[7]. In the meantime, Member States have in part already laid out their own interpretation of necessary requirements based on the legal norm not necessarily following the EC's recommendations.

As for electricity the proposed recast of the directive for a common rules for the internal market in electricity defines "*'smart metering system' as an electronic system that can measure energy consumption, providing more information than a conventional meter, and can transmit and receive data for information, monitoring and control purposes, using a form of electronic communication*"[8]. It further defines 'interoperability' and 'near-real time' among others. These definitions need to be adopted by the co-legislators to enter into effect.

[5] EED (2012/27/EU)
[6] COM (2012) 1342 final Commission recommendation on preparations for the roll-out of smart metering systems
[7] SGTF(2016)WP2 Techniques Clustering - Identification and Selection of Best Available Techniques for the 10 common minimum functional requirements related to the Smart Metering System roll-out under a Cyber -Security and Privacy Perspective
[8] COM(2016) 864, p53

Finally, it should also be noted that water, heat and gas meters installed by suppliers usually rely on batteries often limiting the frequency of data acquisition in benefit of range[9]. Any stakeholder having implemented an AMR has invested effort to provide a source of energy to ensure frequent data recordings and range. Hence, even if smart meters are installed, in certain aspects, they will remain less advanced than already existing AMR installed or widely available in the market. Therefore, smart meters should be able to connect to existing (sub-)meters, collect the data and communicate the complete data set, at least to a local interface.

2.2 Regulatory overview to barriers on European and national level

The deployment of "smart meters", itself, is becoming a barrier for improving energy efficiency specifically in public buildings. Leicester City Council, for instance, started introducing Automatic Meter Reading (AMR) systems in 2004 and monitor around 780 main meters alone (electricity, gas and water). Whenever suppliers install smart meters they regularly disconnect the customer access from the old meter and municipalities are no longer able to monitor the building unless they invest a second time. Moreover, the data recorded by suppliers is generally not available in sufficient resolution, poorly accessible online (e.g. PDF files) and formats differ across suppliers. Municipalities having "lead by example" to increase energy efficiency of their buildings stock using ICT are confronted with having more and more difficulties to access the data they had already access to for years.

The winter package on energy 2016 (Clean Energy for all Europeans), makes immense progress on aspects of market participation such as trading flexibility and self-produced electricity[10] but the progress is not equally met for gas[11] and the secondary effects on 'plain and simple' energy saving behind the meter are not sufficiently considered. These effects become more obvious the more metering points – often hundreds – need to be handled and are often run by different operators[12]. Moreover, even if the physical installation itself is handled by one operator, online platforms, data formats and business process vary across energy providers, the customers' access point to smart meter functionalities. As a consequence, municipalities will also be less able to implement policies and processes for supply side market actions (e.g. flexibility, demand response), the primary goal of smart metering, across a large number of buildings. In short, current EU legislation and communication assumes a straightforward relationship between customer, meters and utility which does not apply in municipalities where centralised energy departments manage large and diverse portfolio of buildings often with their own energy contracts.

2.3 Smart meter requirements for public buildings

This section describes a series of **technical and process requirements** important for municipalities (and most likely other non-residential actors). The title summarises the key requirement and further **specification** is provided along with the **background** explaining, for instance, adverse effects of displacement etc. If

[9] Meters for electricity can feed on the source itself and sometimes choose PLC to transfer data
[10] COM(2016) 864 final – Recast of directive for a common rules for the internal market in electricity
[11] COM(2016) 761 final – Recast of directive 2012/27/EU on energy efficiency
[12] In the majority of cases the operator of meters is the 'district service operator' (DSO). However, to avoid confusion, the document will refer to (smart) meter operators.

references in existing or upcoming regulation or standards exist, they are briefly summarised, occasionally followed by a brief **remark**.

2.3.1 Technical

T1 Physical interface to access data streams from meter locally allowing asset management

Specification: As the metering device itself and the smart meter gateway, heavily restricted by security requirements etc, are often combined in one device, the interface should be "before" the data enters the gateway. This is particularly relevant if the final smart meter (gateway) collects data from smart meters operated by any party other than the municipality. Data from each sub-meter should be accessible through the interface. The smart meter should also provide the energy which is necessary to run the sub meters / consumption sensors. In short, a smart meter gateway compliant with this requirement would need a multiple protocol interface and / or a European standardized interface (e.g. M-Bus).

Background: If smart meters come without a simple interface and at a cost they will displace investments for AMR and the frequency needed to perform certain building management tasks. Furthermore, the mandate M/441 on standardising smart meters on European level does not seem to cover the problem at all: "*Data exchange with other systems e.g. systems for physical mater installation and meter asset management, though of importance to customers, meter operators and suppliers, are beyond the scope of this mandate.*"[13]

Reference: Article 20(e) of the proposal for common rules for the internal market in electricity states: "*if final customers request it, metering data on their electricity input and off-take shall be made available to them, via a local standardised communication interface and/or remote access, or to a third party acting on their behalf, in an easily understandable format*".

Remark: It is assumed that "customers" refer to any kind of customer including municipalities. No resembles exists for the gas market.

T2 Data interface to ensure interoperability with consumer energy management platforms

Specification: The high level functionality defined in on-going standardisation *"[t]o provide information via web portal/gateway to an in-home/building display or auxiliary equipment*" ideally implements a "Home Area Network" (HAN) to allow access to data collected. The on-going German specification by BSI foresees access to at least quarter-hourly data[14].

Furthermore, the HAN access point should provide "push" functionality for each new data package to a server confirmed and verified in the gateway. This could also be resolved via email.

Background: Energy managers must be enabled to use specialised energy management software capable of to detecting wastage across a wide portfolio of buildings. Otherwise any form of rule and notification automatisation will not be possible or more expensive staff needs to be employed to continuously ensuring maximum energy efficiency off. Additional staff or having to install AMR, in parallel to smart meters, to

[13] CEN/CLC/ETSI/TR 50572:2011, p20

[14] https://www.bsi.bund.de/DE/Themen/DigitaleGesellschaft/SmartMeter/UebersichtSP-TR/uebersicht_node.html

ensure such functionally would reduce the cost-benefit ratio of energy efficiency make some wastage the most economical alternative.

Such high level use cases are currently not being followed in national regulation and law. In Germany, such functionality would be explicitly forbidden.

Reference: Article 19(3) of the proposal for common rules for the internal market in electricity states: "*Member States shall ensure the interoperability of these smart metering systems as well as their connectivity with consumer energy management platforms.*"

Remark: Though the same paragraph also enforces "relevant standards" and "best practice" it does not specify them. More importantly, there is no procedure stated for consumers to complain about lack of interoperability or body to be addressed for such matters (see also P1).

T3 Data readings must be made available within less than five minutes after recording

Specification: Data must be recorded and made available in near real-time.

Background: In Spain, smart meters for electricity are being rolled out widely and data recorded at least every fifteen minutes. Data, however, is made available as a bulk at the end of the month rendering it useless for active energy management. In Nuremberg, the data of some ("pre-smart-meter generation" costing EUR1,000 per annum) meters[15] is made available on the next day, but only on the utility's website, as a manually downloadable xls- or csv-document (see T4 below). Electricity meter data is provided in 15-minute detail and gas meter readings are provided in hourly detail.

Reference: Article 2 (20) of the proposal for common rules for the internal market in electricity states: "'*near-real time' means, in the context of smart metering, the time, usually down to seconds, that elapses between data recording and their automated processing and transmission for use or information purposes*".

T4 Online interfaces must provide an API (or similar) enabling bulk downloads from multiple meters

Specification: An opensource and clearly document API must be provided enabling (large) customers, including municipalities, to download large sets of data. Ideally, the API is standardised as well as the content of the database and format of data collected.

Background: In Nuremberg, there is no way to automatically import the data into electronic energy management systems. No API is provided. Moreover, only consumption data are provided, not the raw meter readings which renders the whole online interface useless for automated downloads.

Reference: Article 24 (1) of the proposal for common rules for the internal market in electricity states: "*Member States shall define a common data format and a transparent procedure for eligible parties to have access to the data listed under paragraph 1 of Article 23 [...]*".

Remark: It is not clear what the term "transparent procedure" entails. Does it refer to process of getting permission to download data or downloading the data itself?

[15] Consumption over 100,000kWh/a

T5 Data consistency across energy providers

Specification: The EDI-Net consortium is able and willing to contribute to the standardisation of the format.

Background: Smart meter data is currently hidden in PDF files and in various formats. Importing data into management services is cumbersome, costly and ridden with error messages. It can be as simple as the energy providers changing the scheme by which files are named.

Reference: Article 24 (1) of the proposal for common rules for the internal market in electricity states: "*Member States shall define a common data format and a transparent procedure for eligible parties to have access to the data listed under paragraph 1 of Article 23 [...]*".

Article 24 (2) further describes a *"common European data format and non-discriminatory and transparent procedures for accessing the data [...] that will replace national data format and procedure adopted by Member States in accordance with paragraph 1. Member States shall ensure that market participants apply a common European data format".*

Remark: Considerable effort is being invested in this project to provide a common platform not for the platform itself but for importing data from a wide range of partly non-documented APIs. Such a step as a common format and procedure, assuming it includes the process of accessing data, is welcome.

2.3.2 Process

This section documents fundamental problems related to enforcement of standards and legal requirements. In principle, MS have established a body but neither does it define procedures nor does it simplify the process. EDI-Net provides a first set of procedures which require standardisation but it is being recommended to tender a study which collects most common complaint procedures across all MS to require "out-of-court" bodies to standardise according procedures to fasten and simplify the process.

P1 Right to out-of-court dispute settlement – standardisation of procedures

Specification: MS have implemented settlement institutions[16]. Additionally, clear procedures for frequent and standardised complaints should be made available online and the process documented and aggregated results made public to increase pressure on Distribution System Operators (DSO) etc not following legal and regulatory requirements.

Background: Due to the lack of transparency on complaint procedures and the interdependency of local smart meter operators with the public body, most municipalities refrain from making public complaints and try to resolve issues locally.

Reference: Article 26 (formerly Article 3) defines the settlement procedure referencing a multitude of definitions from other directives.

Remark: As with other matters in the MDI the phrasing seems to focus on end-consumers only. Complaints on a particular issue might have to be repeated for each building operated by another body of the

[16] For instance, in Germany, according to article §111b EnWG, a mediation body ("Schlichtungsstelle Energie") has been established which deals with all energy related disputes between private end-customers and utilities. The use of this mediation body is free of charge for private persons.

municipality (e.g. independent schools). Moreover, the Article should be accommodated with guidance either provided by ACER, an external study or in the Annex of the directive.

Article ~~3~~ 26

⌦ Right to out-of-court dispute settlement ⌫

~~13.~~ Member States shall ensure that ~~an independent mechanism such as an energy ombudsman or a consumer body is in place in order to ensure efficient treatment of complaints and out-of-court dispute settlements~~. ⇨ customers have access to simple, fair, transparent, independent, effective and efficient out-of-court dispute resolution mechanisms for the settlement of disputes concerning rights and obligations established under this Directive. Where the costumer is a consumer within the meaning of the Directive 2013/11/EU of 21 May 2013 on alternative dispute resolution for consumer disputes and amending Regulation (EC) No 2006/2004 and Directive 2009/22/EC [49], such out-of-court mechanisms shall comply with the quality requirements established in Directive 2013/11/EU and provide, where warranted, for a system of reimbursement and/or compensation ⇦.

P2 Procedure to enforce interoperability of smart metering systems

Specification: Member States should empower settlement institutions to not only comply with processes as requested by law but also to act on behalf of the complaining party at the responsible regulatory body at national as well as European level to ensure that all technical specifications are met on national and European level.

Background: In Germany, §75 establishes the option for the Bundesnetzagentur to release regulations to ensure certain standards regarding the data security and the communication of smart meter gateways.

P3 Procedure of permitting access to (third) party data streams

Specification: Each smart meter gateway will require setting up to allow pulling data via HAN (see T2, T3) by a server or via push functionality. This procedure must be made simple enough for a municipality to allow managing hundreds of meters or give permission to a third part to do so. Most of all, the operator of smart meters should be required to provide a pool of all smart meters and modification of criteria of multiple gateways in one session.

Background: If the change of settings of any given gateway requires repeated logging in, it would represent undue administrative burden on the part of municipalities to truly access the functionality of smart meters provided.

Reference: Article 24 (1) of the proposal for common rules for the internal market in electricity states: "*Member States shall define a common data format and a transparent procedure for eligible parties to have access to the data listed under paragraph 1 of Article 23 [...]*".

Remark: The "transparent procedure" is key and should be promoted in regulation. Past technical requirements where often met (see example Spain and Germany in T3) but triggered useless due to procedural barriers enacted. In Leicester, even direct complaints to settlement bodies had not effect.

P4 Smart meter operators are required to announce installation of smart meters

Specification: Municipalities require hundreds of (smart) meters. Operators should be required to announce any changes to (any) metering enabling municipalities to check whether AMR installations will be effected and agree on further procedure. Grouping installation and optimising schedules to reduce costs on both sides should be obligatory for consumers above a certain share of total consumption in the grid.

Background: Any replaced meter within an AMR system has to be connected to the data collection hardware (e.g. M-Bus) and registered in the energy management software. Otherwise, no more consumption data is transmitted. In Nuremberg, the local meter operator does not inform the authority about any changes to meters, neither upfront nor afterwards. The municipality's energy management authority will notice a new meter only after getting informed by a janitor or after own research due to missing consumption data.

P5 Smart meter operators are required to reconnect any existing AMR, or announce the technical impossibility of a failure which is punishable by fee

Specification: At the very minimum any replacement of meters should have to be announced two weeks. Any AMR already on site has to be reconnected with the new smart meter. If it should be technically not possible an immediate notification is to be sent to the owner, ideally through the smart meter gateway itself. The technical reason is to be described in detail. Any failure should be punishable with costs inflicted.

The settlement body should be empowered to handle such issues and be provided with standardised forms and cost sheets.

Background: As described above, organisations installing (smart) meters regularly disconnect AMRs when replacing an old meter. Generally, there is no technical reason. These organisations have no regard to the inflicted cost of having to send staff for fixing the issue and the energy efficiency losses which might occur in the mean time.

Remark: If there is a technical reason to no reconnect an AMR, it is likely to be common and generic issue which can be described with prepared templates which can be passed on to the technician replacing the meter or messages easily triggered via the smart meter.

2.4 Barriers beyond public buildings

The issues identified above apply to all operators of multiple non-residential buildings. Without uniform access to data recorded in sufficient resolution, centralised energy management remains difficult and will require additional hardware which is not unlikely to be disconnected by utility / DSO staff at random notice without notification increasing cost.

With regard to residential buildings (e.g. social housing managed by city councils) the most obvious trade-off remains with data protection. One of the main goals of the smart-grid is to decrease network cost for which, a stabilisation of the on local level is crucial. Whilst communication of price signalling can be standardised on a high level and a smart meter can pass on the signals behind the meter, it requires all consumer devices to follow this norm. Irrespective, such control would only optimise when requested by the grid. It would not be able to detect waste, or behind the meter energy efficiency potential.

2.5 Future steps and recommendation

Development of this section

This section will be shared with PPAs joining EDI-Net. PPAs will be asked to provide further examples for any requirement already listed and given opportunity to add further requirements.

Depending on the interest from EASME and the EC, it could be possible to allow a ranking of the requirements across PPAs as part of the evaluation.

Recommendation to the EC

It is recommended the European Commission commissions a study researching the adverse effects of smart metering for non-residential operators in more detail. The current action MyEnergy focuses entirely on the residential sector. Though some advancement might be beneficial for both sectors, it is possible that certain requirements in the residential domain might be further limiting the application of data for energy saving and efficiency measures in the non-residential sector. The current and future legislation does not differentiate, however, evidence is only provided for the residential sector.

3 Status quo: Regulation and Progress

This section does accept the term "smart meter" as it has been used by its original source.

The following section summarises key European legislation and background which influenced national policy processes pushing for an implementation of smart metering. Though the EC has been active in this field for at least two decades, specific and detailed requirements are, still, not fully defined at least in many Member States.

The section furthermore summarises the progress of smart-metering in Europe. The data is mostly covering households as data for non-residential buildings is not available and not in the focus of debate. For instance, the ad-hoc group "My Energy Data" at the Smart Grid Task Force deliberately limits its work on the domestic sector to open meter data for third parties.[17]

Legislation proposed as part of the Energy package released in November 2016 is deliberately not discussed as the process will take several years and it is not clear which proposals will pass to what extent. However, selected communications and staff working documents linked to the process are quoted as sources.

3.1 EC regulation and communication

3.1.1 Internal market

Since 2002, when the **Barcelona European Council** agreed "on the need for the European Union to show substantial progress in enhancing energy efficiency by 2010", the EU has established a comprehensive framework. Along with pushing regulation and norms, legislative and policy actions were taken regarding "energy performance of buildings", "internal market"; "ICT, smart metering/grids", "energy efficiency plans", other "legislative measures" and in a recent attempt "CO_2 taxation".

Directive 2002/91/EC on the energy performance of buildings states that "demand management of energy is an important tool enabling the Community to influence the global energy market and hence the security of energy supply in the medium and long term". The Directive does not yet make reference to smart metering technologies, but prepares the ground for doing so by providing a precise legislative framework for limiting energy consumption in this sector. In a report [COM(2002) 321 final] on the implementation of the 2000 Green Paper, the EC reports that energy saving in buildings, which currently represent 40% of the energy consumed in the EU, could be reduced by 22% "given the right conditions for economising and improving efficiency".

The success of an internal market is strongly linked to wider deployment of smart meters among other. The 2010 Communication "**Report on progress in creating the internal gas and electricity market**" [COM(2010)84 final] observes that "work of national regulatory authorities tends to shift the focus towards the consumer, including the roll-out of smart meters as the key to smart grids in the internal energy market."

17 https://ec.europa.eu/energy/sites/ener/files/documents/report_final_eg1_my_energy_data_15_november_2016.pdf

The recitals of the **2003 Electricity** (2003/54/EC) and **Gas Directives** (2003/55/EC) as adopted by the Member States following the co-decision process reinforce the objectives identified by the Commission to a large extent. The co-legislators inserted a recital stating that the ability of electricity and gas customers to choose their supplier freely was fundamental to the freedoms which the Treaty guarantees European citizens (Recital 4); reinforced a recital on standards of public service to include the right for household customers and, where Member States deem it appropriate, small enterprises "to be supplied with electricity of a specified quality at clearly comparable, transparent and reasonable prices" (Recital 24); added to the Electricity Directive a recital acknowledging the Commission's intention to ensure that reliable information on the environmental impact of electricity from different sources could be made available in a transparent, easily accessible and comparable manner (Recital 25).

The provisions and recitals on the freedom to choose suppliers and the right to clear, comparable information remained largely unchanged by the co-legislators in the 2007 To summarize, the metering and billing provisions in the electricity and gas markets Directives have remained largely unchanged since they were first proposed/adopted in 2001/2003. Legislative texts and supporting documents reveal that the major objectives of the Commission and co-legislators were to:

- Enable easier and more effective consumer choice;
- Boost competition in retail markets;
- Create consumer incentives to save energy.

Its successor, **Directive 09/72/EC** continued the development by introducing universal service obligations and consumer rights, such as the obligation to inform final customers about the environmental impact or customer rights in the event of a dispute. The Directive states that cross-border interconnections should be further developed in order to secure the supply of all energy sources at the most competitive prices to consumers and industry. It specified the obligations of electricity suppliers towards their customers and further defines the responsibilities of transmission and distribution system operators.

In designing the internal market, efforts are put towards harmonisation of laws, such as with **Directives 2014/35/EU** and **2006/95/EC** relating to the (making available on the market) electrical equipment designed for use within certain voltage limits. The former specifically addresses obligations of various players – manufacturers, importers and distributors – in line with protection of the health and safety of the end-users and their property. Measures to safeguard security of electricity supply and infrastructure investment are also addressed with **Directive 2005/89/EC**. Enhancing competition is key for competitive pricing and affordability; **Regulation No. 714/2009** aims at setting such rules or cross-border exchanges in electricity and facilitating the emergence of a well-functioning and transparent wholesale market with a high level of security of supply in electricity

3.1.2 ICT, Smart Metering and Smart Grids

The 2011 Communication "**Smart Grids: from innovation to deployment**" [COM(2011) 202 final] addresses challenges observed in developing European standards which could further facilitate implementation. The ESO should target "privacy by design" approaches in order to ensure the privacy and security of users and authorities. One major action taken to increase distribution of smart grids was on regional and local level the

Covenant of Mayors initiative. In this regard, the Commission launched the initiative "Smart Cities and Communities" in 2011.

The European Economic and Social Committee highlights in its "**Opinion of the EESC on the 'Roadmap for a low carbon energy system by 2050**' (exploratory opinion)" that smart grid need to be enabled to allow "for better management of peak loads" and "focusing on all structural aspects", "direct and indirect global emissions from the buildings sector (40 % of total emissions)" should be reduced and furthermore highlights that " using smart meters can change the electricity transmission system". With regard to short-term targets the EESC believes focused should be laid, among others, on "energy-efficiency measures [...] paying greater attention to European directives". The prospect of the roadmap depends on "acceleration of technical progress", reducing delays in enforcing of the Energy Performance of Buildings directive and "general harmonisation including "exchange of best practices and information on BAT (Best Available Technologies); interoperable IT security and control systems". The EC strongly agrees in its Communication [COM(2011)112 final] to all involved partners and motivates all stakeholders including members and candidates to consider the implications of the Roadmap in its own legislation.

A "**Commission recommendation on preparations for the roll-out of smart metering systems**" [2012/148/EU] was issued in March 2012. It tackled data protection and security considerations with a specific focus on data protection impact assessments, data protection measures and data security "in order to ensure the fundamental right to protection of personal data". The document defined smart grids and smart metering systems among others. The recommendation also provided "guidance to Member States along with a framework for cost-benefit analysis as a foundation for conducting a consistent, credible and transparent economic assessment of the long-term costs and benefits of the roll-out of smart metering".

The 2009 Communication on "**Mobilising Information and Communication Technologies to facilitate the transition to an energy-efficient, low-carbon economy**" [COM(2009) 111 final] points to the dual enabling and quantifying function of ICTs in improving energy efficiency. Energy consumption of buildings in the EU could be reduced by up to 17% and carbon emissions in transport logistics by up to 27%. ICTs can support more energy-efficient business models, working practices and lifestyles, such as eCommerce, teleworking and eGovernment applications, and advanced collaboration technologies.

The Communication view of smart metering as "**just a first step on the path to smart electricity grids**", seems to neglect the role of gas and remote heating. This is not to play down the importance of consumer metering in electricity grids redesigned to make effective use of wind and other renewable sources whose output is difficult to align with demand.

Despite all ambitions on smart metering recital 33 of **Energy Efficiency Directive (2012/27/EU)** recognises that "*it is important that the requirements of Union law in this area be made clearer"* and "*there is also a need to clarify the requirements for access to information and fair and accurate billing based on actual consumption in cases where smart meters will not be available by 2020".*

3.1.3 Self-consumption

Through technology development and innovation driven by EU and national policies, effective renewable energy technologies have been realised over the last years. Businesses and households can increasingly

produce and consume, some or all of their own electricity, either instantaneously or in a deferred manner through decentralized storage, behind the connection point with the grid. Through the process of self-consumption, passive consumers are therefore becoming active 'prosumers' (i.e. producers and consumers of renewable energy).

The emerging self-consumption model opens new cost-containment opportunities for energy consumers, particularly for Small and Medium-Sized Enterprises (SMEs), which are faced with high electricity prices, allowing them to increasingly control their energy bills.

An EC staff working document entitled "**Best practices on Renewable Energy Self-consumption**"[18] gives insight into lessons learned from national schemes on self-consumption of renewable energy and illustrates best practice in this relatively new policy area. It reports on savings and benefits from self-consumption, best practices, and existing national schemes. The information is valuable especially for the business development part in the project.

3.2 Data privacy – Relevant European Regulation

European regulation provides a high level framework for ensuring data privacy throughout the research process. By adopting the Data Protection Directive of 1995 (Directive 95/46/EC) the European Union set legally binding rules for the protection of individuals with regard to the processing of personal data. Through this regulation basic principles for processing personal data have been stipulated which have to be followed in all Member States:

Transparency: The data subject has the right to be informed when his personal data are being processed. The controller must provide his name and address, the purpose of processing, the recipients of the data and all other information required to ensure the processing is fair. (art. 10 and 11). Data may be processed only under the following circumstances (art. 7):

- when the data subject has given his consent
- when the processing is necessary for the performance of or the entering into a contract
- when processing is necessary for compliance with a legal obligation
- when processing is necessary in order to protect the vital interests of the data subject
- when processing is necessary for the performance of a task carried out in the public interest or in the exercise of official authority vested in the controller or in a third party to whom the data are disclosed
- when processing is necessary for the purposes of the legitimate interests pursued by the controller or by the third party or parties to whom the data are disclosed, except where such interests are overridden by the interests for fundamental rights and freedoms of the data subject

The data subject has the right to access all data processed about him. The data subject even has the right to demand the rectification, deletion or blocking of data that is incomplete, inaccurate or isn't being processed in compliance with the data protection rules. (art. 12)

[18] SWD(2015)0141 final

Legitimate purpose: Personal data can only be processed for specified explicit and legitimate purposes and may not be processed further in a way incompatible with those purposes. (art. 6 b)

Proportionality: Personal data may be processed only insofar as it is adequate, relevant and not excessive in relation to the purposes for which they are collected and/or further processed. The data must be accurate and, where necessary, kept up to date; every reasonable step must be taken to ensure that data which are inaccurate or incomplete, having regard to the purposes for which they were collected or for which they are further processed, are erased or rectified; The data shouldn't be kept in a form which permits identification of data subjects for longer than is necessary for the purposes for which the data were collected or for which they are further processed. MS shall lay down appropriate safeguards for personal data stored for longer periods for historical, statistical or scientific use. (art. 6) When sensitive personal data (can be: religious beliefs, political opinions, health, sexual orientation, race, membership of past organisations) are being processed, extra restrictions apply (art. 8).

3.3 Future EC data protection directive

Since the Directive 95/46 was firstly introduced, Data Protection Acts have frequently been amended by legislation with substantial changes especially during 2009 and 2010 widely driven by the essential changes in ICT related technology. In fact, the law on Data Protection is about to undergo the most fundamental change in 15 years. On 25 January 2012, the European Commission officially presented a first draft of the new data protection regulation for a comprehensive reform of the 1995 data protection rules on personal data processing across the European Union. On December 2015, the EC announced that an agreement was found with the European Parliament and the Council, following final negotiations between the three institutions (so-called 'trilogue' meetings). The Reform consists of two instruments:

- The General Data Protection Regulation will enable people to better control their personal data. At the same time modernised and unified rules will allow businesses to make the most of the opportunities of the Digital Single Market by cutting red tape and benefiting from reinforced consumer trust.
- The Data Protection Directive for the police and criminal justice sector will ensure that the data of victims, witnesses, and suspects of crimes, are duly protected in the context of a criminal investigation or a law enforcement action. At the same time more harmonised laws will also facilitate cross-border cooperation of police or prosecutors to combat crime and terrorism more effectively across Europe.

These new rules will become applicable two years after the agreement (early 2018).

3.4 Data privacy – Relevant national legislation / regulation

National regulation/legislation may, however, go beyond the principles set out in the Commission's Communication, or they may set out particular interpretation of the general principles stipulated by EU-level regulation. The table below briefly summarises national legislative situation in the countries covered by the proposed project. This will be taken into account throughout the project's life cycle.

See factsheets for further details.

3.5 Progress with smart metering (in households)

Data on smart meter deployment on public authorities or other large consumers is almost non-existent. The majority of studies focus on households. This section provides an overview about existing information to provide an overview on data frequency, roll-out of meters and available pricing models in the market.

Member States are required to ensure the implementation of smart metering under EU energy market legislation in the Third Energy Package. This implementation may be subject to a long-term cost-benefit analysis (CBA). In cases where the CBA is positive, there is a roll-out target of 80% market penetration for electricity by 2020.

Information (data) frequency

As part of the 2016 energy package the European Commission evaluated the "EU Framework for Metering and Billing of Energy Consumption" [19] The data focuses mostly on households. Regardless, it should be noted that Finland was the only country in 2014 to legally demand billing (i.e. consumption) information on a daily basis for electricity (p 37). Though frequency requirements increase with smart meters being present, numerous countries opt for less than monthly requirements.

Smart-metering roll-out

With regard to electricity, in 2014, DG ENER and JRC issued the communication "Benchmarking smart metering deployment in the EU-27 with a focus on electricity"[20]. The depictions include results of the assessment of which some assumptions and national policies might have changes in the mean time.

Exhibit 1 - Smart electricity metering roll-out

[19] SWD(2016)399 EVALUATION of the EU Framework for Metering and Billing of Energy Consumption
[20] COM(2014)356, graphics available from http://ses.jrc.ec.europa.eu/smart-metering-deployment-european-union

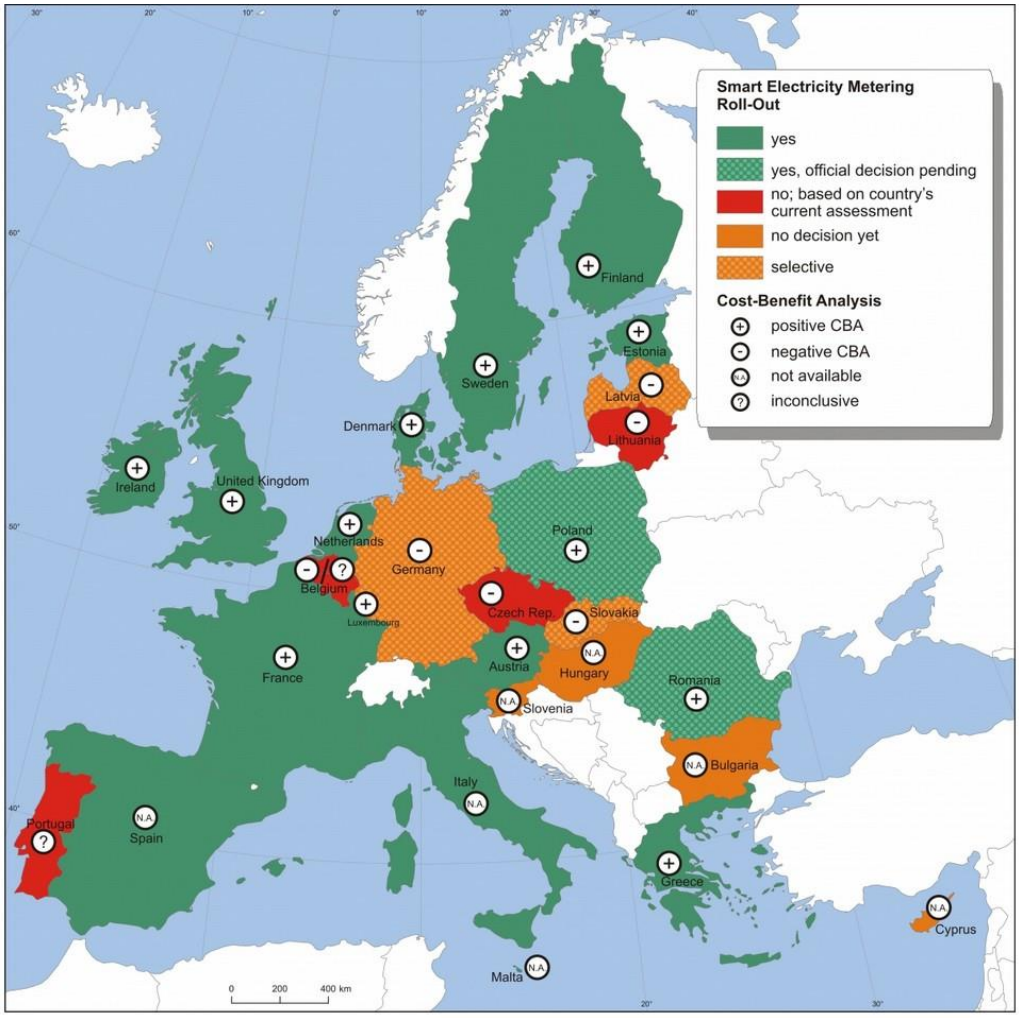
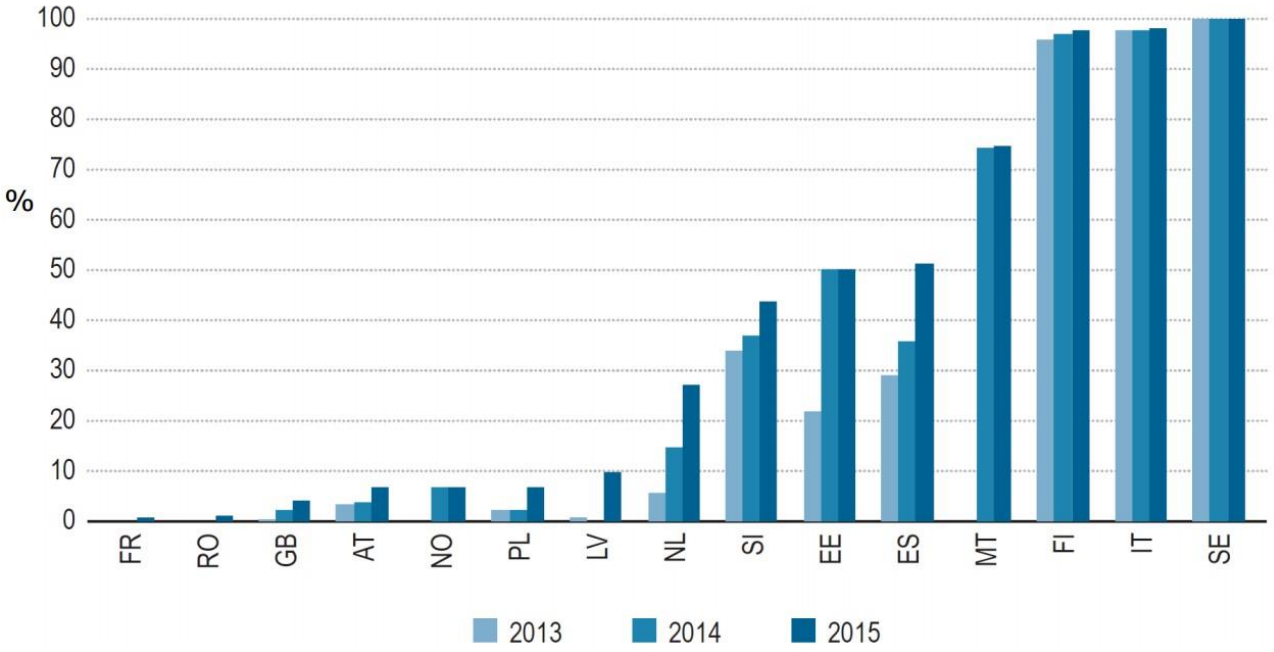
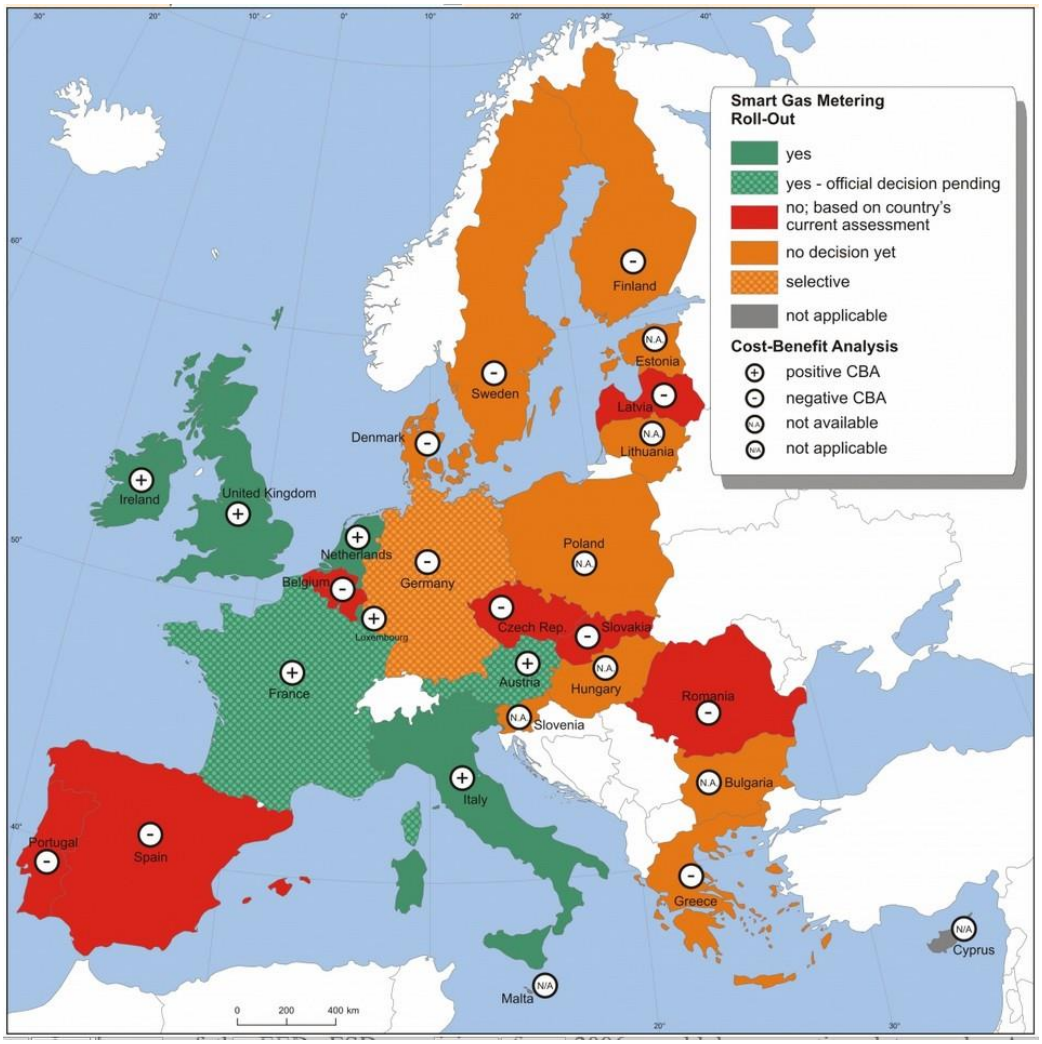


Exhibit 2 - Share of households with smart-metering



Source: ACER presentation on The 5th Annual Report on Monitoring the Electricity and Natural Gas Markets, 9.11.2016

Exhibit 3 - Smart gas metering roll-out

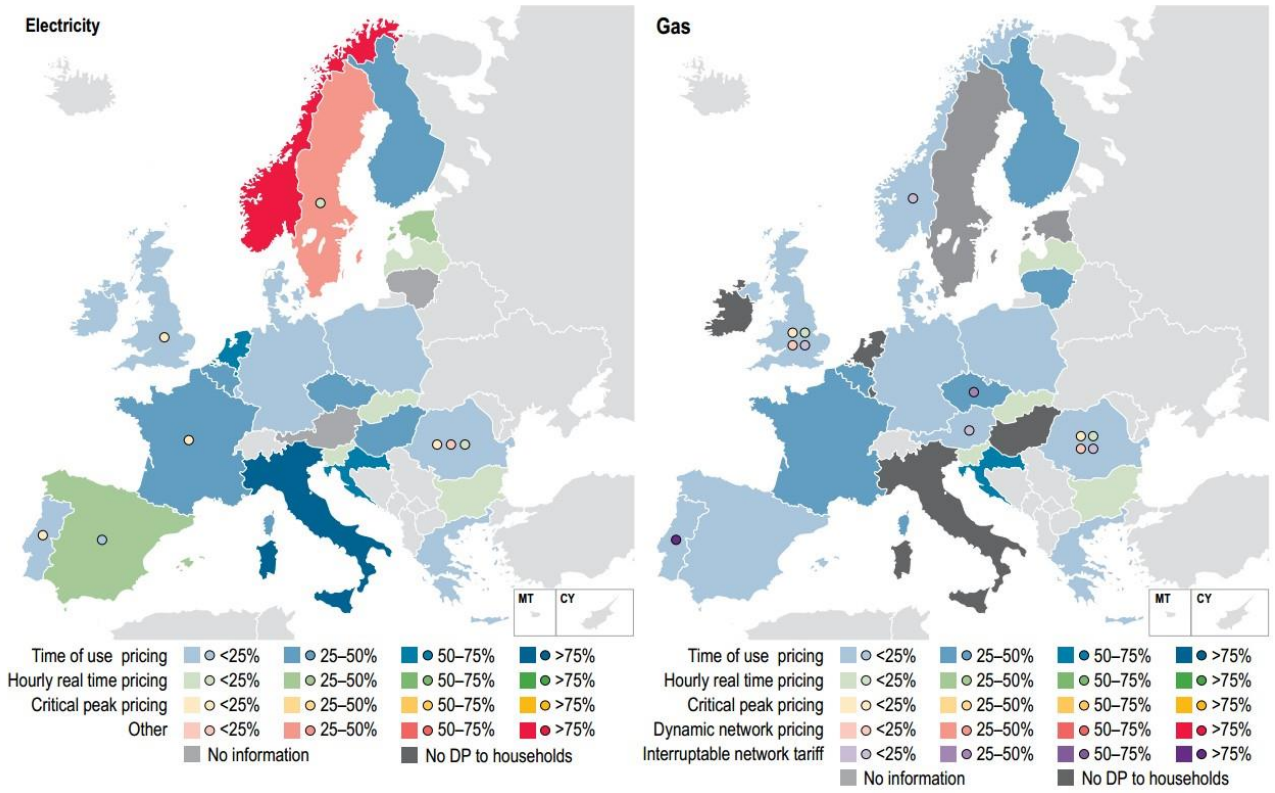


Pricing

The most complete and up-to-date source is the yearly ACER "Market Monitoring Report" from which below graphic stems (2016 report). For a detailed analysis it is recommended to download the full report[21].

[21] http://www.acer.europa.eu/Official_documents/Publications/Pages/Publication.aspx

Exhibit 4 - Share of standard household consumers supplied under dynamic pricing for supply and network charges of electricity in EU MSs – 2015 (%)



Source: ACER Questionnaire on dynamic pricing (2016).

"Note: Countries are coloured according to the dynamic pricing method which is the most representative. The coloured dots represent additional dynamic pricing methods which also appear in a country. For example, in Spain 25 to 50% of households incur hourly realtime pricing. However, ToU also applies in supply to less than 25% of electricity households. The Figure does not list pilot projects which are currently ongoing in the MSs. In Belgium, information has been aggregated and may differ for the three regions (Flanders, Wallonia and Brussels). No information could be provided for the network tariffs in Sweden, as the data collected by the NRA are based on exit points rather than household consumers (one exit point can represent several household consumers). 'Other' in Denmark and Norway refers to spot-based pricing to consumers on the basis of monthly spot-exchange prices."

4 Factsheets

4.1 Germany

4.1.1 Progress with smart metering

Today, only a very small number of residential households have smart-metering deployed in their homes. The time frame considered in law (MsbG) for full replacement of old meters reaches up to 2032. In all instances, replacement only has to take place if technically feasible and economically justified. Economical criteria are defined in §31 based on age of meters, amount consumed / power installed and fees charged for meters. Hence, installations could be delayed if fees are adjusted. Respectively, knowledge of fee and consumption are also are an explicit right for the installation of a smart meter.

4.1.2 Smart metering regulation

In Germany, the Law for the digitalization of the energy transition (Messstellenbetriebsgesetz - MsbG[22]) has entered into force at the beginning of September. It distinguishes between:

1. Customers with a higher consumption and/or bigger renewable energy feed-in systems, who will be equipped with a so-called “intelligent metering system” (ca. 15% of the market).

2. Customers with a consumption below 6000 kWh/a and/or feed-in systems < 7,5kW peak , who will be equipped with a so-called “modern metering equipment” (ca. 85 % of the market).

The law covers metering data, market communication, contractual arrangements related to metering, electricity/gas heating/district heating. Metering data will be stored directly at the smart meter device. Data up to 24 months can be downloaded either directly from the smart meter or from a server/database via the internet at any time by the customer (download my data) and shared with third parties (transfer my data). The supplier, who has the right to use the data, is obliged to delete all person-related metering data after the completion of his tasks. However, at the moment there is no clear definition concerning options to transfer the metering data out of the meter electronically.

On-going work

The technical specifications of data protection requirements for smart meter gateway are not complete[23]. The process is let by BSI (Federal Office for Information Security). The technical body for related standards of metering is DKE/K 461[24].

4.1.3 Data protection

The Federal Data Protection Act (Bundesdatenschutzgesetz) adopted in 18 May 2001, published in the Bundesgesetzblatt I Nr. 23/2001, page 904 on 22 May 2001.

[22] https://www.gesetze-im-internet.de/messbg/BJNR203410016.html

[23] https://www.bsi.bund.de/DE/Themen/DigitaleGesellschaft/SmartMeter/UebersichtSP-TR/uebersicht_node.html

[24] https://www.dke.de/de/ueber-uns/dke-organisation-auftrag/dke-fachbereiche/dke-gremium?id=2000162&type=dke%7Cgremium#

The purpose and scope of this act is specified in Section 1. It states that the "Act shall apply to the collection, processing and use of personal data" to the "public bodies of the Federation" and to the "public bodies of the Länder (states) in so far as data protection is not governed by Land legislation and in so far as they (a) execute federal law or (b) act as bodies of the judicature and are not dealing." The Act shall apply also to the "private bodies in so far as they process or use data in or from data files in the normal course of business or for professional or commercial purposes." With "personal data" is meant "any information concerning the personal or material circumstances of an identified or identifiable individual (the data subject)" (section3). Further in section 3 by "Collection" is meant "the acquisition of data on the data subject, by "Processing" "the storage, modification, communication, blocking and erasure of personal data", and "any utilization of personal data other than processing" is meant by"use".

As the Federal Republic of Germany is a federation of 16 states, and all of them with their own original sovereign rights and legislative responsibilities, there exists a patchwork of laws and regulations covering data protection in these 16 German states which work alongside the Federal Data Protection Act 2001. A number of different authorities responsible for making sure the compliance of data protection laws and regulation are present in Germany, this resulting from the division of the supreme power of the State between the federal and the state governments. The States are responsible for the data protection supervision in the private sector, except the telecommunications and postal services companies that are monitored by the federal government, and more concretely by the Federal Data Protection Commissioner. In fact, the states have no uniform system concerning the private sector supervision as the supervisory functions are performed by different authorities in different states. Concerning the public sector in the states, supervision of compliance with data protection is under state government responsibility which has assigned this function to independent supervisory authorities (data protection commissioners). The Federal Data Protection Commissioner is responsible for monitoring the compliance of data protection laws and regulations by the federal authorities and other public bodies under the federal government control.

4.2 Spain

4.2.1 Progress with smart metering

Around 50% of residential households are equipped with smart-metering. The roll out of the smart meters in Spain will be completed by the end of December 2018. The progress also applies to non-residential buildings.

Spain is only one of five countries which offer real-time pricing. Around 25-50% of all households incure their supply charges based on hourly pricing. Since October 2015, Spanish household consumers on Precio voluntario al pequeno consumidor (PVPC) who are equipped with smart meters are billed based on metered hourly consumption. For more details on PVPC, see Case study 3 in the 2015 MMR.[25] Furthermore, general time-of-use tariffs are used by less than 25% of customers. As for gas, overall, less than 25% use time-of-use pricing.

[25] ACER(2015) Market Monitoring Report 2014 - ELECTRICITY AND GAS RETAIL MARKETS

4.2.2 Smart metering regulation

The Spanish Regulations Real Decreto 216/2014 and Resolución 6203/2015 set the framework for DSOs when it comes to consumption information (hourly load profiles) to be provided the end users (less than 15 kW of contracted power). From 1st October 2015, DSOs are required to publish the hourly load profiles and traders to bill their customers according to the hourly load profiles, if customers already have their smart meter integrated in the smart meter system.

Each DSO also provides a web site that allows to customers connected to its distribution network to consult and download their hourly load profiled (once billed). These load profiles are sent daily to traders, and customers are billed monthly according to their consumption profile. The format could support any granularity, beside the hourly used.

DSOs also provide the possibility to customers to download in flat-file format CSV and Excel, the load profile made available to the trader for billing purposes. The file is accompanied by a graph representing the hourly data for the billing period. The file format to be used is unique for all DSOs in Spain and is specified in the regulation. Metering data from smart meters is stored in the DSO's metering management system.

The DSOs send the data to traders through secure FTP. Traders can only access their customers'

data. Access to non-customers' data is possible only upon explicit consent.

4.2.3 Data protection

Personal Data Protection Law(1999) ORGANIC LAW 15/1999 of 13 December on the Protection of Personal Data(Organic law 15/99)

The protection of personal data is enshrined in the Spanish Constitution through Article 18.4 which requires that the law shall restrict the use of data in order to protect the honour and the personal and family privacy of Spanish citizens, as well as the full exercise of their rights. This provision was further developed by Organic Law 5/1992 on the Regulation of the Automatic Processing of Personal Data, as amended by Organic Law 15/1999 on the Protection of Personal Data. This law corresponds to European legislation. In the Royal Decree 1720/2007, the Rule Development of Personal Data Protection Law is approved. This Decree aims at regulating possible risks of Personal data treatment.

Safety of medical information 41/2002

In law 41/2002 the safety of medical information is set out. It states that: "Health Centres must establish an active and diligent mechanism to safeguard medical records"

Royal Decree 994/199

This law might also be relevant as a legislation dealing with safety and security of medical and personal data. It states that databases that contain medical and personal data must be given maximum security

4.3 United Kingdom

4.3.1 Progress with smart metering

The rollout is to be finalised by 2020. National data does only divide between domestic (residential) and smaller non-domestic installations.

As at 31 December 2016 there were 923,600 (207,900 gas and 715,700 electricity) nondomestic smart and advanced meters operating in smart mode or with advanced functionality by both large and small energy suppliers. This represents over one quarter of all non-domestic meters currently in operation.

According to the Smart Meters, Quarterly Report to end December 2016 (30 March 2017), that as at December 2016 there are 4,947,000 smart meters installed and operating in domestic properties across the UK. There are 923,600 non domestic smart meters in operation too. Therefore there are over 5.87 million smart meters in operation in homes and businesses by large and small suppliers across the UK.

Real-time pricing and critical peak pricing applies to a smaller proportion of households in the UK (<25%). As for gas, various methods are used for pricing. Most dominant is time-of-use pricing with a share of 25-50%. Other methods with less than 25% are critical peak, hourly real time, dynamic network pricing and interruptible network tariff.

4.3.2 Smart metering regulation

Since April 2011, the Department for Energy and Climate Change (DECC) (now Department for Business, Energy and Industrial Strategy, BEIS) has been directly responsible for managing the implementation of the smart meter programme. Ofgem has been providing DECC / BEIS with independent regulatory advice and expertise. Ofgem has also taken on additional regulatory functions to support smart metering. Ofgem will continue to take on new functions, including regulation of the new Data and Communications Company (DCC).

Through the Smart Metering Implementation Programme and consistent with the UK Government's broader "midata" initiative, arrangements have been put in place to enable domestic consumers to easily access their own energy consumption data. A broad information (SMART Energy GB) has started in 2015 in Leicester[26].

In the UK the Smart Metering Programme is being delivered in two key stages. A foundation stage and a main installation stage. In the UK, installers are responsible for planning and delivering the roll out of smart meters as best suits their business needs and the needs of their customers. The only condition specified by Government is that the roll out is completed by 2020. The number of installations are monitored by BEIS, however some fluctuation in installations is expected across periods.

Consumers will be able to access their own energy consumption data through:

- Their In-Home Display (offered to all households free of charge) in near real time;
- The connection of additional devices to a Home Area Network as part of their smart metering system;
- Requesting information from their supplier;

[26] https://www.smartenergygb.org/en/about-smart-meters/what-is-a-smart-meter

- Authorised third party organisations (such as switching websites) to access their consumption information directly from their smart meters via the Data and Communications Company (DCC).

In order to protect consumer interests whilst enabling proportionate access to data by energy suppliers and others, a Data Access and Privacy Framework has been established. The central principle of this Framework is that domestic consumers will have control over how their energy consumption data is used, except where this is required for billing or other regulated purposes.

Data can be accessed by authorised parties (subject to consumer consent) directly from the smart metering interface in the premises or through the Data and Communications Company (DCC). The solutions available address both “download my data” and “share my data”.

In addition to energy suppliers and network operators, authorised third parties of the DCC, such as price comparison websites, home automation services and energy efficiency advice providers (as well as prospective suppliers). These third party users must obtain the explicit consent of the consumer before accessing their consumption data through the DCC.

In order to protect consumer interests whilst enabling proportionate access to data, a Data Access and Privacy Framework has been established. The central principle of this Framework is that domestic consumers will have control over how their energy consumption data is used, except where this is required for billing or other regulated purposes.

The local interface to the meter is standardized (ZigBee Smart Energy). Consumers can request up to 24 months of detailed energy consumption information directly from their energy supplier. Where such a request is made, the information must be provided to the consumer free of charge and in a readily understandable format.

Smart meters store 13 months of half hourly data for electricity and gas. Most energy suppliers rolling out smart meters offer the ability to view the data on their website. 30 minutes’ data is available remotely, while 10 seconds (electricity only) is available via the smart meter.

Information can be available on real time or updated every day, depending on the energy supplier, customer proposition and whether the access is granted via an app or the webpage.

The DCC is responsible for linking smart meters in homes and small businesses with the systems of energy suppliers, network operators and energy service companies. DCC will develop and deliver the data and communications service through external providers.

DECC granted the DCC licence to Smart DCC Ltd, a subsidiary of Capita plc with effect from 23 September 2013.The Smart Energy Code is a new industry code and sets out the terms for the provision of the DCC’s services and specifies other provisions to govern the end-to-end management of smart metering. Like other industry codes, Ofgem is responsible for approving any modifications to ensure consumers’ interests remain protected.

Some customers have had smart meters installed before the completion of the government’s regulatory framework for the smart meter roll-out. We have put in place measures to protect consumers who receive smart meters early. These include measures to:

- support effective switching for domestic consumers that have smart meters installed
- strengthen existing protections for domestic consumers, especially vulnerable consumers, in relation to disconnection and the use of meters operating in prepayment mode

The Smart Metering Installation Code of Practice (SMICoP) is an important consumer protection measure during the rollout of smart meters, setting out rules and standards of conduct for suppliers installing smart meters.

4.3.3 Data protection

The Data Protection Act of 1998

The EU Data Protection Directive (DPD) was transposed into national legislation by the Data Protection Act of 1998. The act stipulates general rules for processing of information relating to individuals, including the obtaining, holding, use or disclosure of such information. Vital signs data is classified as "sensitive personal data" (section 1). "Data protection principles" are set out in Schedule 1 (section 4). As in DPD, "Processing" includes any storage ("holding") or transmission; the data do not have to be manipulated for their use to qualify as "processing". Schedule 1 specifies the first such data protection principle, for the case of sensitive personal data, as "Personal data ... shall not be processed unless ... at least one of the conditions in Schedule 2 is met, and ... at least one of the conditions in Schedule 3 is also met." Schedule 2 allows processing under at least three circumstances; processing is allowed if

The data subject has given his consent to the processing.

The processing is necessary

- for the performance of a contract to which the data subject is a party, or ...
- in order to protect the vital interests of the data subject."

Schedule 3 allows processing if consent is obtained i.e. if the data subject has given his explicit consent to the processing of the personal data. So in summary, the Act allows transmission and storage of vital signs and therefore vital signs triage by anyone, given the client's consent. Schedule 2 also allows processing if "6 (1) ... necessary for ... legitimate interests pursued by the data controller ... except where the processing is unwarranted" and allows the Secretary of State to specify what this means. However the Data Protection Act of 1998 covers personal data to a large extent. In relation to data on energy consumption in buildings etc. there are 2 further pieces of legislation: The Freedom of Information Act 2000 and the Environmental Information Regulations 2004.