Status Review on Regulatory Aspects of Smart Metering (Electricity and Gas) as of May 2009

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INFORMATION PAGE

Abstract

This document (E09-RMF-17-03) is an ERGEG status review of regulatory aspects of smart metering for electricity and gas.

This document seeks to initiate discussion on ERGEG's future work on Guidelines of Good Practice on regulatory aspects of smart metering policy in Europe.

Target Audience

Customer representative groups, distribution system operators, energy suppliers, energy customers, energy industry, policy-makers, academics and other interested parties.

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Related Documents

CEER/ERGEG documents

- Smart Metering with a Focus on Electricity Regulation, ERGEG Report (E07-RMF-04-03), 31 October 2007, http://www.energy-regula-tors.eu/portal/page/portal/EER_HOME/EER_PUBLICATIONS/CEER_ERGEG_PAPERS/Customers/2007/E07-RMF-04-03_SmartMetering_2007-10-31_0.pdf

External documents

- Directive 2006/32/EC of the European Parliament and of the Council on energy end-use efficiency and energy services and repealing Council Directive 93/76/EEC, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:114:0064:0064:EN:PDF
- Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:211:0055:0093:EN:PDF

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Executive Summary

The European Union's 3rd Package[1] and the Directive on energy end-use efficiency[2] contain provisions regarding the installation of "intelligent metering systems", with the aim of better informing customers of their consumption and helping to increase energy efficiency awareness. Intelligent meters (hereafter 'smart meters') were also an important issue at the first Citizens' Energy Forum which took place in London in October 2008, where the Forum invited ERGEG to prepare a status review on this issue in time for the second Forum.

This ERGEG Status Review provides an overview of the state of play regarding the introduction of smart meters in ERGEG member and observer countries. The report examines the issue from a regulatory perspective; that is to say according to 4 areas of particular importance when considering intelligent metering systems: meter value management; roll-out policy; access to data and privacy issues; and functional and technical aspects. Among other things, the report illustrates the diversity of approaches to smart metering, visible in part by the lack of common definitions to key concepts, even at national level.

The Status Review was prepared with the support of 2 internal questionnaires (electricity and gas) issued to national regulatory authorities (NRAs) in May 2009. For electricity, 25 of the 31 ERGEG members and observers provided input to this report. For gas, 21 of the 31 members and observers participated. It should be noted that participating NRAs did not necessarily respond to every query. In many cases, this is related to the presence or not of smart metering in each country. As this is a rapidly evolving policy area, readers are asked to note that the findings presented in this report (dating to May 2009) may be overtaken by ongoing or future policy decisions in the individual countries.

Meter Value Management

Meter value management concerns the collection, treatment and use of the data provided by utility meters. The approach to this management is central to market functioning and is the subject of much debate, in particular as regards functional and technical aspects (addressed in Chapter 9). As smart meters with additional functionalities and offering more data more frequently come online, the question of meter value management will become all the more important. The Status Review found that in most countries (23 out of 25 in electricity and 18 out of 21 in gas), the responsibility for the meters (installation, maintenance, meter reading, data management, etc) lies with the distribution system operator (DSO). In some countries, other bodies, such as a metering company or/and a supplier, could also be responsible for metering operations.

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[1] The 3rd legislative Package of the European Commission with proposals for the European Internal Market in Energy which was announced on 19 September 2007, included 5 legislative proposals: 2 amended Directives on the Directives of the European Parliament and of the Council amending Directive 2003/54/EC and Directive 2003/55/EC concerning common rules for the internal market in electricity and the internal market in natural gas, respectively; 2 amended Regulations of the European Parliament and of the Council Amending Regulation (EC) No 1228/2003 on conditions for access to the network for cross-border exchanges in electricity and Regulation (EC) No 1775/2005 on conditions for access to the natural gas transmission networks; and a new Regulation establishing an Agency for the Cooperation of Energy Regulators. The Package was finally adopted on 13 July 2009. http://eur-lex.europa.eu/JOHtml.do?uri=OJ:L:2009:211:SOM:EN:HTML

[2] Directive 2006/32/EC of the European Parliament and of the Council on energy end-use efficiency and energy services and repealing Council Directive 93/76/EEC

Roll-out policy

When examining roll-out policies, it is important to consider several basic issues contributing to the decision to introduce smart meters. These include the policy objectives behind the roll-out; its expected benefits; the use of a cost-benefit analysis; the regulator's role and the impact of smart meters on market processes.

An analysis of the diverse roll-out-policies for electricity and gas in Europe has not provided in a uniform picture. In **electricity**, Italy and Sweden have completed their roll-out for 90% and 99% of customers, respectively. In addition, 4 countries have decided a large scale roll-out of smart meters. Meanwhile, in a further 11 countries a roll-out is under discussion. In some countries, the roll-out is executed on a voluntary basis executed by DSOs, while in others it follows official legal provisions. In **gas,** there are fewer uptakes of smart meters, only Italy has a planned roll-out, while 4 countries are discussing the possibility. Several countries have decided that smart meters for gas are not presently economically justifiable.

The decision to introduce smart meters can be in part based on a cost benefit analysis. In **electricity**, 15 countries are or have conducted an assessment of the economic implications of smart meters. In **gas**, 11 countries are or have conducted this analysis. In some countries, the findings indicated that for a certain market the smart meters are not economically reasonable or efficient. That being said, some countries that have decided to introduce smart metering did not conduct a cost benefit analysis, illustrating the disparity in the rationales for smart metering in individual markets.

The report found that the most important policy objectives for supporting and encouraging a roll-out of smart meters in both **electricity and gas** are energy efficiency, peak load management and more frequent meter readings; with 15 countries for electricity and 10 for gas having mentioned all 3 or a combination of them as the main drivers. Meanwhile, the 2 most important regulatory tools for doing so are legal obligations and minimum functional requirements.

Regarding the possible expected benefits of a nationwide and standardised roll-out of smart meters for all domestic household customers, the Status Review found that for both **electricity and gas** the promotion of energy savings and energy efficiency was the most important benefit overall. Other areas where the responding countries see advantages are the possibility to develop new tariff models which better reflect consumption behaviour; to give information on the global peak of consumption and contribute to an accurate network management; and to better detect fraud.

In terms of the regulator's role in the roll-out process, many countries reported that for both **gas and electricity** the regulator would be involved in the definition of the roll-out timetable, the minimum technical standards or functionalities and the level of the return on investment (ROI). Meanwhile, the impact on the market actors was not considered to be great, with 5 countries in **electricity** and 2 in **gas** indicating that responsibilities would change due to the introduction of smart meters. The most often sited changes to market processes resulting from **electricity** smart meters (in terms of metering, connection, disconnection, complaint handling and other market processes) were the reduction of costs for the supplier and the DSO, improved fluidity of the process in question and an improvement in customer information. For **gas**, given the lower relevance of the issue, fewer countries responded and the answers were less conclusive.

Access to data and privacy issues

When it comes to discussions about smart metering in both **electricity and gas**, data privacy and access to data are important issues from the customer's point of view. General data privacy laws normally address data exchanges in any sector or industry. Smart meters, however, offer the possibility to collect much more data (including personalised data) than before. These new functionalities have led to discussions on adapting existing laws to specifically cover meter values. At the moment, 9 countries for electricity and 7 countries for gas do not have specific legislation regarding meter value data privacy. The responses to the questionnaire do not permit an analysis of what specific privacy rules exist.

In terms of access to data, the Status Review notes that in nearly all cases the DSO has access to most types of data (consumption, historical load curve, quality supply, etc). For **electricity**, in some countries the current supplier and competing suppliers also have access to the customer's data. For **gas**, this is less often the case. In both sectors, customers generally have access to their data, primarily through their bills, although not for all types of data (e.g. instantaneous power in electricity or supply quality in gas).

Functional and technical aspects

The definition of minimum requirements for functions, interfaces and standards is a key element of a regulatory framework for an efficient and working smart metering system. So far, 16 countries have prescribed or discussed different elements of minimum requirements for smart **electricity** meters. Not all these countries have included all the functions mentioned in the questionnaire (See Annex 1 - metering interval, remote control, communication protocol, etc.) in their country-specific requirements, so there is no visible uniform approach for the functional and technical aspects dealt with by regulators. In the **gas** sector, only 4 countries have prescribed some kinds of minimum requirements for smart gas meters.

However, the differences in the requirements themselves for each function illustrate that a discussion at EU-level is required to promote interoperability, standardisation and an effective and efficient approach to smart metering, as this has an direct impact on market functioning and customer choice.

Next Steps

While there are a number of similarities between the electricity and gas sectors, in particular as regards the basic issues in roll-out policy, the development of smart metering in each sector differs significantly. While in **electricity** there are already 4 countries with large-scale smart metering roll-outs, in **gas** only Italy has planned a roll-out.

This Status Review shows that much work remains to be done in order to ensure a sound future for smart metering in Europe. In particular, a common approach should be envisaged for defining smart meters and their functional requirements. In addition, a standard communication protocol and a transparent methodology for conducting a cost benefit analysis would contribute to the interoperability of this evolving technology. At this stage, the number of roll-outs and projects differ between ERGEG members and observers. Topics such as meters' functionalities and the stage and timeframe of roll-outs are very complex and may very well undergo substantial and further changes, in particular as the provisions on metering in the 3rd Package (see Annex I) are implemented and as various European initiatives work on standardisation issues. ERGEG therefore plans to continue its dialogue and analysis with stakeholders and to develop Guidelines of Good Practice (GGP) on regulatory aspects of smart metering.

1   Introduction

The traditional energy meter, currently installed in most households in Europe, was developed at the beginning of the 20th century. The development of computers and digital communication during the last 20 years has brought substantial changes in technology, which can also be translated to utility meters. Digital, electronic intelligent (smart) meters are able to log metered data, manage different and individual tariff models, or monitor voltage parameters such as quality. This new generation of meters offers many advantages to both customers and market systems as a whole.

The need for a status review and detailed analysis of smart meters in Europe was raised at the first Citizens' Energy Forum in London in October 2008. The Forum expressed a strong interest in this topic and asked the European Regulators Group for Electricity and Gas (ERGEG) to prepare a status review on smart metering for electricity and gas to present it in time for the second Forum. This status report should focus on minimum technical functionalities and minimum system capabilities of smart metering systems. Additionally, it should also give an overview of cost benefit analyses that have been carried out and cover privacy and data protection issues that are related to smart metering.

At European level, several legislative acts refer to smart meters. Directive 2006/32/EC on energy end-use efficiency and energy services (Article 13) mentions the use of advanced metering systems to improve energy efficiency awareness and to inform the customers better about their own consumption.[3] In addition, the recently adopted Directives of the 3rd Package[4] will also have an impact on the deployment of new metering systems, given new provisions in Annex A (now "I") of the Electricity and Gas Directives (2003/54/EC and 2003/55/EC, respectively) requiring Member States to "ensure the implementation of intelligent metering systems that shall assist the active participation of customers in the electricity supply market", subject to a positive cost-benefit analysis. Customers shall also be properly informed of their actual consumption and costs frequently enough to enable them to control their own electricity consumption. In electricity, where a roll-out of smart meters is assessed positively, at least 80 % of customers shall be equipped with intelligent metering systems by 2020. In addition, Member States, or any competent authority they designate, shall ensure the interoperability and the use of appropriate standards of smart metering systems, having regard to the importance of the development of the internal market in electricity.[5]

There are several European initiatives supported by the European Commission currently addressing aspects of smart meters, including 7th Framework Programme projects, such as the Open Meter Project, and an official mandate from the Directorate General for Enterprise to CENELEC, CEN and ETSI for the development of an open architecture for utility meters involving communication protocols and functionalities enabling interoperability. The general objective of this mandate is to create European Standards that will enable interoperability of utility meters (water, gas, electricity, heat), which can then improve the means by which customers' awareness of actual consumptions can be raised in order to allow timely adaptation to their demands. The mandate envisages that harmonised solutions for additional functions shall be completed within 30 months of the acceptance of the mandate (in May 2009). ER-

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[3] Directive 2006/32/Ec of the European Parliament and of the Council energy on end-use efficiency and energy services and repealing Council Directive 93/76/EEC

[4] See Footnote 1.

[5] Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC

GEG is fully involved in this work and has nominated a permanent representative to interface with the European Commission and the standardisation bodies.

Smart metering systems allow interval metering for both active and reactive energy, consumed and injected into the network, thereby contributing to more accurate balancing, losses and cost calculation, in order to promote peak/off-peak prices and to discourage bad practices in the use of the network. New smart metering technologies will provide information on quality of supply at each connection point, contributing to more effective investments and grid renovation plans, thus increasing security of supply. Because of the accurate information smart meters can provide on actual time of use, customers should feel encouraged to increase their efficiency in consuming energy and be part of demand-response plans. Finally, smart metering systems accelerate supplier switching processes and in general commercial transactions towards customers.

ERGEG is keenly aware of the importance of the future development of smart meters, not only for customers, but for market functioning as a whole. Following an internal status review in 2006, ERGEG published a report in 2007 on "Smart Metering with a focus on Electricity Regulation" (E07-RMF-04-03), which identified a number of issues relevant for regulators and setting out recommendations for regulators. Annex 1 of the report presents the main findings of the 2006 internal Status Review.

Methodology

ERGEG issued two internal questionnaires, electricity and gas respectively, to its members and observers. The questionnaires covered 4 areas of particular importance when considering intelligent metering systems: meter value management; roll-out policy; access to data and privacy issues; and functional and technical aspects.

The responses to the questionnaires informed this status review. Readers should note that not all the possible response options are shown in the tables and figures; only those selected by at least 1 NRA. Furthermore, it should be mentioned that not all countries responded to all questions, so the dataset for some countries is partly incomplete, making it difficult to draw general conclusions. The terms smart meters and intelligent meters are used interchangeably in this report.

The Status Review is divided into two main parts: one for electricity and one for gas. More detailed information regarding some of the questions can be found in Annex 1.

In **electricity**, 25 ERGEG members and observers replied to the questionnaire.

In **gas,** 21 ERGEG members and observers completed the questionnaire.

Definitions

As part of ERGEG's analysis of the state of play of smart metering in Europe, it was important to obtain a first impression of countries' policies and activities in this area. One basic indicator is therefore the existence of definitions for key terms associated with this field, namely 'smart meter' and 'mass market'. In order to assess regulatory aspects of the introduction of smart meters and what needs to be done from a European perspective in order to ensure a coherent and compatible approach, ERGEG asked NRAs to indicate how these key terms are defined nationally. The responses indicate some basic commonalities, although they also illustrate the differing approaches and practices in this area and the lack of a common vision of smart meters. Below is a sampling of the individual NRA responses.

- Definitions Smart Meters Electricity

There is no international, universal standard definition of the term "intelligent" or "smart" meter. Countries where asked if they have a definition.

By way of background, ERGEG's 2007 report on "Smart Metering with a Focus on Electricity Regulation" (E07-RMF-04-03) specified that the term smart metering is not restricted to the meter device alone, but also includes the whole system behind it, the communication and IT infrastructure connecting the meter and customer (e.g. display) and also the meter and the (central) meter control centre, where the meter data is administrated and meters are remotely operated. Smart metering in the context of this definition therefore refers to the entire meter data infrastructure, fulfilling or partly fulfilling the following main specifications:

- Interval meter data (load profile measurement);

- Remote meter reading, data processing to market players;

- Remote meter management (power reduction, disconnection, demand management, etc.);

- Measurement of consumption and generation by distributed units;

- Remote meter parameters such as tariff structures, contractual power, meter interval, etc.;

- Remote message transfer from market players to the customer (customer/generator) as e.g. price signals;

- Information display on the meter and/or communication port for external display;

- Main communication port (e.g. GPRS, GSM, PLC, etc.) ;

- Power quality measurement (incl. continuity of supply and voltage quality);

- Communication port for collection and transmission of other metered data (e.g. gas, heat).

Austria has defined the smart meter in the Austrian system charges regulation from 2009 as: "A smart meter is an electronic, remotely read, digital electricity meter, which measures the electrical work and its time of usage without measuring the electric power of the customer." The so-called system charges regulation is adapted and issued by the Austrian regulator, E-Control, every year and determines the regulated tariffs for all kinds of network-related services, including the metering services.

The **Czech Republic** does not have a definition, but from the regulator's point of view an intelligent meter should measure data on consumption in the customer's house, collect data and support two-way communication between the meter and the data collection system. The system of intelligent meters should be prepared for installation of supplementary equipment i.e. display.

Denmark stated that there is no common definition, so the term intelligent meter covers all meters from one-way automatic reading meters to technologically advanced meters, which e.g. can be connected to the customer's own computer either by a cable or a wireless transmission.

In **France**, the regulator has defined four main objectives to be reached with the roll-out of an intelligent meter system. For customers, this means that they must have access to their consumption data easily and as often as possible. Energy suppliers must have the opportunity to develop new offers based on tailored tariffs depending on different hourly periods within a

day. An intelligent metering system must also allow the system operator to bill the network tariff and to manage security of supply aspects. In order to reach all these aims, intelligent meters must at least support "two-way" communication system. This means communication not only from the meter to the data acquisition system in order to transfer up consumption data in real time, but also from the data acquisition system to the meter in order to adapt remotely its "parameters" (connected load, tailor tariff, etc.). For the French regulator, an automated meter management (AMM) or intelligent metering system must also allow the management of remote operations (connections / disconnection, tariff change, etc.)

In **Germany**, there is no legal definition of "intelligent meters". According to the vocabulary of European and German legal texts, the German government is interested in the implementation of "meters that accurately reflect the final customer's actual energy consumption and that provide information on actual time of use. Currently these kind of meters need to be installed by the metering operator in buildings that are newly connected to the energy grid and in those buildings that are subject to major reconstruction. The German government is consulting on proposals for a roll-out of smart metering within a possible 6 year timeframe.

Great Britain has different terms which are all related to intelligent metering systems:

- AMR - Advanced Meter Reading - used to describe a metering system that permits remote meter reading,

- Smart Metering - used to describe a metering system that supports two-way communications, remote connection/disconnection, export metering, local display devices, etc.

The UK Government is currently consulting on proposals for the roll-out of smart metering over a 10-year period. This will include an implementation programme that will determine specifications and interoperability arrangements.

In **Hungary**, the regulator uses the term "smart metering" according to the definition and usage of ERGEG 2007 report "Smart Metering with a Focus on Electricity Regulation".

In **Italy**, although the regulator has promoted a nationwide roll-out, there is no official definition. Usually, "intelligent meter" or "smart meter" are terms used to identify the electronic device used for AMM purposes, complying with all the functional requirements given by the regulator.

In **Norway**, it is not common to use the phrase "intelligent meter". On the other hand, the phrase AMS is used, which in English is an abbreviation for "Advanced Metering and Management System". In its basic form, AMS comprises 3 main components: an advanced meter, a data collection/front end system and a two-way communication system between the meter and the data collection system. It should be possible to install supplementary equipment e.g. display, if the customer requires it, but then at the customer's own expense.

In **Poland**, an official definition is not available. The meaning of "intelligent meters" in Poland is equivalent to the meaning of "intelligent metering" understood as a common system for data observation, collection and management founded on a bi-directional two-way communication system, being able to transfer sets of data, information and commands with intervals of sampling adequate to realised assumed functions (from 1 hour to 1 minute).

There is no official definition of intelligent meters in **Portugal**. Nevertheless, intelligent meters are generally considered to be meters with 15 minute consumption discrimination and with two-way remote communication. Under a government mandate, the Portuguese regulator, ERSE, issued a proposal at the end of 2007 on basic sets of functionalities and a roll-out plan (after public consultation), also suggesting the implementation of a pilot test with a sig-

nificant number of intelligent meters, in order to provide input to the study, to validate the assumptions made and to enable more detailed and cost-based proposals on minimum functionalities. To date, there have not been any developments.

Although there is no 'standard definition' for smart metering in **Spain** in legislation regarding compulsory new meter systems, the Spanish regulator can state that smart metering implies hourly recording and remote management. This implies remote parameterisation of time zones, remote reading of active and reactive consumption (according to hourly parameterisation) and maximum consumption power, remote synchronisation, remote power control (even disconnection) and event recording (such as illegal access or outages).

In **Sweden**, there is no definition of the term smart meters. The expressions "remotely read meter" or "remote access meter" are used. Swedish definitions refer to the key element of the remote access to the meter.

Summary

Many of the responding countries do not have a definition for an intelligent or smart electricity meter. There is also no single term for a smart or intelligent meter, some countries call them "intelligent meter", others "smart meter" and yet others refer to AMM or smart metering systems. The lack of a common definition makes implementation and a common understanding difficult. This problem is relevant to both the 3rd Package and the Directive on end-use efficiency, which require intelligent meters but do not provide a definition which could be applied across the European Union.

For the majority of the countries, the ability to access the meter remotely is an essential function. And for 15 countries, the so-called "two-way communication" or AMM[6] function is key to identifying smart meters.

- Definitions Smart Meters Gas

At this stage, there is no ERGEG definition of smart metering for gas.

In **France**, there is no "official" definition of intelligent meters in gas, but DSOs, energy suppliers and third parties have defined what they estimated, for mass market, for gas intelligent meters:

- to get a meter reading value more frequently, and ideally each month, in order to improve data used for billing;
- to get, if needed and on demand, the customer's consumption history or his/her load curve history.

In order to reach these two aims, the actors agreed that an automated meter reading (AMR) system was suitable enough. This means that the intelligent meter has to support only a one-way "communication system" (from the meter to the data acquisition system).

In **Germany**, there is, as in the electricity sector, no legal definition of "intelligent meters" for gas. But according to the vocabulary of European and German legal texts, the German gov-

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[6] Automated Meter Management: Technologies which allow a two-way communication between the meter and the data collector.

ernment is interested in the implementation of "meters that accurately reflect the final customer's actual energy consumption" and that provide information on actual time of use.

Great Britain has the same definitions for the smart gas meter as for the smart electricity meter:

- AMR - Advanced Meter Reading - used to describe a metering system that permits remote meter reading;

- Smart Metering - used to describe a metering system that supports two way communications, remote connection/disconnection, export metering, local display devices etc.

The UK government is currently consulting on proposals for the roll-out of smart metering over a 10-year period. This will include an implementation programme that will determine specifications and interoperability arrangements.

In **Italy**, a nationwide roll-out has been introduced also for gas meters. As in electricity, no "official definition" has been given. Usually "intelligent meter" or "smart meter" are used to identify the electronic device used for AMM purposes, complying with all the functional requirements given by the regulator.

In **the Netherlands**, they call intelligent meters for gas "remote access meters". A smart gas meter means that the gas data is communicated via the electricity unit, meaning that all technical/operational issues are exactly identical to electricity.

Slovenia defines an intelligent meter for gas as a meter which allows two-way communications between system operators and customers.

In **Spain**, there is an obligation to install so-called "telemeters" for all clients with an annual consumption > 5.000.000 kWh/y (about 2.500 clients have a daily telemeter - with hourly recorded information - in Spain, representing 80% of gas demand).

Summary

In the gas sector, there are 7 European countries with a definition for smart meters. As in the electricity sector, for at least 4 countries the two-way communication is one key element of the definition of a smart metering system. Again, the differing interpretations and levels of progress in this area, demonstrate the need for further clarity and consistency.

- Definition mass market Electricity

The report relates only to smart meters in the mass market. The concept of mass market differs highly from other markets and there is no common definition among the ERGEG members and observers. It is of extreme importance to understand the different approaches, in order to make sure that data is comparable.

5 countries namely Austria, Czech Republic, Denmark, Germany and Norway define the mass market **by consumption**. In **Austria** and **Norway**, the electricity mass market is defined as one including customers up to a yearly consumption of 100.000 kWh. The same goes for **Denmark**, where they are considering changing this limit to a yearly consumption of < 25.000 kWh. In the **Czech Republic** it is defined as a market for customers of low voltage level, as high voltage and very high voltage levels are known as a wholesale market. In **Germany**, the mass market consists of household customers, who purchase energy primarily for their own household consumption or for their own consumption for professional, agri-

cultural, or business purposes and who do not exceed annual consumption of 10.000 kWh. These customers are entitled to a supplier of last resort. The mass market also includes larger customers with an annual consumption of up to 100.000 kWh. Both groups are standard load profile customers.

5 countries, namely Estonia, Finland, France, the Netherlands and Sweden define the mass market as being dependent on the customer's **fuse**. For **Estonia** and **Sweden**, small customers with a fuse up to 63 Ampere are part of the mass market. For **Finland**, all small customers with a main fuse of no more than 3 x 63 Ampere are part of the mass market. **Hungary** uses the same definition as Finland and furthermore includes some public institutions in the mass market. **The Netherlands** defines the mass market as including all small users, having a max. capacity flow of 3 x 80 Ampere, consisting of house

In **France**, all household and small business customers whose connected load is under or equal 36 KVA are part of the mass market.

The **British** government's proposals for smart metering will cover all domestic (household) customers. Proposals are also expected to cover non-domestic customers with different requirements for small/medium sized enterprises (SMEs) and larger non-domestic customers.

For **Iceland** and **Poland**, the definition is very general, as it is understood as the retail market for customers connected to distribution systems.

Ireland focuses on domestic and small to medium enterprise markets.

In **Italy**, the definition of mass market is quite similar to the definition included in Article 3 of Directive 2003/54/CE regarding the provision of universal service to small customers. The mass market consists of all household customers and small enterprises (namely enterprises fewer than 50 occupied persons and an annual turnover or balance sheet not exceeding EUR 10 million) connected to LV grid.

Luxembourg states that its definition applies to all residential and small non-residential customers although it is not a legal definition.

Portugal mentions that its mass market is considered to include all electricity customers at low voltage, up to 41,4 kVA.

For statistical purposes, **Spain** considers household customers as those with meter point type 5, which means that contracted power capacity less than 15 KW.

For some countries there is no such term as "mass market". For example, for **Greece**, it would be valid to assume that this term refers to all residential customers, as well as non-residential ones with a subscribed demand up to and including 25kVA (3x40 meter fuse), but there is no clear, formal definition. In **Romania** there is also no common definition, just the definition of households and small businesses. Small business customers are defined as those with an annual consumption of up to 30.000 kWh. A household electricity customer is any natural person purchasing electricity on his/her own.

- Definition mass market Gas

The report relates only to smart meters in the mass market. As there is no common definition of what can be defined as such a market, it is important to focus on the differences between the countries, in order to make sure that data is comparable.

7 out of 17 participating countries define the mass market by **consumption**, which can be seen as the main definition of the term "mass market". In **Austria**, the mass market is defined as including all household and small business customers up to a yearly consumption of

100.000 m^3. In **France**, all household customers and small enterprises with a level of consumption under or equal 300 MWh per year are part of the mass market. The **German** mass market consists of household customers, who purchase energy primarily for their own household consumption or for their own consumption for professional, agricultural, or business purposes and who do not exceed annual consumption of 10.000 kWh. These customers are entitled to a supplier of last resort. The mass market also includes larger customers with an annual consumption of up to 1.500.000 kWh. Both groups are standard load profile customers. **Ireland** defines the mass market as including all sites with an annual quantity of < 5.5GWh per year. Also for **the Netherlands**, the mass market is equivalent to the gas retail market, which consists of all household and small business customers with a technically maximum year usage of 170.000 m^3. In **Portugal**, it is considered to include all natural gas customers, up to 10.000 m^3 yearly. These customers are supplied at a pressure level no greater than 4 bar. For **Sweden**, the maximum yearly consumption is under 0.3 GWh.

In **Estonia**, the mass market consists only of household customers.

In **Great Britain**, the government's proposals for smart metering will cover all domestic (household) customers. Proposals are also expected to cover non-domestic customers with different requirements for small/medium sized enterprises (SMEs) and larger non-domestic customers.

For **Denmark**, there is no clear definition in the regulatory framework. The same goes for **Latvia**.

In **Italy**, the definition is similar to the one used for electricity: this means that the mass market includes all household customers and small enterprises with annual consumption up to 200.000 mc.

Luxembourg states that it applies to all residential and small non-residential customers although it is not a legal definition.

For **Poland** the mass market is equivalent to the retail market for customers connected to distribution networks.

In the **Slovak Republic**, there is also no definition of the mass market, just of households and small business, whereas a gas household customer is a natural person purchasing gas for his/her own household consumption and a small business is a gas end-customer with an annual consumption of up to 100.000 kWh.

Part One: Electricity

2   Meter Value Management

Meter value management concerns the collection, treatment and use of the data provided by utility meters. The approach to this management is central to market functioning and is the subject of much debate, in particular as regards functional and technical aspects (addressed in Chapter 9). As smart meters with additional functionalities and offering more data more frequently come online, the question of meter value management will become all the more important. This chapter gives an overview of the important processes and activities regarding meter value management and who is responsible for them. The different terms related to meter value management have not been specified or described in the questionnaires so it could be that some answers from several countries might vary.

Meter value management is an important part of all smart metering systems, but it is also relevant for normal existing metering systems. This chapter therefore reflects the general framework on meter value management, regardless of the type of meters used.

2.1   Legal responsibilities

In general, who is responsible for the different kinds of operations related to metering services depends on the market system. These services can be divided into the following 5 main operations:

- Installation;

- Maintenance;

- Meter reading;

- Data validation; and

- Data management.

In 23 ERGEG members and observers, these operations are the responsibility of the DSO. However, there are also markets where the metering services are liberalised and the supplier or an independent metering company can be responsible.

2.2   Installations

In 23 countries, installations are managed by the DSO. In addition, in Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Ireland, Italy, Luxembourg, Norway, the Netherlands, Poland, Portugal, the Slovak Republic, Spain and Sweden the DSO has the responsibility for installing the electricity meter.

In **Belgium** and the **Czech Republic**, the DSO can outsource the installation of the meter to

a metering company, but according to legislation, it is still the responsibility of the DSO.

Meanwhile, as metering services in electricity and gas are liberalised[7] in **Germany** and the **Great Britain** the supplier (Great Britain) or the independent metering operator (Germany) can also be in charge of the installation as desired by the customer.

In **Germany**, the DSO is the metering company for customers who have not chosen an independent metering operator but an energy supplier can also act as an independent metering operator if the customer so wishes. In **Great Britain**, suppliers are responsible to ensure that a meter is installed. Typically, they will use agents to undertake the work.

In **Spain**, the customer is responsible for providing himself with an electricity meter device, but he/she can compel the DSO to provide a metering service in return for payment of rent (this is the common agreement). In some countries, for example **Iceland**, the installation of meters can be outsourced, but such an arrangement does not affect the responsibility of the DSO.

2.2.1 Maintenance

In most ERGEG countries, maintenance of the electricity meters must be done by the DSO.

Only 7 out of 24 countries, Denmark, Estonia, Germany, Great Britain, the Netherlands, Romania and Spain state that the maintenance is done by a party other than the DSO.

In Germany, which has a liberalised metering market, the DSO is the metering company for customers who have not chosen an independent metering operator. Therefore, the DSO is also in charge of the maintenance of the meters. However, the energy supplier can also act as an independent metering operator. In this case, the supplier acting as the contracted, independent metering operator has to undertake the maintenance. In **Great Britain**, suppliers have the responsibility to ensure that a meter is maintained so they will use agents or independent companies to undertake the work.

2.2.2 Meter Readings

As can be seen from previous answers, most of the assignments related to metering services are the responsibility of the DSO.

Regarding electricity, in 23 of the countries the DSOs are responsible for reading the meter. Nevertheless, in some countries there is also the possibility for meter reading to be done by the energy supplier, a metering company or the customer himself. In most countries, it is common for the customer to read the meter himself and to send the data on, but the DSO is nevertheless legally responsible for the meter readings. For example, in **Great Britain**, suppliers have the responsibility to ensure that a meter is read, although in practice this is usually done by agents.

A mandatory meter reading frequency is defined in most ERGEG countries, but not in all. In the electricity sector, Denmark, Greece, Ireland and the Slovak Republic do not have a legal

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[7] The liberalisation of the market for metering services is different from a simple outsourcing strategy. With liberalisation taking place it can be whoever being responsible for the installation of the meter. This might be the supplier or a third party agent.

framework that guarantees a mandatory reading of the customer's meter.

In **Austria**, meters have to be read at least every three years. The meter reading is done on site by the grid operator. For large customers, with a yearly consumption of more than 100.000 kWh and a connection load of more than 50 kW monthly reading is mandatory.

In **Belgium**, there is a clear regional distinction: in the Walloon region meter reading has to be done once a year, in the Flemish region only every two years. Also, in Belgium it is possible (and happens frequently) for the customer to read the meter and to pass on the information to the DSO in a meter reading card (post), by phone or on the DSO's website.

In **Denmark**, the customer usually has to read the meter once a year and send the data to the supplier/DSO but there is no mandatory frequency.

In **Finland**, the DSO collects meter readings from customers once a year from non-hourly readable meters. From January 2014 onwards this collection will occur at least three times a year. Generally, data is collected from smart meters at least once a month until end-2011. From January 2012 onwards, all smart meters must be read once a day. The DSO conducts the reading or uses a service provider.

In **France**, the DSO has to collect the meter reading at least once a year.

In **Germany**, meters of standard load profile customers have to be read by the metering operator (DSO or independent) every three years. In between, the billing can be done by customer self-reading or estimation.

In **Great Britain**, suppliers are required by their license to read the meter at least every two years. Typically, they will seek to read the meter every three to six months.

In **Iceland**, the DSO shall collect a meter reading from each customer at least every four years. The DSO shall make the customer read the meter on a yearly basis and customers must send the data to the DSO if required.

Ireland is the country with the highest frequency of meter readings: here, meters are read six times per year.

In **Italy**, mandatory reading frequencies are different depending on whether smart meters are installed or not. For household customers with a smart meter, meter values are read once every two months instead of once a year.

The mandatory meter reading frequency in **Portugal** is 3 months, for small business customers meter reading is done on a monthly basis.

In **Sweden**, the DSO is obliged to read every meter once a month.

2.2.3 Data validation

As the DSO is responsible for metering services in 23 of the responding countries, it is also the DSO who is responsible for the validation of data quality. However, in 4 countries, the Czech Republic, Germany, Great Britain and Romania, this is not (solely) the responsibility of the DSO.

Given the liberalised the metering market in Great Britain, the energy supplier could also be responsible for guaranteeing the quality of data. As the validation of measurement data is a rather complex process, the customer is normally not able to do this on his/her own.

2.2.4 Changed responsibilities due to smart metering

To date, only **Finland** has made changes to the distribution of responsibilities and activities between the entities in charge of the metering operations following a smart meter roll-out. In Finland, customers will no longer own their meters from 1st January 2014. The DSO may buy metering as a service, although according to the legislation it remains responsible for the meters and meter reading.

However, a few countries are considering changing their framework. In **the Netherlands**, there have been discussions about a change in the market system. Collecting raw metering data, validation and defining formal metering data should be shifted from the DSO towards the supplier. A new Act is necessary for this, and this Act is currently uncertain, and will not be final before October 2009.

The Portuguese government has established the legal framework to change the electricity and gas metering activity in the future but complementary regulation is still needed before it can be implemented.

3   Roll-out policy

When examining roll-out policies, it is important to consider several basic issues contributing to the decision to introduce smart meters. These include the policy drivers/objectives behind the roll-out; its expected benefits; the use of a cost-benefit analysis; the regulator's role and the impact of smart meters on market processes. Although the analysis of the diverse roll-out-policies for electricity and gas in Europe has not provided in a uniform picture of smart metering in Europe, the Chapter does suggest that NRAs share a number of common views on the regulatory and market factors related to a roll-out policy.

3.1   Main policy drivers to encourage smart metering

The 3 main drivers/objectives for encouraging a smart metering roll-out in a majority of ER-GEG countries are energy efficiency, more frequent meter reads and peak load management. There are a number of key regulatory tools which play an important part in the introduction of smart meters, in particular the development of legal obligations, financial incentives, meter standardisation and minimum functional requirements.
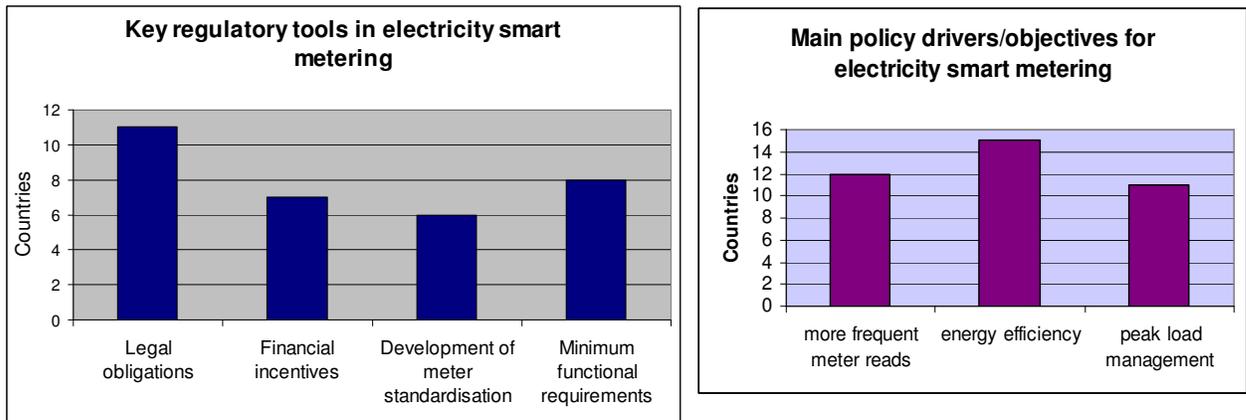
Figure 1: Key regulatory tools in electricity smart metering

Figure 2: Main policy drivers/objectives to encourage smart metering roll-out in electricity (multiple answers were possible)

Figures 1 and 2 show how many countries sited various tools and drivers as being of importance for them. For more detailed information please see Annex 1 - Table 3.

3.2   Status and timeframe of the smart meter roll-out

In total, 5 countries are proceeding to a roll-out of electricity smart meters and they have some type of legal framework on the implementation of smart metering. These countries are Finland, Greece, Italy, Spain and Sweden. In four of these countries, an explicit roll-out-plan has been officially decided upon, while in Sweden the roll-out is implied by the meter reading frequency obligations.

A roll-out is under discussion in a further 12 countries, as illustrated in Table 1.

Smart meters are already installed	Smart meters are being installed	Roll-out plan is decided	Roll-out plan is under discussion	There is no roll-out planned
Denmark (15%)	Iceland (15%)	Finland	Austria	Hungary
Italy (90%)	Denmark (35%)	Greece	Czech Republic	Luxembourg
Sweden (99%)	Italy (5%)	Italy	Denmark	
Finland (25%)	The Netherlands (4%)	Spain	France	
			Germany	
			Great Britain	
			Ireland	
			The Netherlands	
			Norway	
			Poland	
			Portugal	
			Slovak Republic	

Table 1: Overview of status of electricity smart metering roll-out (questions 6 and 7 of the questionnaire)

In **Austria**, despite the lack of a legal obligation for installing smart meters at customer premises, some grid operators have begun to roll-out smart meters on a voluntary project basis. At the moment, approximately 30.000 smart electricity meters are installed in Austria. A nationwide roll-out is under discussion.

In **Belgium** (Brussels and Flanders regions), there are pilot projects ongoing or in preparation. The results will be used to decide on a roll-out of smart meters.

In the **Czech Republic**, there are pilot projects and further analysis in progress which could work as the basis for a roll-out.

Also in **Denmark**, the decision on installing smart meters has been based solely on voluntary decisions by DSOs. In contrast to other countries, a rather high number of electricity meters have already been replaced by a smart meter device, and the DSO plans to equip another 35% of their customers with a smart electricity meter during the next years.

In **Estonia**, a large-scale smart meter roll-out is under discussion, while about 2% of all customers already have a smart meter device. A roll-out should begin in 2011 and end in 2013.

In **Finland**, smart electricity meters are being installed and 25% of all electricity meters have been replaced by a smart meter. By 2014, at least 80% of all customers and small production locations should have an hourly read smart meter device. There are certain exceptions to mandatory hourly metering, such as customers equipped with:

- a main fuse no more than 3 x 25 A; and

- a main fuse over 3 x 25 A, but with electricity consumption of no more than 5.000 kWh/y and electricity supplied by the delivery responsible supplier.

The roll-out will begin during 2009; for customers with main fuse over 3x63 A it will be finished by the end of 2010.

In **France**, the biggest DSO, ERDF, is expected to make a smart metering roll-out by the end of 2010, based on the results of a trial. If the roll-out is agreed, the timetable would be: For DSOs with more than 100.000 customers, at least 50% of smart meters must be installed by the end of 2014 and 95% at the end of 2016. For DSOs with less than 100.000 customers (which concerns more than 150 small DSOs), they have to contribute to a national objective of 96% installed smart meters by 2020.

In **Germany**, a compulsory full roll-out of smart meters is under discussion. Germany pursues a policy of competition in the metering market. By enabling the customer to choose from competitive offers for metering devices and services, smart solutions should be in place. The customer is then able to decide to install a smart meter which reflects actual energy consumption and provides information on actual time of use or has other functionalities. In Germany, there are at least 50 pilot projects with a span of 10 to 100.000 installed meters per project. Smart meters need to be installed by the metering operator in buildings that are newly connected to the grid and in those buildings that are subject to major reconstruction from the 1st January 2010. By the same date, smart meters are to be offered by the metering operator to every customer, but the customer can refuse this offer and request a regular meter.

In **Great Britain**, the rollout mandate and overall timeline have been agreed but the detailed plan for the roll out is still under discussion.

In **Greece**, a smart meter roll-out has been decided. All medium voltage (MV) customer meters have been replaced and since 2005 smart meters are also installed at new low voltage (LV) connections ≥ 85 kVA. Every new MV and LV (≥ 85 kVA) connection is supplied with a smart meter. A roll-out for all LV connections ≥ 85 kVA has also been decided. For the MV-level, a general meter replacement was executed from 2002 to 2005, and *the Automatic Meter Reading capability will be activated for these meters* throughout 2007 to 2009. On the LV-level for *connections ≥85 kVA*, new connections are equipped with smart meters since 2005, and a full-scale replacement roll-out *as well as the activation of Automatic Meter Reading capability* is planned for the years 2010-2013.

In **Hungary**, a study is currently being elaborated to prepare an introduction.

In **Ireland**, a pilot study on smart metering is being carried out and it is anticipated that smart metering may be rolled out in future - however this has not yet been decided upon.

In **Italy**, a nationwide roll-out plan regarding 95% of all meters installed is almost complete. More than 33 million of intelligent electricity meters are working, while the rest (more than 1,5 million) are going to be installed by the end of 2011.

In **Luxembourg** trial tests of smart meters are being carried out by some DSOs.

In **Norway**, the smart meter roll-out is expected be finalised by the end of 2014. The regulator will make the decision on the roll-out plan and minimum requirements for functions by the end of 2009.

The **Portuguese** regulator has conducted a preliminary study on the smart meter installation.

In **Poland**, a smart meter roll-out which should begin in 2010 and should be ready in 2017 is under discussion.

In **Spain**, the smart meter roll-out began in January 2008 and will be completed by the end of December 2018.

In **Sweden**, the implementation of smart meters is based on an obligatory provision to read the meter every month from 1st July 2009. To reach this target it is necessary to install remotely read smart meter devices.

In other countries, like **the Slovak Republic** and **Great Britain** discussions on a roll-out of smart meters are ongoing.

3.3   Benefits expected from an electricity smart meter roll-out

A nationwide and standardised roll-out of smart meters for all domestic household customers could generate many benefits and advantages for all market participants, and especially for all customers.

Looking at the answers provided by NRAs, it is clear that the promotion of energy savings and energy efficiency is an important or highly important topic for 15 ERGEG member and observer countries like Austria, Cyprus, Denmark, Estonia, Finland, France, Great Britain, Greece, Hungary, Italy, Poland, Romania, Spain, Sweden and the Netherlands.

Another striking issue in promoting a smart meter roll-out is to develop a high bandwidth of tariffs addressing customers' individual consumption behaviour and needs. Accurate information on the peak of consumption is also of high importance. As are a more accurate detection of fraud and the development of more advantaged prepaid services.

In the questionnaire, it was possible to place in order of reference the expected importance of seven different benefits. In the figure below you will find the benefits expected from a roll-out, categorised as not important, important and very important. It is worth noting that many countries shared similar ideas on the benefits to be expected from a roll-out.
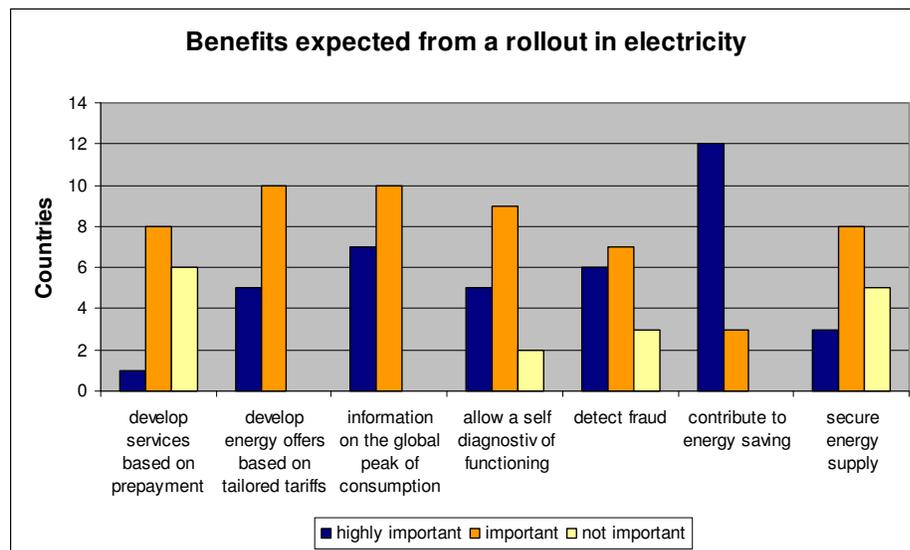

Figure 3: Benefits (multiple answers possible) for more detailed information, see Annex 1 - Tables 4 and 5

3.4   Cost-Benefit Analysis

The 3rd Package specifies that the roll-out of smart metering systems may be subject to an economic assessment of the costs and benefits. A cost-benefit analysis is a recommended tool to determine the economic effects of a policy or measure on the whole market. For this reason, in most countries the regulator or the government has decided to start such an analysis for both electricity and gas. That being said, some countries that have decided to introduce smart metering did not conduct a cost benefit analysis, illustrating the disparity in the rationales for smart metering in individual markets.

8 of the responding countries have conducted a cost benefit analysis, and another 7 have one in progress. The countries that have already done a cost-benefit analysis are the Czech Republic, Finland, France, the Netherlands, Norway, Portugal, Spain, and Sweden. Austria, Belgium, Denmark, Germany, Great Britain, Ireland and Poland have a cost-benefit-analysis in progress.

The Flanders region of **Belgium** has also done a cost-benefit analysis: the model has been set up and produced first results. The goal is to repeat this at a later date, with better and more complete data.

In the **Czech Republic** in 2006 a feasibility study was carried out on implementation of smart metering which led to a negative result. For that reason a new analysis was carried out, for which results were expected in July 2009. The study was made just from the DSO's point of view and supposes an average increase of distribution tariffs by 14 CZK/MWh.

The **Finnish** cost-benefit analysis dealt with the evaluation of possible benefits and with possible costs at a general level.

In **France**, results of the cost benefit analysis for the mass market showed that for AMM, improving DSOs' performance cannot justify by itself an AMM roll-out. However, an AMM business model becomes positive for the mass market when the expected benefits for all actors (not only DSOs but customers and suppliers as well) are taken into account.

The **Spanish** regulator was responsible for designing a timetable for the replacement of new smart meters, but not just a benefit-cost analysis.

Distributors get a hiring price for household meters they are in charge of (almost all). Since these meters have a real life longer than the accounting life, there are many meters working but amortised that provide them with extra income and that they do not compute as a cost when replacing. Taking into account these two facts, the plan estimates the time required to replace all meters without any extra payments for customers. This study does not consider other items such as secondary concentrators or IT systems. Their cost should be implemented in a regulated tariff in future if the ministry considers they are greater than savings coming from reading and billing. The result of the Spanish study was that smart metering for a yearly consumption lower than 5.000.000 kWh is not economically reasonable and is inefficient in terms of costs.

For **Sweden**, a cost benefit analysis was done in 2002 for hourly measured systems and monthly measured systems (household customers). The overall costs per customer for an hourly based system was 2000 SEK (~180 euro), calculated over a period of 15 years and 6% interest - would be a cost of 200 SEK (~18 euro) per customer. To this must be added a cost of about 30-50 SEK (~3-5 euro) per year for maintaining/running the systems. For monthly read systems, the cost would be about 200 SEK per year in total. The savings for installing these systems were calculated to be 160-170 SEK per year. All the costs were related to the DSO. The benefits for the suppliers were calculated to be about 70-100 SEK per customer and year.

3.5 Role of the regulator regarding a possible roll-out

In most European countries, metering services are regulated and the business solely of the DSOs. In **Germany** and **Great Britain**, the liberalisation of metering activities requires the regulator to implement an additional framework resulting in more complex structures. These different approaches mean that regulators are in many cases involved in different processes and activities regarding the roll-out of smart meters.

The activities where regulators are most involved could be, among others, the definition of a timetable; participation in the project management; definition of minimum technical standard or functionalities and definition of the level of return on investment (ROI).[8]

The 3rd Package requires governments and regulatory authorities to be involved in all processes for an efficient nationwide roll-out of smart meters for all customers.

In the 6 countries where a legal obligation is in place, the regulator has been involved in the definition of the timetable, with another 17 countries indicated that the NRAs would be involved in the timetable. Meanwhile, a total of 16 countries indicated that they were (or would be) involved in the definition of minimum technical standards or functionalities. 12 countries indicated they were (or would be) involved in the definition of the level of ROI.

Several countries indicated they had limited or no role in these processes. In **Luxembourg**, the regulator is responsible for the cost recovery surveillance. In the **Netherlands**, the role of the regulator is mainly tariff regulation and cost research. In **Sweden**, the regulator was involved in the timetable in that sense that the monthly reading of all electricity meters is obligatory from 1st July 2009.
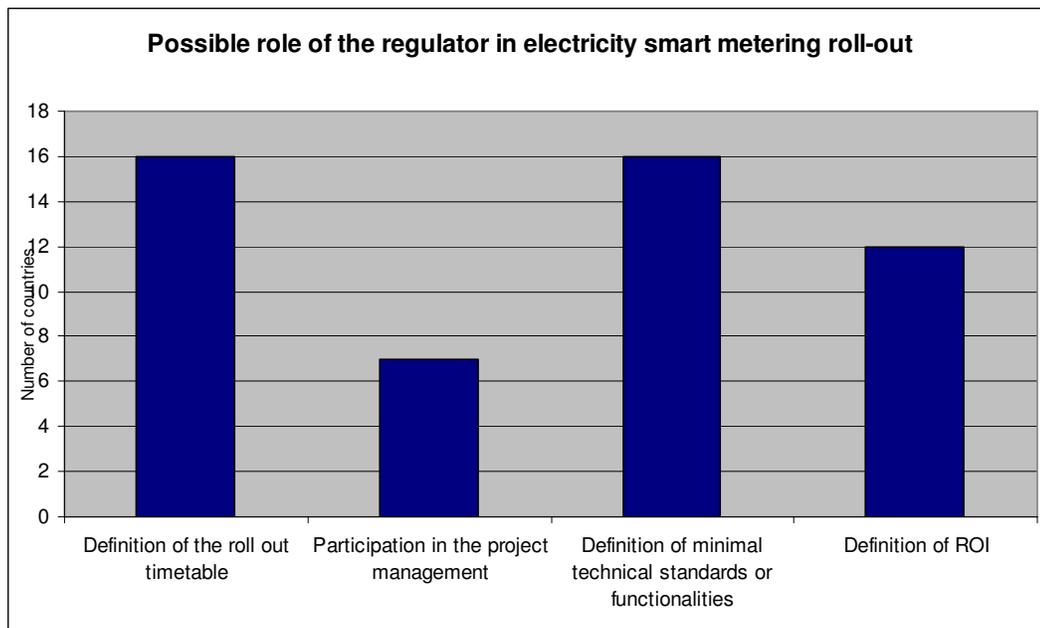
Figure 4: Possible roll of the regulator in electricity (multiple answers were possible), see Annex 1 - Table 6

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[8] ROI is the ratio of money gained or lost on an investment relative to the amount of money invested.

3.6   Market processes

The introduction of a smart metering system can affect many processes within the different market systems. 5 main areas where changes may occur can be identified (aside from distinctions in the various market models):

- Switching;

- Connection and Disconnection;

- Complaint handling;

- Detection of fraud; and

- Billing.

In general, these processes can benefit from increased data based on readings from smart meters. Due to this increased database, it may be essential to change or adapt market processes. How these changes look depends on the market system and how the different market processes are organised.

These 5 processes can be impacted on in different ways, with a number of improvements possible, such as a reduction in lead times, improved fluidity of the process, improved customer information, reduction of costs for the supplier and reduction of costs for the DSO. The most often sited changes to market processes resulting from electricity smart meters were the reduction of costs for the DSO, improved fluidity of the process in question and an improvement in customer information.

A number of countries intend to make or expect changes in their market systems due to the roll-out of smart meters. 16 countries expect changes to the market processes related to billing, complaint handling and switching followed by connection and disconnection where 15 countries estimate changes. 14 countries expect changes in the market process for detecting frauds.

4   Access to data and privacy

When it comes to discussions about smart metering, data privacy and access to data are important issues from the customer's point of view. General data privacy laws normally address data exchanges in any sector or industry. Smart meters, however, offer the possibility to collect much more data (including personalised data) than before. These new functionalities have led to discussions on adapting existing laws to specifically cover meter values.

Irrespective of the presence of smart metering devices, in terms of access to data the Status Review notes that in nearly all cases the DSO has access to most types of data (consumption, historical load curve, quality supply, etc). For electricity, in some countries the current supplier and competing suppliers also have access to the customer's data. Customers generally have access to their data, primarily through their bills, although not for all types of data (e.g. instantaneous power).

4.1   Access to data

All participating countries but one indicated that the DSO has access to several kinds of data, such as consumption data, billing parameters, the historical load curve, instantaneous power and the quality of electricity supply.

The Czech Republic is the only company where the metering company, as well as the DSO, has access to all kinds of information. In most countries, the current supplier has access to the relevant data concerning its customers. In many countries, competing energy suppliers also have access to information about customers' consumption and billing parameters.

Great Britain and **Ireland** state that it is too early to talk about conclusions because no decision has been taken on who has access to the data of the smart meter.

4.2   Data available to the customer

In most countries, information about consumption and billing components is available to the customer. In most cases, consumption data is given through the customer bill, the meter display or the supplier's website.

Detailed information on billing components such as energy price and energy charge per kWh are given to the customer in all countries. All countries, except the Netherlands, stated that this is done through the bill, while 9 countries indicated that this information is available through the suppliers' website.

Information of the historical load curve can be either given on the customer bill, through the smart meter display or a remote display unit, or on the supplier's or DSO's website.

Information on instantaneous power is only given by 10 countries, either on the bill, the meter or remote display unit, or the websites of suppliers and DSOs.

Information on electricity quality is rarely given.
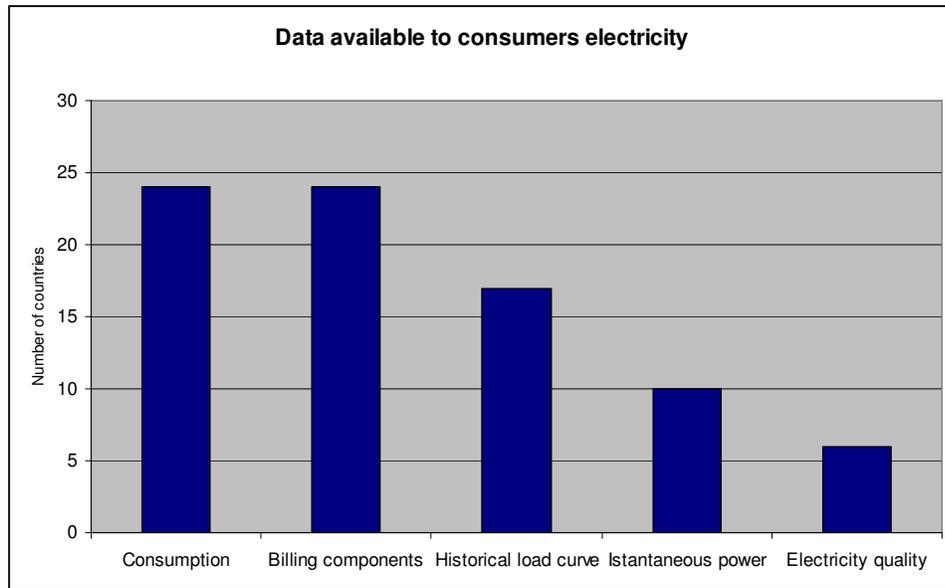
Figure 5: Data available to electricity customers (multiple answers were possible), see Annex 1 - Table 7

4.3 Privacy laws related to meter values

In most countries, a general privacy law applies for meter values. Nevertheless, some countries stated that there is a special law referring to smart meters. The answers provided regarding the specific law were sometimes contradictory and therefore not usable for further analysis in this report, nevertheless this might be topic of interest for further analysis. The differing policies illustrated below reflect the complexity of privacy legislation in a rapidly evolving digital age and the need for high-level discussions on how to deal with privacy matters, in particular as regards utility meters.

In **Austria, Belgium, Finland, Germany, Great Britain, Norway and Sweden** privacy law relates only to generic law.

For **Belgium**, the ownership of data is governed by the technical regulations proposed by the regulator and confirmed by the Minister. These technical regulations should be regarded as "secondary legislation". The 'Technical rules for use of the distribution grids' only stipulate that the meter data is managed by the system operator. The system operator has the monopoly of collecting, providing and archiving the meter data. The system operator has an obligation of professional secrecy concerning this data. There is no explicit legal obligation regarding ownership of the data in the technical rules. However, meter data is considered to be data concerning individual privacy, therefore meter data is considered to be owned by the system user. The basis of this idea is the right of every individual to dispose of all data that concern him/her. This idea is reflected in the general laws regarding privacy. The customers remain the legal owner of the data.

In the **Czech Republic**, according to 458 ACT of 28th November 2000 on Business Conditions and Public Administration in the Energy Sectors and on Amendment to Other Laws (the "Energy Act") market participants are obliged to keep secrets about information related to meter value. According to same Act, regulator's employees are also obliged to keep secrets

about information related to meter value.

Denmark mentions that the Act on Processing of Personal Data can also be applicable to smart meters.

In **France**, privacy aspects are defined in a "generic" law regarding the uses of IT files and privacy.

In **Greece** secondary legislation and regulations stipulate that obligations of the data owners to publicise or release information to third parties are subject to data privacy legislation. Moreover, the standardised procedure for public announcement and release of information to third parties is approved by the Regulator.

In **Ireland**, there is no legal obligation regarding ownership of data measured by the meter. Privacy law related to meter values is regulated through the Data Protection Act.

Italy states that any use of meter values has to be authorised by the customer, except use for system functioning.

In **Norway**, regulation on energy-related topics does not deal with these kinds of questions. The protection of customer data in general is handled by another body, The Data Inspectorate.

In **Portugal**, under switching procedures, the customer's authorisation is needed to access the data because of the privacy law on the protection of personal data. There is a list of data commercially sensitive which is approved by the regulator after proposal by the DSO.

In the **Slovak Republic**, the data privacy aspect is stipulated in the DSO's Operational Orders.

5 Functional and Technical Aspects Electricity

The definition of minimum requirements for functions, interfaces and standards is a key element of a regulatory framework for an efficient and working smart metering system. As outlined in Chapter 3 on the roll-out policy, regulators would very often be involved in defining these requirements in order to ensure market clarity, certainty and a level playing field for all market participants.

It should be noted that the responses received for this section reflects the answers from both countries with smart meters and countries without smart meters. The data can therefore be considered to represent regulators' views in principle on which functional and technical standards should be addressed, rather than strictly those being dealt with in the context of ongoing smart metering roll-outs in electricity.

5.1 Minimum requirements

There are many different functions, standards and technologies which together can guarantee a functional smart metering system:

- Remote control;

- Ability to measure both production and consumption Interval of metering;

- Types of communication (one- or two-way communication);

- Communication protocol and technology;

- Data security;

- Storage capability;

- Local communication interface;

- Capability to record different tariffs.
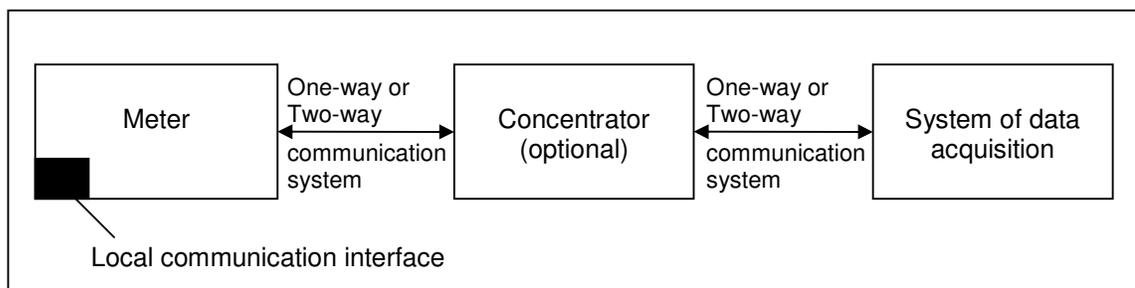
Figure 6: General structure of a smart metering system (also see Annex 2 - questionnaire)

So far, at least 16 countries have regulated or discussed some kind of minimum requirements for smart electricity meters. These countries are Germany, Austria, Cyprus, Estonia, Finland, France, Hungary, Iceland, Italy, Lithuania, the Netherlands, Norway, Poland, Portugal, Spain and Sweden. Not all these countries have included all the functions mentioned in the questionnaire (See Annex 1 - metering interval, remote control, communication protocol, etc.) in their country-specific requirements, so there is no visible uniform approach for the

functional and technical aspects dealt with by regulators.

The fixation of such minimum standards which must be implemented in all smart meters is a key element to providing every customer with the same functions and options when they receive their smart meter. This is also vital for other market participants, such as electricity suppliers. For them, for example, the integration or possibility to record different tariffs could allow them to offer their new or potential customers new attractive tariff models.

The differences in the countries of the requirements themselves for each standard, seen in Figure 7, illustrate that a discussion at EU-level is required to promote interoperability, standardisation and an effective and efficient approach to smart metering, as this has an direct impact on market functioning and customer choice.

In Germany each of the required functions mentioned is still under discussion, however the answers provided by Germany by Spring 2009 are reflected in the graph below.
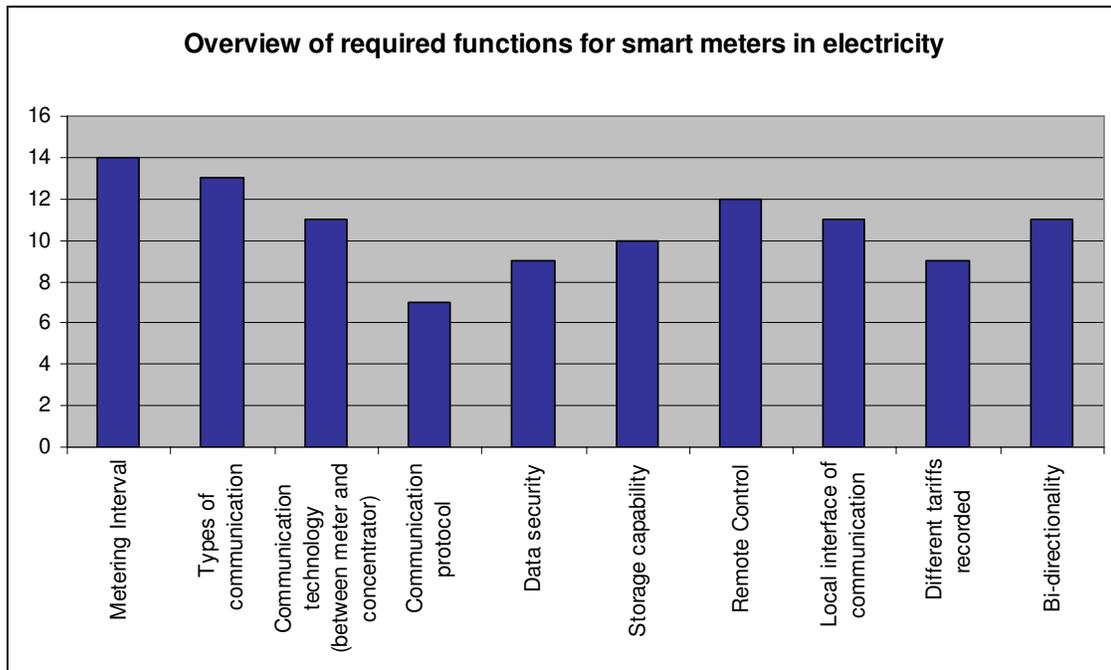
Figure 7: Overview of required functions for smart meters in electricity (multiple answers were possible), see Annex 1 - Table 8

5.1.1 Metering interval

For customers, one of the biggest advantages of having a smart meter is its ability to offer actual consumption data, therefore the definition of metering intervals, and the standardisation of the local communication interface are very important. The local interface provides the customers the possibility to connect to an external in house-display for their smart meter to get actual consumption data at any time, without for example connecting to the Internet or calling the energy supplier's hotline.

13 countries, namely Cyprus, Estonia, Finland, France, Greece, Hungary, Italy, Lithuania, the Netherlands, Poland, Romania, Spain and Sweden have stipulated a metering interval for smart meters.

These intervals range from 1mn - 30mn in Greece, Hungary and Poland; to 30mn – 1hr in France, Italy, Poland, Spain and the Netherlands and to 1 hr – once per day in Estonia, Greece, Finland, Lithuania, Poland and Romania. These metering intervals are stored directly within the smart meters and do not necessarily match the actual time of meter readings or the billing intervals. Cyprus, Estonia and Sweden reported a metering interval of once a month.

In **Norway**, the latest hearing suggests weekly meter reading.

5.1.2 One or two-way-communication

11 of the responding countries namely Cyprus, Estonia, Finland, France, Greece, Hungary, Italy, Lithuania, Poland, Spain and the Netherlands reported that they have defined two-way communication as the minimum requirement for the communication system for smart meters in electricity. In addition, Estonia, Lithuania and Romania indicated that they use a one-way communication system. In Estonia and Lithuania both one- and two way communication are possible. The Norwegian regulator states that there will certainly be two-way-communication in Norway.

5.1.2.1 Remote Control

Remote control is a functionality of the meter which allows control (for instance switch on/off) of electronic devices or the connection/disconnection of the meter from a distance. For 11 of the responding countries, this function should be implemented in a smart metering system. In their view, the most important functionalities of a remote control are remote monitoring of the connected load (9 countries); remote connection/disconnection of the meter (10 countries); and remote changes of contractual parameters, such as tariff conditions (10 countries).

5.1.3 Telecommunication technologies

Within a smart metering system, there are typically 2 different communication streams:

The first one is the communication stream between the meter on the premises and the data concentrator[9] where usually the PLC (power line carrier) is supported. The second communication stream circulates between the data concentrator and the data administration and/or billing system of the operator of the smart metering system.

The technology used for each of these communication streams can differ between wireless (radio frequency, GSM, GPRS, Wimax, others) and cable (PLC, ADSL, others) technologies. From a regulatory perspective, standardisation of the technology used by all market participants would help to ensure interoperability and competition.

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[9] The concentrator is the computer server/system which collects and merges the data submitted by individual meters for use by the party(ies) responsible for metering operations.

5.1.3.1 Communication between the meter and the concentrator[10]

10 countries reported on the kind of communication technology used between the meter and the concentrator. 8 countries (Cyprus, Estonia, France, Greece, Lithuania, the Netherlands, Poland and Spain) answered that PLC should support the smart metering system.

Additionally, 8 countries replied that radio frequency should be supported by the smart metering system, and another 4 countries think that GPRS technology should be supported. 3 countries want the smart metering system to support GSM technologies.

And respectively 2 countries answered that Wimax and ADSL communication should be supported

5.1.3.2 Communication between concentrator and the system of data administration

For 5 countries namely Cyprus, Estonia, Lithuania, Poland and France the communication between the concentrator and the system of data administration should support GPRS technologies. Another 5 countries answered that the communication should support GSM. 4 countries think that the communication between the concentrator and the data administration system should support PLC (power line carrier). Respectively 3 countries replied that radio frequency and ADSL should be supported.

5.1.3.3 Local Interface of communication

A local interface of communications is an interface, based on the meter, to plug in a device in order to access in real time to data available in it. The device could eventually transfer data up to a visual unit display.

10 ERGEG members replied that a local interface of communication is or should be supported by the smart metering system.

5.1.3.4 Communication protocol

The communication protocol is the set of standard rules for data representation, signaling, authentication and error detection to send information over a communication channel.

So far 6 countries Cyprus, France, Greece, Italy, Lithuania and Poland have answered that that communication protocols are important for interoperability. The countries didn't specify which communication protocol is or should be used.

Further more 10 countries answered that the communication protocol is or should at least be an open standard. An open standard is available for everyone use and free of charge.

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[10] See Figure 6.

Part two: Gas

6   Meter Value Management

The management of meter values, the collection, distribution and processing of metering data loggings is a key factor for the functioning of a liberalised gas market. This chapter gives an overview of all the important processes and activities regarding gas meter value management and who is responsible for it. As in electricity, the different terms related to meter value management have not been specified or described in the questionnaires so it could be that some answers from several countries may vary.

6.1   Legal responsibilities

In general, responsibility for the different kinds of operations related to metering services may depend on the type of market in place. These services can be divided into the following five main operations:

- Installation;
- Maintenance;
- Meter reading;
- Data validation; and
- Data management.

In 18 countries, these operations are the responsibility of DSOs. However, as has been noted for electricity, there are also gas markets where metering services are liberalised and the supplier or an independent metering company can be responsible.

6.2   Installations

In the 18 countries, namely Austria, Belgium, the Czech Republic, Denmark, Estonia, France, Germany, Ireland, Italy, Luxembourg, Latvia, the Netherlands, Poland, Portugal, the Slovak Republic, Slovenia, Spain, and Sweden, the DSO has the authority to install all gas meters at the customer's premises. In **Germany**, an independent metering operator can be responsible if contracted by the customer. In **Latvia**, the responsibility depends on the type of customer – for domestic household customers the DSOs install meters at their own expense, but for legal entities meters are installed at the customers' expense.

6.2.1 Maintenance

In 18 countries, the DSO is responsible for maintenance of the gas meter. In certain countries, maintenance can also be the responsibility of the supplier, a metering company (e.g. in Germany) or the customer.

Only in a couple of countries, e.g. Estonia, France, Latvia and Spain, is it possible that the customer must to ensure the maintenance of his/her gas meter.

6.2.2 Meter Readings

As in electricity, most countries have defined a clear and mandatory gas meter reading frequency. However in some countries, e.g. Denmark, Estonia, Ireland, Latvia and the Slovak Republic, there is no regulation regarding such mandatory frequencies.

In 18 countries, the DSO is responsible for metering reading, but this does not necessarily mean that it is the only able and responsible party.

In **Austria,** gas meters must be read every year.

In **Belgium**, there is a clear regional distinction: in the Walloon region meter reading has to be done once a year, in the Flemish region only every two years. Also, in Belgium it is possible (and happens frequently) for the customer to read the meter and to pass on the information to the DSO in a meter reading card (post), by phone or on the DSO's website.

In **Great Britain**, suppliers are required by their license to read the meter at least every two years. Typically, meter readings are done more frequently than required.

In **Ireland**, meters must be read four times per year, in **Portugal** and **Spain** the time period is set at two months.

In **Italy**, the roll-out for installation of smart meters has begun and the mandatory frequencies are still the same as before, whether there is a new meter or not.

In **the Netherlands** the meter reading must be done once every three years by the DSO or the metering company itself.

6.2.3 Data validation

In the gas sector, the responsibilities are more widely spread than in the electricity sector, nevertheless the responsibility lies with the DSO in all countries except the Czech Republic, Denmark, Germany, Great Britain, Ireland and the Netherlands.

In **Germany**, the DSO must validate all kinds of billing-relevant data, while the energy supplier and the metering company must validate other, non billing-relevant data. **Great Britain** states that gas suppliers are responsible for the data they submit to central systems.

6.2.4 Data management

In most of the responding countries, the DSO is responsible for data management. In 5 out of 19 countries, namely Denmark, Germany, Ireland, the Netherlands and the Slovak Republic, the responsible party can be different from the DSO. In **Denmark** and the **Slovak Republic**, the energy supplier can also be the responsible party and in **Germany** due to the liberalised metering market, the metering company (which can also be active in the role of an energy supplier), can be in charge of meter data management. In **the Netherlands**, it is both the DSO and/or the metering company who could be responsible for handling the meter data.

6.3   Changed responsibilities due to smart metering

Most of the countries have not planned any change in the responsibilities of the entities which are currently in charge of the operations related to metering following the roll-out of smart gas meters.

Poland has changed some DSO responsibilities, excluding instrument transformers. In **Por-

tugal, the government has established the legal framework to change the electricity and gas metering activity in the future but complementary regulation is still needed before it can be implemented.

7 Roll-out Policy

The decision to roll-out smart meters may depend on a number of factors, such as key drivers and policy objectives. We note that in the gas sector, energy efficiency is of particular importance for many countries, while the most popular regulatory tool is legal obligations.

7.1 Main policy drivers to encourage smart metering

Energy efficiency and the possibility for customers to get access to their consumption data are of high importance. Interestingly, the main drivers to encourage a smart metering roll-out in 10 countries are varying aspects of energy efficiency. This issue is linked to more frequent meter reads, which in many countries is also a main driver for starting a smart metering roll-out.
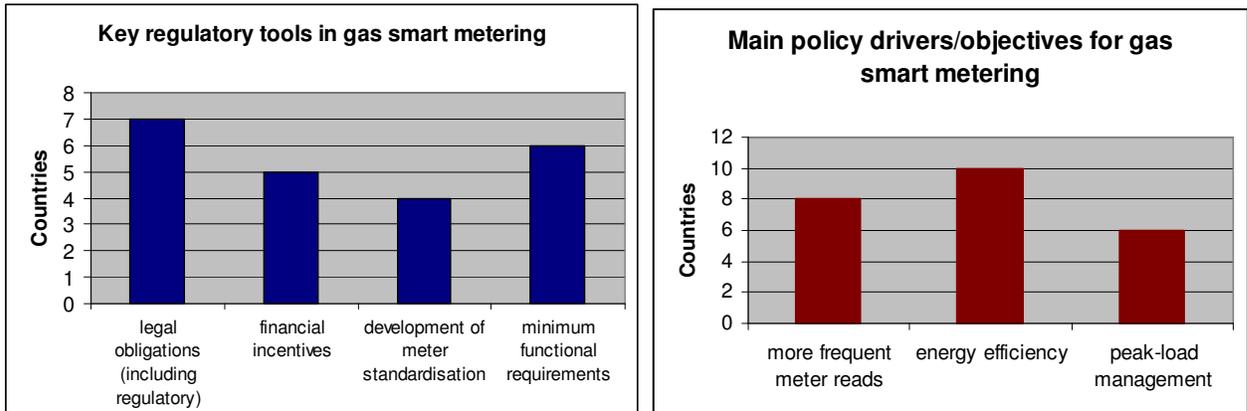
Figure 8: Key regulatory tools in gas smart metering

Figure 9: Main policy drivers/objectives to encourage smart metering roll-out in gas (multiple answers were possible)

7.2 Status and timeframe of the smart meter roll-out

In most countries, there is no smart gas meter roll-out planned. Only **Italy** has decided to roll-out of gas meters at the time of this report.

Smart meters are already installed	Smart meters are being installed	Roll-out plan is decided	Roll-out plan is under discussion	There is no roll-out planned
	The Netherlands (4%)	Italy	France	Belgium
			Great Britain	Czech Republik
			Slovenia	Denmark
			The Netherlands	Estonia
				Germany
				Ireland
				Latvia
				Luxembourg
				Portugal
				Slovak Republic
				Spain
				Sweden

Table 2: Status of gas smart meter roll-out

In Austria, France, Great Britain, the Netherlands and Slovenia a roll-out is currently under discussion.

In **Germany**, as in the electricity sector, there is no roll-out planned for gas. Germany pursues the policy of competition in the metering market. By enabling the customer to choose from competitive offers for metering devices and services, smart solutions should be in place. The customer is able to decide to install a meter which reflects actual energy consumption and provide information on actual time of use or other functionalities.

In **Ireland**, a pilot study on smart metering is being carried out and it is anticipated that smart metering may be rolled out in the future – however this has not yet been decided upon.

Italy has decided to roll-out smart meters. Their roll-out-plan says that at least 5% of all gas customers should be equipped with a smart meter by the end of 2012 and another 20% of all customers by 2013, 2014 and 2015. By the end of 2016 at least 80% of all Italian gas customers should be equipped with a smart meter. **Poland** is currently discussing a smart metering roll-out between 2010 and 2017.

In **Spain**, the introduction of such metering systems for a yearly consumption less than 5.000.000 kWh/y is at the moment neither economically reasonable nor cost-effective for gas customers. Also, there is an obligation to install so-called "telemeters" for all clients with an-

nual consumption > 5.000.000 kWh/y (about 2.500 clients in Spain have daily telemeter –with hourly recorded information, representing 80% of gas demand).

7.3 Benefits expected from a gas smart meter roll-out

Analysing the answers provided by NRAs, it is worth noting that the promotion of energy savings is an important or highly important topic for at least 6 countries Austria, France, Germany, Italy and Spain and the Netherlands. Interestingly, the 3rd Package places an emphasis on the promotion of energy efficiency by using smart metering technologies (see Annex I of the Directives). In addition, more accurate detect of fraud and the possibility to allow self-diagnostics was important for a number of countries.
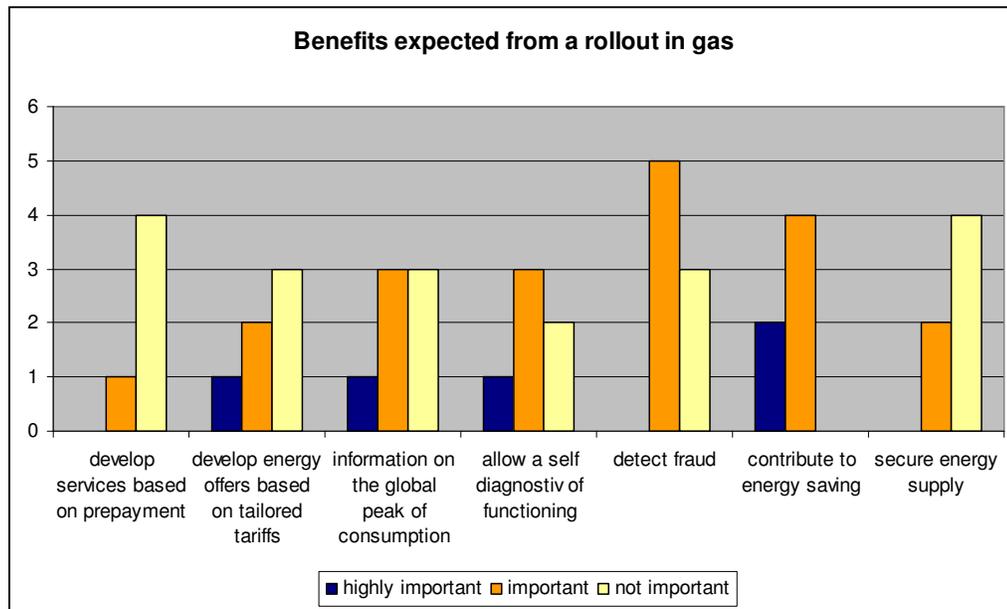
Figure 10: Benefits for countries in gas (multiple answers possible), see Annex 1 - Tables 10 and 11

7.4 Cost-Benefit Analysis

As explained in Section 3.4 on cost-benefit analysis for electricity, the 3rd Package specifies that national roll-outs may be subject to an economic assessment.

4 of the 5 countries that are considering introducing gas smart metering are conducting or have conducted a cost benefit analysis.

3 countries namely Italy, Spain and the Netherlands stated that they have conducted a cost-benefit-analysis, and another 8 countries namely Austria, Belgium[11], France, Germany, Great Britain, Ireland, Poland, and Slovenia stated that such an analysis is in progress.

In the **Czech Republic**, a feasibility study was undertaken on the implementation of smart

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[11] Flanders (Belgium) has also done a cost-benefit analysis: this model has been set up and produced first results. The goal is to repeat this exercise at a later date, with better and more complete data.

metering for which results were expected for September 2009.

Estonia, Hungary, Iceland, Ireland, Luxembourg and Slovak Republic have not done a cost-benefit analysis.

The **Italian** analysis for gas highlighted that for an annual consumption up to 5.000 m^3, neither AMR nor AMM seem justifiable, regardless of the size of the DSO. Nevertheless, for this annual consumption pattern, AMM implementation is more profitable than AMR. The reason is that with similar investments, the financial benefits of AMM are higher, especially when considering supply activations and deactivations, contractual transfers, missed meter readings and the technical and financial administration of bad payers. AMR implementation for an annual consumption over 5.000 m^3 shows undoubted financial benefits even just a few years after the investments have been made. For large and medium-sized DSOs, the analysis is also positive. This reflects the high benefits deriving from consumption over 5.000 m^3.

The **Spanish** cost analysis for the electricity sector and the cost-benefit analysis for the gas sector led to the result that smart metering for a yearly consumption lower than 5.000.000 kWh is not economically reasonable and inefficient in terms of costs.

7.5   Role of the regulator regarding a possible roll-out

The **German** ordinance of incentive regulation generally enables the network operator to regain the efficient costs for meters which reflect energy consumption and provide information on actual time of use since it is a duty for the network operator to offer and install these kinds of meters. For the German regulator, it is possible to enable legally necessary smart metering implementation within the liberalised regime. In **Ireland**, the regulator is responsible for the cost-benefit analysis. The Netherlands regulator's role is not defined but it is involved in all relevant issues.

As in electricity, regulators indicated they would be most involved in the definition of minimal technical standards of functionalities as well as the definition of the roll-out timetable. In gas, many regulators would also be involved in the definition of the return on investment (ROI).
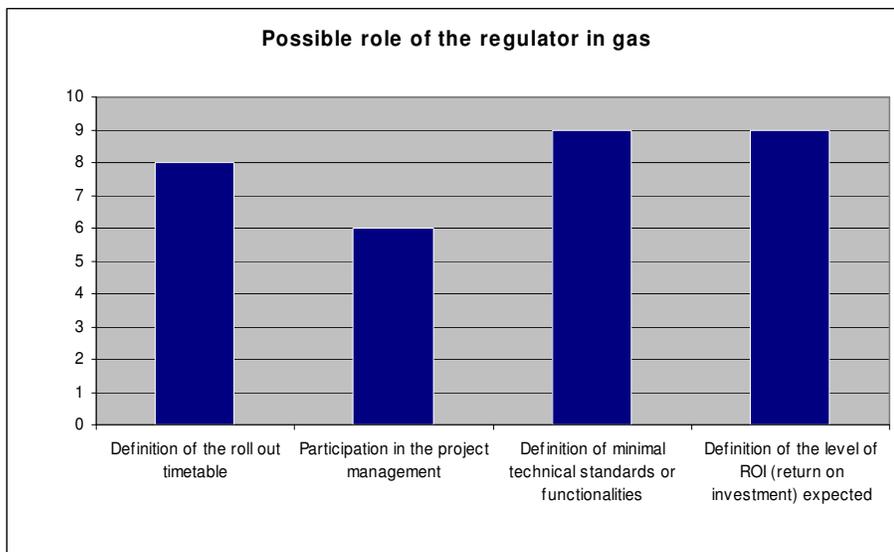
Figure 11: Possible role of the regulator in gas (multiple answers were possible), see Annex 1 - Table 12

7.6 Market Processes

In the gas sector, there are only a few countries where there are (or will be) changes in the different market processes. As most of the market systems are the same in electricity and gas, there are also 5 main processes identified which can be affected by the introduction of smart gas meters:

- Switching;

- Connection and Disconnection(of the customer);

- Complaint handling;

- Detection of fraud; and

- Billing.

The use of smart meters results in an increased database, which may have an impact on the market processes above (according to the market system in place). Such changes/improvements could relate to reduction of lead times, improved fluidity of the process, improved customer information, reduction of costs for the supplier and reduction of costs for the DSO.

In gas, a number of countries intend to make or expect to make changes to their market processes due to a roll-out of smart meters. 6 countries state that the most common market processes where changes are expected are billing and complaint handling, followed by switching where 4 countries estimate changes. Furthermore, the processes for detecting fraud are expected to change in 4 countries. Changes in processes regarding connecting and disconnecting customers are expected by 3 countries.

8 Access to data and privacy

As in electricity, data privacy and access to data are important issues from the customer's point of view. The new functionalities possible with smart meters have led to discussions on adapting existing laws to specifically cover meter values.

In terms of access to data, the Status Review notes that in nearly all cases the DSO has access to most types of data (consumption, historical load curve, quality supply, etc). For gas, the current supplier and competing suppliers do not always have access to the customer's data. Meanwhile, customers generally have access to their data, primarily through their bills, although not for all types of data (e.g. supply quality).

8.1 Access to data

In most countries, the DSO has access to relevant customer data, including information about consumption, billing parameters, the historical load curve and the quality of gas.

The current supplier also has access to information on customers in Denmark, Estonia, Germany, Great Britain, Ireland, Portugal, Slovenia, and Spain. In all other countries, this information is only partly available. In the Czech Republic, the metering company, if existent, has access to all kinds of information, as does the DSO.

Other energy suppliers have complete access to information in Denmark.

8.2 Data available to the customer

All responding countries indicated the high importance of making data available to the customer. Most of the mentioned information can be found on the customer's bill, only a few countries make the data available through the meter display, a display unit, or via the regulator or DSO website or sms. Data about consumption is mostly given through the customer bill.
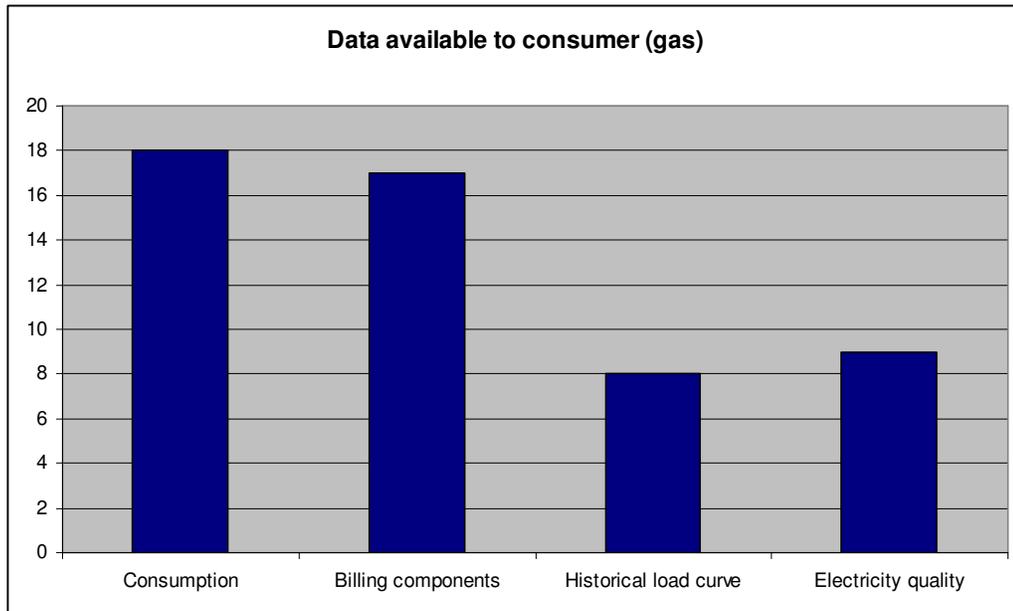
Figure 12: Data available to customer gas (multiple answers were possible), see Annex 1 - Table 13

Detailed information on billing components such as energy price and energy charges per kWh are given to the customer in nearly all countries. All countries stated that this is done through the bill but some countries also give this information on the supplier or DSO website, the meter or display unit or via sms.

Information of the historical load curve and gas quality is less often given, 8 countries for historical load curve and 9 for gas quality. Information can be either given on the customer bill, through the smart meter display or a remote display unit, or on the supplier or DSO website.

8.3 Privacy laws related to meter values

In most countries, a general privacy law also applies for meter values. Nevertheless, some countries stated that there is a special law referring to smart meters. As in electricity, the answers provided regarding the specific law were sometimes contradictory and therefore not usable for further analysis in this report, nevertheless this might be topic of interest for further analysis.

For **Belgium**, the ownership of data is governed by the technical regulations proposed by the regulator and confirmed by the Minister. These technical regulations should be regarded as "secondary legislation". The 'Technical rules for use of the distribution grids' only stipulate that the meter data are managed by the System Operator. The System Operator has the monopoly of collecting, providing and archiving the meter data. The System Operator has an

obligation of professional secrecy concerning this data. There is no explicit legal obligation regarding ownership of the data in the technical rules. But meter data is considered to be data concerning individual privacy, therefore meter data is considered to be owned by the system user. The basis of this idea is the right of every individual to dispose of all data that concern him/her. This idea is reflected in the general laws regarding privacy. The customer remains the legal owner of the data.

In **France**, as in the electricity sector, privacy aspects are defined in a "generic" law regarding the uses of IT files and privacy. Also in **Germany**, data protection is defined in generic law.

In **Ireland**, there is no legal obligation regarding ownership of data measured by the meter. The regulator can get access to meter read information with meter numbers (but not names and addresses) for all NDM domestic meters. Information regarding some meter read information for all other meter points including NDM industrial and commercial points (including names and addresses) are made available to all shippers in the market.

In **Portugal** under switching procedures, the customer's authorisation is needed to access the data. There is a privacy law with regard to the protection of personal data. A list of commercially sensitive data is approved by the regulator after proposal by the DSO.

9 Functional and Technical Aspects

It should be noted that the responses received for this section reflects the answers from both countries with smart meters and countries without smart meters. The data can therefore be considered to represent regulators' views in principle on which functional and technical standards should be addressed, rather than strictly those being dealt with in the context of ongoing smart metering roll-outs in gas.

9.1 Minimum requirements for smart meters

There are many different functions, standards and technologies which together form the basis of a smart metering system. These include the possibility for remote control; the ability to measure both production and consumption interval of metering; types of communication (one- or two-way communication); communication protocol and technology; data security; storage capability; local communication interface; and the capability to record different tariffs.
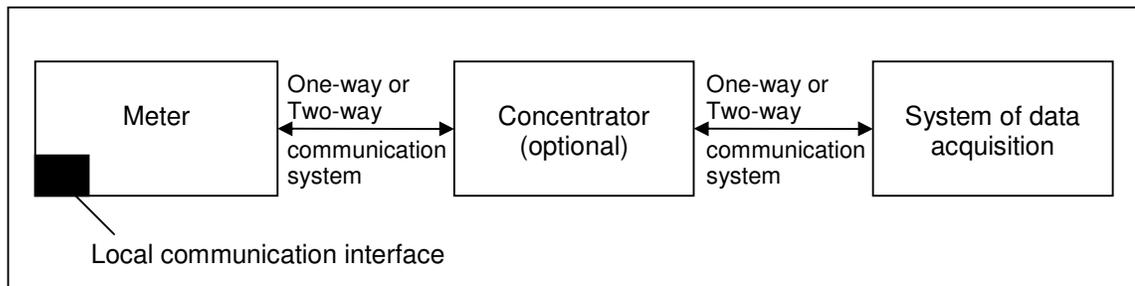
Figure 13: General structure of a smart metering system (see Annex 2 - questionnaire)

At least 4 participating countries, France, Italy, Poland and the Netherlands, have prescribed or discussed some type of minimum requirements for gas meters. Not all these countries have included all the functions stated in the questionnaire (see Annex 1) into their country-specific requirements, so there is no comprehensive picture at the moment.

As Figure 14 shows, a few countries have, thus far, introduced or discussed some kind of minimum requirements for the gas sector. To date, Only **Italy** has prescribed remote control as a function for smart gas meters.

Overview of required functions for smart meters in gas
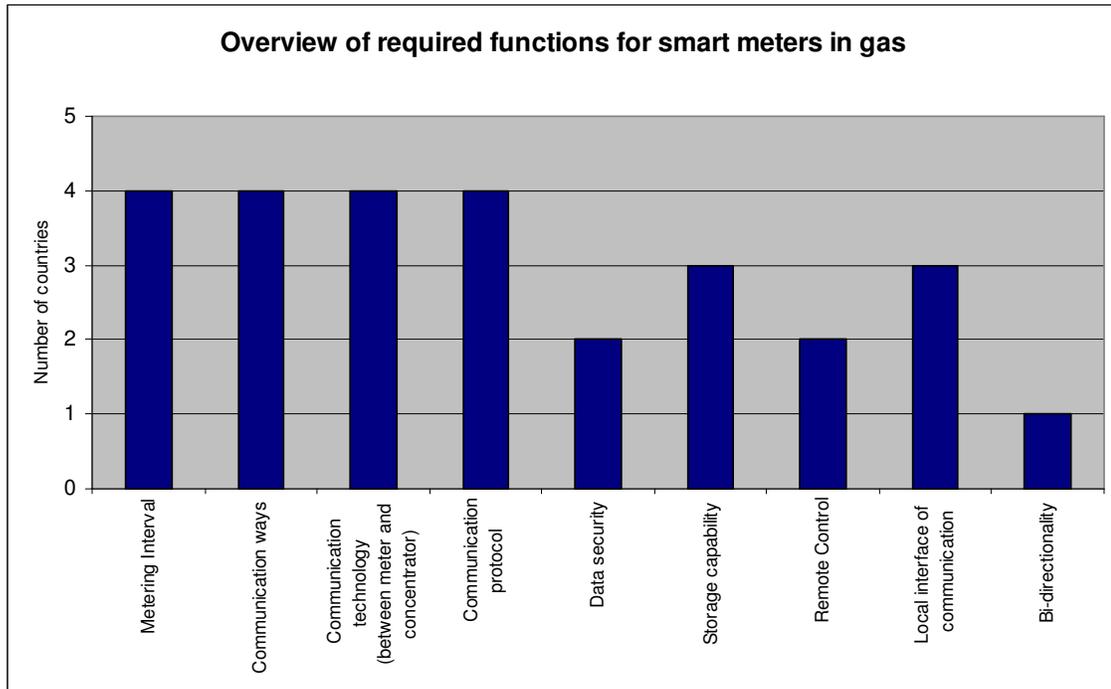
Figure 14: Overview of answers regarding required functions for smart meters (multiple answers were possible)

9.1.1 Metering interval

In the gas sector, there are only 4 countries which have defined a metering interval for smart gas meters, namely France, Italy, Poland and the Netherlands.

These metering intervals are stored directly within the smart meters and do not necessarily match the actual time of meter readings or the billing intervals. Italy and Poland have defined a metering interval between 1 hour and once a day and the Netherlands has defined a very short timeframe, of less than one minute.

9.1.2 One or two-way communication

The existence of a two-way communication system is one function which must be considered when discussing an efficient smart metering system which provides all possible advantages for the market.

Italy, Poland and the Netherlands have included two-way communication in their minimum requirements for smart meters in gas. In France, only one-way communication for smart gas meters is required.

10   Conclusions

Smart metering is a widespread topic which covers important parts of electricity and gas markets, making it also an important issue for NRAs and relevant stakeholders. When creating a regulatory framework which is influenced by the introduction of smart metering, issues such as market processes, data privacy issues, functionalities and standards, roll-out-plans and others should be carefully considered by national authorities.

The complexity of the issue is reflected in the lack of a common European or international standard term and/or definition for both smart meters and their related systems. As shown in this Status Review, few countries have a formal definition for smart metering or a term used nationally to describe smart metering. The situation is further complicated by the lack of any Europe-wide list of common functions and standards for smart meters. A few countries have however decided on such a list of necessary functions and standards, whereas others are still discussing this issue and only have a general idea of how a smart metering system should work.

The status review shows that the developments regarding smart metering are very different for electricity and gas respectively. Regarding electricity, 2 countries have already rolled out smart meters and 4 other have decided a large scale roll-out. Meanwhile in the gas sector, only Italy has planned a smart metering roll-out. In addition, several European countries are presently executing or planning voluntary electricity projects of different sizes. In some of these countries, gas projects are also planned. It should be noted that, overall, developments are slower in the gas market, partly due to technical restrictions of the smart gas metering systems.

Regarding the definition of a smart metering system, two issues seem to be of particular importance: remotely readable meters and/or a two-way communication. Two-way communication seems to be very important for 15 countries regarding electricity, but only for 4 countries regarding gas. In electricity, at least Austria, France, Great Britain, Spain, Sweden and the Netherlands have mentioned that the concept of smart meters includes remote reading.

This Status Review shows that much work remains to be done in order to ensure a sound future for smart metering in Europe. In particular, a common approach should be envisaged for defining smart meters and their functional requirements. In addition, a standard communication protocol and a transparent methodology for conducting a cost benefit analysis would contribute to the interoperability of this evolving technology. At this stage, the number of roll-outs and projects differ between ERGEG members and observers. Topics such as meters' functionalities and the stage and timeframe of roll-outs are very complex and may very well undergo substantial and further changes, in particular as the provisions on metering in the 3rd Package (see Annex I) are implemented and as various European initiatives work on standardisation issues.

While compiling the report, ERGEG noted inconsistencies in the responses on several issues. This is the case for several areas, like minimum technical functions and data privacy. Also, the lack of a common definition for smart metering in electricity and gas could be a barrier for an aligned discussion about standardisation and implementation of market processes. All these issues may be subject of more detailed analyses by ERGEG.

In view of the many open issues surround smart metering policies, as regards both the basic concept of smart meters and the functional, communication and technical aspects of their implementation, ERGEG plans to continue its dialogue and analysis with stakeholders and to develop Guidelines of Good Practice (GGP) on regulatory aspects of smart metering.

Annex 1 – Figures and Tables for Electricity and Gas

In this part of the Annex you can find summarised, but yet detailed information of different areas of the report. However not all answers to the questionnaires are covered here.

Figures and Tables for electricity

	Legal obligations (including regulatory ones)	Financial incentives	Development of meter standardisation	Minimum functional requirements	More frequent meter reads	Energy efficiency	Peak-load management
Austria			X	X	X	X	
Belgium	X		X	X	X	X	X
Cyprus	X	X				X	X
Denmark	X	X	X		X	X	X
Estonia		X			X	X	X
Finland	X				X	X	X
France	X			X	X	X	X
Germany	X		X		X	X	
Great Britain						**X**	
Greece				X		X	X
Iceland		X					
Italy	X	X		X	X	X	X
Norway	X			X	X	X	
Poland	X	X	X	X	X	X	X
Portugal	X				X	X	
Romania						X	
Spain	X						
Sweden					X		X
The Netherlands		X	X	X	X	X	X

Table 3: Main policy drivers to encourage smart metering roll-out in electricity (multiple answers possible)

	develop services based on prepaid system	develop energy offers based on tailored tariffs	Information on the peak of consumption and contribute to an accurate network management	allow a self diagnostic of the functioning or not of the meter	detect fraud	contribute to energy savings	secure energy supply
Austria	X			X	X		
Cyprus	X	X		X			X
Denmark		X	x		X	X	X
Estonia		X	X			X	X
Finland		X	X				X
France	X						X
Great Britain		X	X	X	X		X
Greece	X			X	X		
Hungary	X	X	X	X	X		
Iceland		X	X				X
Italy		X	X			X	
Poland	X			X			
Romania	X	X		X			
Sweden		X	X				
Spain			X	X	X		
The Netherlands	X		X	X	X		X

Table 4: Important Benefits

	develop services based on prepaid system	develop energy offers based on tailored tariffs	give information on the global peak of consumption and contribute to an accurate network management	allow a self diagnostic of the functioning or not of the meter	detect fraud	contribute to energy savings	secure energy supply
Austria		X	X			X	X
Cyprus			X		X	X	
Denmark				X			
Estonia				X	X		
Finland						X	
France		X	X	X	X	X	
Great Britain	X					X	
Greece		X	X			X	
Hungary						X	X
Italy				X			
Lithuania			X	X	X		
Poland		X	X		X	X	X

	develop services based on prepaid system	develop energy offers based on tailored tariffs	give information on the global peak of consumption and contribute to an accurate network management	allow a self diagnostic of the functioning or not of the meter	detect fraud	contribute to energy savings	secure energy supply
Romania			X		X	X	
Spain		X				X	
Sweden						X	
The Netherlands						X	

Table 5: Very important benefits

	Definition of the roll-out timetable		Participation in the project management		Definition of minimal technical standards or functionalities		Definition of the level of ROI (return on investment) expected	
	active	non active	active	non active	active	non active	active	non active
Austria	X		-	-	X		X	
Belgium			X		X			
Czech Republik	X		X		X		X	
Cyprus	X				X		X	
Estonia	X			X	X		X	
Finland	X			X	X			X
France	X		X		X		X	
Germany		X	X		X			
Greece	X				X		X	
Hungary	-	-	-	-	X		X	
Iceland	X		-	-	X		X	
Ireland	-	-	-	-	-	-	-	-
Italy	X			X	X			X
Luxembourg	-	-	-	-	-	-	-	-
Norway	X			X	X		X	
Poland	X		X		X		X	
Portugal	X				X		X	
Romania	X			X	X			X
Slovak Republik	X		X			X	X	
Spain	X		X					X
Sweden	X			X		X		X
The Netherlands		X		X		X		X

Table 6: Possible role of the regulator in electricity

	Consumption	Billing components	Historical load curve	Instantaneous power	Electricity quality
Austria	X	X		X	
Belgium	X	X	X		
Cyprus	X	X	X	X	
Czech Republic	X	X		X	
Denmark	X	X	X		X
Estonia	X	X	X		
Finland	X	X	X		X
France	X	X	X	X	X
Germany	X	X	X	X	
Great Britain	X	X	X		
Greece	X	X	X	X	
Hungary	X	X			
Iceland	X	X	X	X	
Ireland	X	X	X		
Italy	X	X	X	X	
Luxembourg	X	X			
Norway	X	X		X	
Poland	X	X		X	X
Portugal	X	X	X		X
Romania	X	X	X	X	
Slovak Republic	X	X	X		X
Spain	X	X	X		
Sweden	X	X	X		
The Netherlands	X	X			

Table 7: Data available to customer (electricity)

	Metering Interval	Communication ways	Communication technology	Communication protocol	Data security	Storage capability	Remote Control	Local communication interface	Different tariffs recorded	Bi-directionality
Cyprus	X	X	X	X	X	X	X			
Estonia	X	X	X		X	X	X	X	X	X
Finland	X	X			X		X	X		
France	X	X	X	X	X	X	X	X	X	X
Germany (under Discussion)	X	X	X	X	X	X	X	X	X	X
Greece	X	X	X	X	X		X	X		X
Hungary	X	X					X			X
Iceland			X						X	X
Italy	X	X		X	X	X	X	X		X
Lithuania	X	X	X	X	X	X	X	X	X	X
Poland	X	X	X	X			X	X		X
Romania	X	X	X			X			X	X
Spain	X	X	X			X	X	X	X	X
Sweden	X					X		X	X	
The Netherlands	X	X	X		X	X	X	X	X	

Table 8: Overview of required functions for smart meters in electricity

Figures and Tables for Gas

	Legal obligations (including regulatory ones)	Financial incentives	Development of meter standardisation	Minimum functional requirements	More frequent meter reads	Energy efficiency	Peak-load management
Belgium	X			X	X	X	
Denmark		X	X		X	X	X
Estonia	X	X	X	X	X	X	X
France	X			X	X	X	
Germany	X				X	X	
Great Britain						X	
Italy	X	X		X	X		X
Poland	X	X	X	X	X	X	X
Portugal	X					X	
Slovenia						X	X
The Netherlands		X	X	X	X	X	X

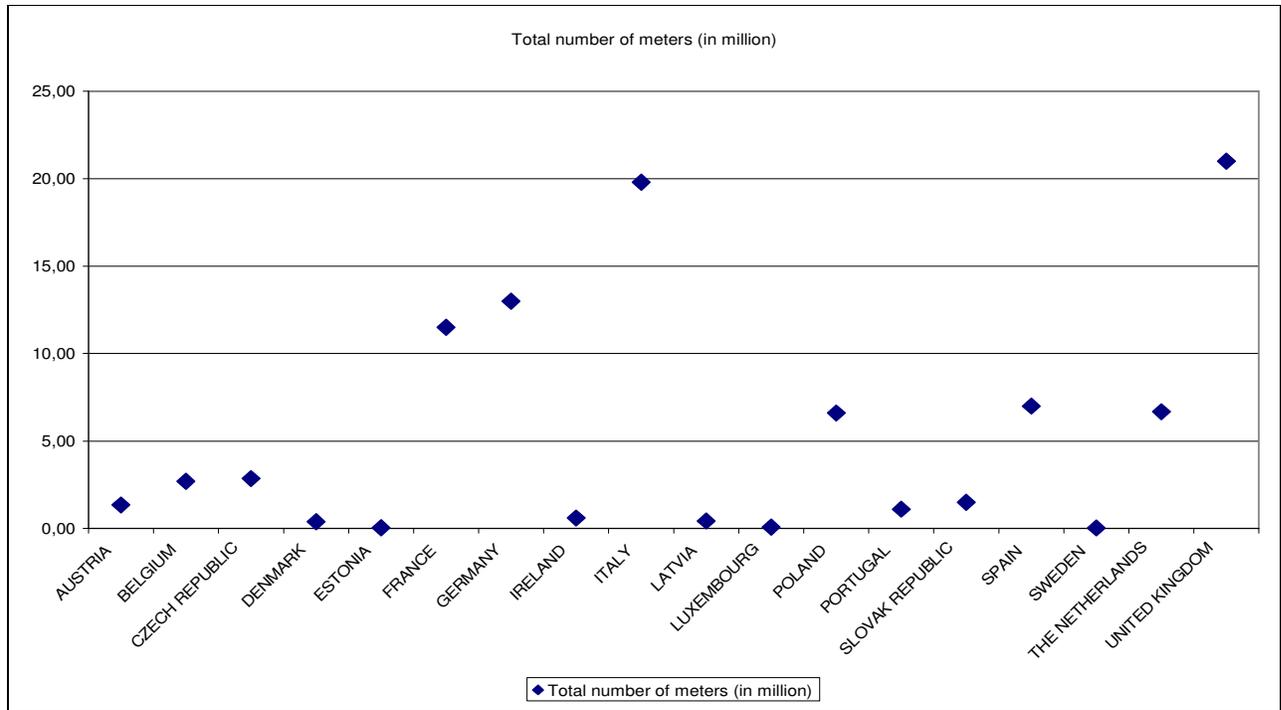Table 9: Main policy drivers to encourage smart metering roll-out in gas

Figure 15: Total number of meters in the mass market

	To develop services based on prepaid system	To develop energy offers based on tailored tariffs	To give information on the global peak and contribute to an accurate network management	To allow a self diagnostic of the functioning or not of the meter	To detect fraud	To con-tribute to energy savings	To secure energy supply
Austria				X	X		X
France					X	X	
Germany			X		X	X	
Italy		X	X			X	
Spain				X	X	X	
The Netherlands	X	X	X	X	X		X

Table 10: Important benefits

	To develop services based on prepaid system	To develop energy offers based on tailored tariffs	To give information on the global peak of consumption and contribute to an accurate network management	To allow a self diagnos-tic of the functioning or not of the meter	To detect fraud	To contribute to energy savings	To secure energy supply
Austria		X	X			X	
Italy				X			
The Netherlands						X	

Table 11: Very Important benefits

	Definition of the roll-out timetable		Participation in the project man-agement		Definition of minimal technical standards or functionalities		Definition of the level of ROI (return on investment) expected	
	active	non active	active	non active	active	non active	active	non active
Austria	X		-	-	X		X	
Belgium	X		X		X		X	
Czech Republik	X		X		X		X	
Denmark		X		X		X		X
Estonia	X		X		X		X	
France	X		X		X		X	
Germany		X		X	X			X
Italy	X			X	X			X
Latvia		X		X		X		X
Poland	X		X		X		X	
Portugal	X			X	X		X	
Slovak Republik		X	X			X	X	
Slovenia		X		X		X	X	
Spain		X		X		X		X
TheNetherlands		X		X		X		X

Table 12: Possible role of the regulator in gas

	Consumption	Billing components	Historical load curve	Gas quality
Austria	X	X		
Belgium	X	X	X	X
Czech Republic	X	X		X
Denmark	X	X	X	X
Estonia	X			X
France	X	X	X	
Germany	X	X		
Great Britain		X	X	
Ireland	X	X		
Italy	X	X	X	X
Latvia	X	X		X
Luxembourg	X	X		
Poland	X	X		
Portugal	X	X	X	X
Slovak Republic	X	X		X
Slovenia	X	X		
Spain	X	X	X	X
Sweden	X			
The Netherlands	X	X	X	

Table 13: Data available to customer (gas)

Annex 2 – ERGEG Questionnaires for Electricity and Gas

Introduction

A growing number of European companies, regulators and governments are currently investigating or completing the introduction of smart metering systems for some or all customer segments. European Community legislation already calls for "roll-out of meters accurately reflecting the actual consumption level" (Article 13 of Directive 2006/32/EC).

The Citizen's Energy Forum in 2008 invited ERGEG to present a status review of its report on smart metering at the next Forum with a particular focus on minimum technical functionality and minimum system capabilities criteria for the "smart meters". The report should also provide an overview of existing cost/benefit analyses that have been undertaken in countries and consider privacy and data protection issues associated with smart metering.

Furthermore an agreement has been reached regarding the third package of legislation on the electricity and gas markets. In the third package it is stated that:" The introduction of intelligent metering systems may be based on an economic assessment. Should that assessment conclude that the introduction of such metering systems is economically reasonable and cost-effective only for customers with a certain amount of electricity consumption, countries may take this into account when implementing intelligent metering systems", see article 41 e12. This further stresses the importance of learning more about how the regulatory framework is designed regarding intelligent metering systems and the meters.

The European energy regulators will therefore first draw up a status review on intelligent metering to then arrive at Guidelines of Good Practice on the issue in 2010. The purpose of this questionnaire is to prepare a status review on regulatory aspects associated with the roll-out of intelligent metering systems in Europe.

NOTE: The internal questionnaires on electricity and gas are identical unless otherwise noted in the text below.

Scope and key definitions

This questionnaire **concerns exclusively the mass market** (see glossary)

The main issues to be considered in this questionnaire are: how to ensure non-discriminatory access to meter data; an overview of existing cost-benefit analysis; minimum technical functionalities; minimum system capabilities criteria; market processes to be put into place (automated supplier switching processes, replacement of standardised load profiles with individual interval of data for household customers, frequency of meter reading, etc.); and consideration of the data privacy issues.

General structure for an intelligent metering system can be described as following:

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[12] Interinstitutional File: 2007/0195 (COD), Draft Directive of the European Parliament and of the Council concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC
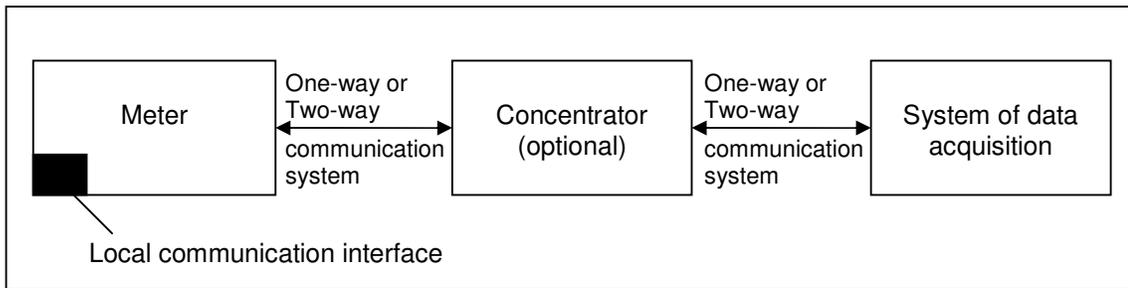
Figure 16: General structure of a smart metering system (also see questionnaire)

Introductory questions

As the definition of "**intelligent meters**" may be different according to the countries, please use the box below to specify the most common definition used in yours, if definition available:

As the definition of the "**mass market**" may be different according to the countries, please clarify the scope of mass market in yours (criterion and threshold value).

I – GENERAL FRAMEWORK
1. How many meters in total are installed in your country for retail market?
2. Who has the legal responsibility for these different kinds of operations related to metering?
   Check all boxes that apply (several answers allowed)

   2.1 Installation
      a. Distribution system operator
      b. Energy Supplier
      c. Metering company (if independent from the DSO)
      d. Customer

      Box for comments

   2.2 Maintenance
      a. Distribution system operator
      b. Energy Supplier
      c. Metering company (if independent from the DSO)
      d. Customer

      Box for comments

   2.3 Meter reading
      a. Distribution system operator
      b. Energy Supplier
      c. Metering company (if independent from the DSO)
      d. Customer

      Box for comments

2.4 Quality of data validation
   a. Distribution system operator
   b. Energy Supplier
   c. Metering company (if independent from the DSO)
   d. Customer

   Box for comments

2.5 Data management
   a. Distribution system operator
   b. Energy Supplier
   c. Metering company (if independent from the DSO)
   d. Customer

   Box for comments

3. What is the percentage of meters inaccessible for reading (e.g. located off the premises …)?

Please use the box below to specify if necessary the different situations:

4. Is there a mandatory frequency (excluding for switching or moving situations) for meter reading defined in your country?
   a. No. Then go directly to question 6
   b. Yes

   Box for comments

5. Please specify, for each kind of meter, the distribution (**in %**) between each situation :

   5.1 For "non" intelligent meters
      a. Once a day or more
      b. Between more than once a day and once a week
      c. Between more than once a week and once a month
      d. Between more than once a month and 6 times per year
      e. Between more than 6 times a year and once a year
      f. Less than once a year. Then, specify the frequency (box for comments)

   5.2 For intelligent meters
      a. Once a day or more
      b. Between more than once a day and once a week
      c. Between more than once a week and once a month
      d. Between more than once a month and 6 times per year
      e. Between more than 6 times a year and once a year
      f. Less than once a year. Then, specify the frequency (box for comments)

6. What is the status of intelligent metering roll-out in your country (several an-

swers possible)?
   a. Intelligent meters are already installed. Then, box for specifying the % re-garding to the total number of meters
   b. Intelligent meters are being installed. Then, box for specifying the % re-garding to the total number of meters
   c. Roll-out plan is decided.
   d. Roll-out plan is still under discussion. Specify then, go directly to question 9.
   e. There is no roll-out planned yet. Then go directly to question 9

7. Please specify the date of beginning and ending of the intelligent metering roll-out.
8. Has the regulator or the government made a cost / benefit analysis relating to any decision – positive or negative - regarding a roll-out?
   a. Yes. Please specify– the main results -–positive/negative - and main ele-ment for result.
   b. It is in progress
   c. No

9. What are (were) the main policy drivers to encourage intelligent metering roll-out in your country?
   a. Legal obligations (including regulatory ones)
   b. Financial incentives
   c. Development of meter standardisation
   d. Minimum functional requirements
   e. More frequent meter reads
   f. Energy efficiency
   g. Peak-load management
   h. Other, specify (box for comments)

10. Referring to question 2, will (has) the smart metering roll-out change(d) the re-sponsibilities or the activities of the entities currently in charge of the operations relating to metering ?
   a. Yes, please specify in what way
   b. No

11. What could be (was) the role of the regulator in the processes below :

   Fill the boxes with: 0 if "not active"
                              1 if "active"

   a. Definition of the roll-out timetable
   b. Participation in the project management
   c. Definition of minimal technical standards or functionalities
   d. Definition of the level of ROI (return on investment) expected
   e. Other, please specify (box for comments)

12. Do you have a mandatory roll-out or policy already defined for smartgrids (see glossary)? (*question not relevant for gas*)
   a. Yes, then specify –n what way
   b. No

II - ACCESS TO DATA AND PRIVACY

13. Is there a legal obligation regarding ownership of data measured by the meter?
   a. Yes
   b. No. Then go directly to question 14

   13.1   Who is the owner of this data (several answers allowed)
      a. The DSO
      b. The energy supplier
      c. The metering company
      d. The customer
      e. Not defined
      f. Other (box for comments)

14. Who (besides the customer) has the access to the following data?

   14.1   The DSO
          Check boxes that apply (several answers allowed)

      a. Consumption
      b. Information on billing parameters
      c. Historical load curve
      d. Instantaneous power (see glossary – *not relevant for gas*)
      e. Data about electricity quality
      f. Others, specify

   14.2   The metering company
          Check boxes that apply (several answers allowed)

      a. Consumption
      b. Information on billing parameters
      c. Historical load curve
      d. Instantaneous power (see glossary – *not relevant for gas*)
      e. Data about electricity quality
      f. Others, specify

   14.3   The customer's current energy supplier
          Check boxes that apply (several answers allowed)

      a. Information on billing parameters
      b. Historical load curve
      c. Instantaneous power (see glossary – *not relevant for gas*)
      d. Data about electricity quality
      e. Others, specify

   14.4   Others energy supplier
          Check boxes that apply (several answers allowed)

      a. Information on billing parameters
      b. Historical load curve
      c. Instantaneous power (see glossary – *not relevant for gas*)

    d. Data about electricity quality
    e. Others, specify

14.5   Other
    15.5.1   Please specify who (box for comments)
    15.5.2   Please specify the kind of information accessible
            Check boxes that apply (several answers allowed)

        a. Information on billing parameters
        b. Historical load curve
        c. Instantaneous power (see glossary – *not relevant for gas*)
        d. Data about electricity quality
        e. Others, specify

15. Focus on the customer's situation: what kind of data is accessible to them and how?

15.1   Consumption
    a. Yes
    b. No. Then go directly to question 15.2

    15.1.1 Then, how is it made available or accessible to the customer?
          Check boxes that apply (several answers allowed)

        a. On the customer bill
        b. Through the intelligent meter display
        c. Through a remote display unit
        d. On the supplier website
        e. On the DSO website
        f. Sent by SMS
        g. Other, please specify (box for comments)

15.2   Information on billing components (energy price, energy charge per kWh, …)
    a. Yes
    b. No. Then go directly to question 15.3

    15.2.1 How is it made available or accessible to the customer?
          Check boxes that apply (several answers allowed)

        a. On the customer bill
        b. Through the intelligent meter display
        c. Through a visual display unit
        d. On the supplier website
        e. On the DSO website
        f. Sent by SMS
        g. Other, please specify (box for comments)

15.3   Historical load curve
    a. Yes
    b. No. Then go directly to question 15.4

15.3.1 How is it made available or accessible to the customer?
Check boxes that apply (several answers allowed)

    a. On the customer bill
    b. Through the intelligent meter display
    c. Through a visual display unit
    d. On the supplier website
    e. On the DSO website
    f. Sent by SMS
    g. Other, please specify (box for comments)

15.4 Instantaneous power (see glossary – *question not relevant for gas*)
    a. Yes
    b. No. Then go directly to question 15.5

15.4.1 How is it made available or accessible to the customer? (*question not relevant for gas)*
Check boxes that apply (several answers allowed)

    a. On the customer bill
    b. Through the intelligent meter display
    c. Through a visual display unit
    d. On the supplier website
    e. On the DSO website
    f. Sent by SMS
    g. Other, please specify (box for comments)

15.5 Data about electricity quality (or gas quality)
    a. Yes
    b. No. Then go directly to question 15.6

15.5.1 How is it made available or accessible to the customer?
Check boxes that apply (several answers allowed)

    a. On the customer bill
    b. Through the intelligent meter display
    c. Through a visual display unit
    d. On the supplier website
    e. On the DSO website
    f. Sent by SMS
    g. Other, please specify (box for comments)

15.6 Other kinds of data, please specify (box for comments)

16. Is the any data privacy law related to meter value?
    a. Yes
    b. No

Please use the box below to explain how the regulator deals with this privacy aspect

$$*$$
$$* \qquad *$$

For the rest of the questionnaire, depending of the progress of intelligent metering roll-out in your country (cf. question 5a, b and c), please answer according to these perspectives:

- **the intelligent metering system that you already installed, or you are installing;**

or

- **the intelligent metering system you have decided upon.**

$$*$$
$$* \qquad *$$

III – FUNCTIONAL AND TECHNICAL ASPECTS

17. Main functions to frame or to standardise in order to preserve interoperability aspects

    17.1   Interval of metering
        a. Yes
        b. No. Then go directly to question 17.2

        17.1.1   Please specify each relevant interval and for which customer segment it applies?
                a. …< 1mn
                b. 1 mn ≤ …< 30 mn
                c. 30 mn ≤ …< 1 h
                d. 1 h ≤ …< Once a day
                e. Once a day ≤ …< Once a week
                f. Once a week ≤ …< Once a month
                g. Once a month

    17.2 Number of types of communication system
        a. Yes
        b. No. Then go directly to question 17.3

        17.2.1   Please specify the kind of communication system used in your country (one or two-way: see glossary)?
                a. One-way
                b. Two-way

        17.2.2   Please specify the kind of technology/ies that should support the communication system between the meter and the concentrator (several answers allowed)

                a. Wireless technology:

                    − Radio frequency
                    − GSM
                    − GPRS
                    − Wimax
                    − Others (box for comments)

                b. Cable technology:

- PLC (power line carrier)
- ADSL
- Others (box for comments)

17.2.3 What kind of technology must support the communication system between the concentrator and the system of data acquisition? (several answers allowed)
a. Wireless technology:
  - Radio frequency
  - GSM
  - GPRS
  - Wimax
  - Others (box for comments)

b. Cable technology:
  - PLC (power line carrier)
  - ADSL
  - Others (box for comments)

17.3 Communication Protocol (see glossary).
a. Yes
b. No. Then go directly to question 17.4

17.3.1 What kind of communication protocol is used? (box for comments)
17.3.2 The use of the communication protocol should be :
a. Open standard (see glossary).
b. Proprietary
c. Available but with a license to pay (see glossary).

17.3.3 In order to secure data, are there rules to secure the data within the meter and the communication system?
a. Yes
b. No

17.4 Storage capability (see glossary).
a. Yes
b. No. Then go directly to question 17.5

17.4.1 What is the storage capability for the intelligent meter? (box for comments, unit = days)
17.4.2 For how long must metering data be stored in the data acquisition system? (box for comments, unit = years)
17.4.3 What is the minimum timeframe to transfer up the data from the meters to the data acquisition system?

a. Real time, please specify
b. Less than a day
c. Less than a month
d. More than a month

17.5 Remote control (see glossary).
a. Yes
b. No. Then go directly to question 17.6

17.5.1 A intelligent metering system must (will) be capable of (several answers possible) :
a. A remote monitoring of the connected load (see glossary – *not relevant for gas*)
b. A remote connection / disconnection of the meter
c. A remote change of contractual parameters (tariffs conditions)[13]
d. A remote control of indoor electronic devices (water-heater, washing machine, ...)
e. A remote monitoring of the electrical distribution network (reduction of the DSO's losses, monitoring of the electricity grid in case of outage…)(*not relevant for gas)*

17.6 Local interface of communication (see glossary).
a. Yes
b. No. Then go directly to question 17.7

17.6.1 What kind of data can be delivered through the local interface communicate to the end user? :
a. Consumption
b. Information on billing parameters
c. Part of load curve
d. Instantaneous power (see glossary – *not relevant for gas*)
e. Data about electricity quality
f. Others, specify (box for comments)

17.7 Different kind of tariffs recorded (network tariff, supplier tariff, meter tariff, …)
a. Yes, then specify
b. No

17.8 Bi-directionality (see glossary–
a. Yes
b. No

IV - MARKET PROCESS

18. Which of the following processes are affected as a result of introducing intelligent metering system?
Check all boxes that apply (several answers allowed)

18.1 Switching
a. Reducing lead times

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[13] For reduction or increasing of connected load for example

b. Fluidity of process
c. Improving customer information
d. Reduction of costs for the supplier
e. Reduction of costs for the DSO
f. Others, specify (box for comments)

18.2 Connection
a. Reducing lead times
b. Fluidity of process
c. Improving customer information
d. Reduction of costs for the supplier
e. Reduction of costs for the DSO
f. Others, specify (box for comments)

18.3 Disconnection
a. Reducing lead times
b. Fluidity of process
c. Improving customer information
d. Reduction of costs for the supplier
e. Reduction of costs for the DSO
f. Others, specify (box for comments)

18.4 Complaint handling
a. Reducing lead times
b. Fluidity of process
c. Improving customer information
d. Reduction of costs for the supplier
e. Reduction of costs for the DSO
f. Others, specify (box for comments)

18.5 Detection of fraud
a. Reducing lead times
b. Fluidity of process
c. Improving customer information
d. Reduction of costs for the supplier
e. Reduction of costs for the DSO
f. Others, specify (box for comments)

18.6 Billing
a. Reducing lead times
b. Fluidity of process
c. Improving customer information
d. Reduction of costs for the supplier
e. Reduction of costs for the DSO
f. Others, specify (box for comments)

19. What are the main benefits or values expected from an intelligent metering roll-out?
Fill boxes with: 0 if "not important"
1 if "important"
2 if "highly important"

a. To develop services based on prepaid system
b. To develop energy offers based on tailored tariffs
c. To give information on the global peak of consumption and contribute to an accurate network management
d. To allow a self-diagnostic of the functioning or not of the meter
e. To detect fraud
f. To contribute to energy savings
g. To secure energy supply
h. Others (box for comments)

Glossary for Electricity and Gas Questionnaires

Bi-directionality	Ability to measure both production and consumption
Connected load (electricity)	It is the power (in watts, W) defined by the customer in order to best fit his/her own needs. It is usually calculate in order to allow the use of all the electronic devices at a time. Customers are not allowed to connect a load which requires more power than the connected load. It is also used as a bill parameter by the energy supplier to charge its customers.
Instantaneous power (electricity)	The instantaneous power, measured in watt (W), is the power required to operate all the devices supplied with electricity and turned on at the instant t.
Local communication interface	An interface, based on the meter, to plug a device in order to access in real time to data available in it. The device could eventually transfer data up to a visual unit display.
Mass market (electricity)	All household customers, and small enterprises (namely enterprises with fewer than 50 occupied persons and an annual turnover or balance sheet not exceeding EUR 10 million)[14]
One-way (for a communication system) – see also two-way	Ability for a communication system to read data in the meter, to transfer this data up to the data acquisition system (through the concentrator)
Communication Protocol	It is the set of standard rules for data representation, signalling, authentication and error detection to send information over a communication channel.
[Protocol] available but with a license to pay	The protocol belongs to the company which has developed it but everyone is allowed to buy the license for use.

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[14] Chapter 2 Article 3 p.3, Interinstitutional File: 2007/0195 (COD), Draft Directive of the European Parliament and of the Council concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC

[Protocol] open Standard	The communication protocol is available for everyone use and free of charge.
Remote control	Remote control is a functionality of the meter which allows the control (for instance switch on / off) of electronic devices or the connection / disconnection of the meter from a distance.
Remote monitoring of the connected load (electricity)	Ability to change the value of the connected load from a distance.
Smartgrids (electricity)	Electricity network that can intelligently integrate the actions of all users connected to it – generators, customers and those that do both – in order to efficiently deliver sustainable, economic and secure electricity supplies. Smart grids employ innovative products and services together with intelligent monitoring, control, communication, and self-healing technologies.
Storage capability	The total amount of stored information that a meter or a concentrator can hold.
Two-way (for a communication system) – see one-way	Same ability as a "one-way" plus ability to transfer data down to the meter in order to perform remote control processes

Annex 3 – ERGEG

The European Regulators for Electricity and Gas (ERGEG) was set up by the European Commission in 2003 as its advisory group on internal energy market issues. Its members are the energy regulatory authorities of Europe. The work of the CEER and ERGEG is structured according to a number of working groups, composed of staff members of the national energy regulatory authorities. These working groups deal with different topics, according to their members' fields of expertise.

This report was prepared by the Retail Market Functioning Task Force of the Customer Working Group.

Annex 4 – List of abbreviations

Term	Definition
A	Ampere
AMM	Automated Meter Management (system)
AMR	Advanced Meter Reading
AMS	Advanced Metering and Management System
CEER	Council of European Energy Regulators
DSO	Distribution System Operator
ERDF	Electricité Réseau Distribution France, French DSO
ERGEG	European Regulators Group for Electricity and Gas
ERSE	Entidade Reguladora dos Serviços Energéticos, Portugal NRA
GGP	Guidelines of Good Practice
HV	High Voltage
IT	Information technologies
kWh	Kilowatt
kVA	Kilovolt Ampere
LV	Low Voltage
MV	Medium Voltage
NRA	National Regulatory Authority
PLC	Power Line Carrier
ROI	Return On Investment
W	Watts