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Internal Energy Market
Internal Market

**A joint contribution of DG ENER and DG INFSO
towards the Digital Agenda, Action 73:
Set of common functional requirements of the
SMART METER**

FULL REPORT

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Contact : Rogelio Segovia, DG INFSO. rogelio.segovia@ec.europa.eu

Manuel Sánchez, DG ENER. manuel.sanchez-jimenez@ec.europa.eu

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Introduction

Background

- Annex I of the 2009 Electricity and Gas Directives (Directive 2009/72/EC and 2009/73/EC);
- Recommendation C(2009)7604 and subsequently in the Digital Agenda for Europe, Com(2010)245;
- ERGEG Guidelines of Good Practice (GGP) on regulatory aspects of Smart Meters for electricity and gas (Ref. E10-RMF-29-05), providing a set of 16 high level requirements for meter and gas.
- CEN/CENELEC/ETSI Smart Meter Co-ordination Group (M441) has proposed a set of 6 functionalities relevant for communications and is working on their standardization.

We believe that a commonly agreed definition of the Smart Meter, based on a set of minimum or optional functional requirements, would enable Member States to identify common means of achieving cost-efficiencies (and inefficiencies) in their roll-out plans. This could in turn serve Member States, the metering industry and utilities as a solid basis for their respective investments, facilitate roll-out-associated procurement and provide regulators with European reference definitions.

This is a joint contribution of DG ENER and DG INFSO towards the Digital Agenda, Action 73.



http://ec.europa.eu/information_society/digital-agenda/index_en.htm

Purpose

To date, around one third (11) of Member States have already carried out a an economic assessment of the costs and benefits of Smart Metering Systems as set out in Annex I of Directives 2009/72/EC and 2009/73/EC.

In this context the Commission sees a benefit in reaching a consensus around the functional specifications for Smart Meters. To this end, based on an analysis of these 11 cost benefit assessments (CBAs), we have defined a Smart Metering System in terms of 13 key Functionalities – see below.

We then determined, by means of a questionnaire, whether these Functionalities have been considered within the scope of your national CBAs, and their respective impact on the cost of the metering system.

The Commission then convened a workshop to seek agreement on what Functionalities could be considered as common.

We would like to propose this set of common Functionalities to the remaining Member States, to be used in their CBAs.

Original Functionalities included in the questionnaire

The following Functionalities of a Smart Meter were used in the Questionnaire and were based on the ERGEG Guidelines of Good Practice on Regulatory Aspects of Smart Metering for Electricity and Gas (E10-RMF-29-05):

For the Customer:

- 1** Provides readings from the meter to the customer and to equipment that he may have installed;
- 2** Updates these readings frequently enough to allow the information to be used to achieve energy savings;
- 3** Provides these readings in a form easily understood by the untrained consumer, and with calculations enabling final customers to better control their energy consumption. E.g. In terms of cost, as averages, as comparisons to other periods, etc.

For grid & network support:

- 4** Allows remote reading of meter registers by energy suppliers and by grid operators;
- 5** Provides two-way communication between the meter and external networks (both supply & grid) for maintenance and control of the meter;
- 6** Provides for the monitoring of Power Quality;
- 7** Allows readings to be taken frequently enough to allow the information to be used for grid control.

For commercial aspects of energy supply:

- 8** Supports advanced tariff systems. Includes multiple tariffs, time of use registers, block tariff registers, remote tariff control, etc as applicable;
- 9** Supports energy supply by pre-payment and on credit;
- 10** Allows remote ON/OFF control of the supply and/or flow or power limitation.

For security and privacy:

- 11** Provides Secure Data Communications;
- 12** Fraud prevention and detection.

To allow distributed generation:

- 13** Provides Import / Export & Reactive Metering.

Answers received

Answers to the questionnaire were received from the following countries:

| | N° of Functionalities Considered ¹ | | | |
|-------------|---|-----|---------------|----------------|
| | Electricity | Gas | Questionnaire | After Workshop |
| Austria | ✓ | | 10.5 | 10.5 |
| Belgium | ✓ | ✓ | 8 | 8.5 |
| France | ✓ | ✓ | 10 | 10.5 |
| Ireland | ✓ | | 10.5 | 11 |
| Netherlands | ✓ | ✓ | 12 | 12 |
| Norway | ✓ | | 8 | 8 |
| Poland | ✓ | | 11 | 11.5 |
| Portugal | ✓ | | 11.5 | 12.5 |
| Slovenia | ✓ | | 10 | 10 |
| Sweden | ✓ | | 4 | 10.5 |
| UK | ✓ | ✓ | 13 | 13 |

The differences between the number of Functionalities considered by each country in the questionnaire and after the workshop is the result of a better understanding of the questions asked and a better understanding of the situations in each of the countries.

¹ When assessing the number of functionalities considered in each country's CBA, a YES scored 1, a PARTLY scored ½ and a NO scored 0

Statistics

| Post-workshop | AT | BE | FR | IE | NL | NO | PL | PT | SE | SI | UK | yes | partly | no | consensus level |
|--|---------|--------|--------|---------|---------|---------|---------|--------|------|---------|---------|-----|--------|----|-----------------|
| Functionality 1 | | | | | | | | | | | | | | | |
| Provides readings from the meter to the customer | partly | partly | yes | yes | yes | yes | partly | yes | yes | yes | yes | 8 | 3 | 0 | 9,5 |
| Impact | minimal | | | low | low | low | low | | | low | low | | | | |
| Functionality 2 | | | | | | | | | | | | | | | |
| Updates these readings frequently enough | yes | yes | yes | yes | yes | yes | yes | yes | yes | partly | yes | 10 | 1 | 0 | 10,5 |
| Impact | medium | | | low | low | minimal | low | | high | | low | | | | |
| Functionality 3 | | | | | | | | | | | | | | | |
| Calculations | yes | partly | no | yes | yes | yes | partly | partly | no | yes | yes | 6 | 3 | 2 | 7,5 |
| Impact | | | | medium | medium | high | low | | | low | minimal | | | | |
| Functionality 4 | | | | | | | | | | | | | | | |
| Allows remote reading | yes | yes | yes | yes | yes | yes | yes | yes | yes | yes | yes | 11 | 0 | 0 | 11 |
| Impact | high | | | high | minimal | medium | medium | | high | minimal | low | | | | |
| Functionality 5 | | | | | | | | | | | | | | | |
| Maintenance and control of the meter | yes | partly | yes | partly | yes | no | yes | yes | yes | yes | yes | 8 | 2 | 1 | 9 |
| Impact | low | | | high | medium | | medium | | | minimal | low | | | | |
| Functionality 6 | | | | | | | | | | | | | | | |
| Power Quality | no | no | yes | yes | partly | partly | partly | yes | no | yes | yes | 5 | 3 | 3 | 6,5 |
| Impact | | | | | minimal | high | low | | | minimal | low | | | | |
| Functionality 7 | | | | | | | | | | | | | | | |
| Grid control | yes | yes | yes | no | yes | no | yes | yes | yes | no | yes | 8 | 0 | 3 | 8 |
| Impact | minimal | | | | minimal | | minimal | | | | low | | | | |
| Functionality 8 | | | | | | | | | | | | | | | |
| Advanced tariff and payment | yes | partly | yes | partly | yes | partly | yes | yes | yes | yes | yes | 8 | 3 | 0 | 9,5 |
| Impact | medium | | | | low | low | low | | | low | low | | | | |
| Functionality 9 | | | | | | | | | | | | | | | |
| Pre-payment and on credit | partly | no | no | yes | yes | partly | yes | yes | no | no | yes | 5 | 2 | 4 | 6 |
| Impact | minimal | | | minimal | low | low | low | | | | low | | | | |
| Functionality 10 | | | | | | | | | | | | | | | |
| Remote ON/OFF / power | yes | partly | partly | yes | yes | yes | yes | yes | yes | yes | yes | 9 | 2 | 0 | 10 |
| Impact | medium | | | minimal | low | low | low | | | medium | low | | | | |
| Functionality 11 | | | | | | | | | | | | | | | |
| Provides Secure Data Communications | yes | yes | yes | yes | yes | yes | yes | yes | yes | yes | yes | 11 | 0 | 0 | 11 |
| Impact | medium | | | low | medium | | medium | | | low | low | | | | |
| Functionality 12 | | | | | | | | | | | | | | | |
| Fraud prevention and | yes | yes | yes | yes | partly | partly | yes | yes | yes | yes | yes | 9 | 2 | 0 | 10 |
| Impact | low | | | minimal | low | | low | | | low | low | | | | |
| Functionality 13 | | | | | | | | | | | | | | | |
| Import / Export & Reactive | partly | yes | yes | yes | yes | yes | yes | yes | no | partly | yes | 8 | 2 | 1 | 9 |
| Impact | low | | | minimal | medium | minimal | low | | | minimal | low | | | | |
| country profile level | 10,5 | 8,5 | 10,5 | 11 | 12 | 9 | 11,5 | 12,5 | 9 | 10 | 13 | | | | |

Summary Analysis of the Answers Received to the original Questionnaire ²

Consensus level threshold set to 8/11

² When assessing the number of functionalities considered in each country's CBA, a YES scored 1, a PARTLY scored ½ and a NO scored 0

Final Functionalities with high consensus

Following analysis of the Questionnaires received and the workshop, the Functionalities of a Smart Meter were amended and three were removed as not having consensus enough. They now read:

For the Customer:

- **Provides readings from the meter to the customer and to equipment that he may have installed;**
- **Updates these readings frequently enough to allow the information to be used to achieve energy savings;**

For the Meter Operator:

- **Allows remote reading of meter registers by the Meter Operator;**
- **Provides two-way communication between the meter and external networks for maintenance and control of the meter;**
- **Allows readings to be taken frequently enough to allow the information to be used for network planning.**

For commercial aspects of energy supply:

- **Supports advanced tariff systems;**
- **Allows remote ON/OFF control of the supply and/or flow or power limitation.**

For security and privacy:

- **Provides Secure Data Communications;**
- **Fraud prevention and detection.**

To allow distributed generation:

- **Provides Import / Export & Reactive Metering.**

Functionalities for the Customer:

Functionality 1: Provides readings from the meter to the customer and to equipment that he may have installed ³

Explanations

This Functionality relates purely to the Demand side, namely the end customer, and in particular to the requirements of DIRECTIVE 2006/32/EC.

Points to be considered within this Functionality include:

- The need for all customers to benefit from Smart Metering;
- Customer ownership & control of Meter Data;
- Provision of a method (such as an SM-HAN or a user accessible communications port) by which this data is transmitted to in-house devices;

Points not to be considered here but within other Functionalities include:

- Provision of messages or other information to the customers from the energy supplier. This is considered under Functionality 10;

Statistics

| | | | |
|-----------------------------------|----------------|------------|---------------------|
| Was this Functionality considered | Yes — 8 | Partly — 3 | No — 0 ⁴ |
| Cost Impact | Minimal to Low | | |
| | Minimal: 1 | Low: 6 | Medium: 0 High: 0 |
| Consensus Level ⁵ | 9.5 | | |

³ This relates to the provision of readings to a display external to the meter, to a computer, etc. This does not refer to any display built into a meter. **The external display cost is not included here.**

⁴ This negative response related simply to the fact that this functionality had not been considered in the CBA. Information is provided by the DSO.

⁵ When assessing the consensus level for each Functionality, a YES scored 1, a PARTLY scored ½ and a NO scored 0

Comments made

In most countries, the meter is fitted with a user accessible port. This allows the consumer to connect other equipment such as an In-home Display (IHD) to the meter and thus monitor energy use. One country is mandating the supply of such a display to all domestic consumers while seven countries are actively considering a Home Area Network (HAN).

Some concerns were expressed as to the cost of providing such a display; also as to the lack of standardisation of this port.

Following clarifications at the workshop, one Country reports that at the time of the CBA, this functionality was not included, but later used at all metering systems. We count them as a YES to be included in future CBAs.

Conclusions

This Functionality appears to be considered as essential of a Smart Meter,— as consumer feedback is essential if savings are to be achieved. There is universal consensus on the provision of a gateway, but less agreement on how the information provided by this gateway is to be communicated in the house. In some cases, provision of an In-home Display (IHD) appears to be the customer's decision.

Full answers

AT

Functionality 1 considered in the CBA?

Yes Partly No

Comments on the functionality

In Austria the smart meter itself has to include a gateway where the customer can receive the measured data from the meter to use it e.g. for a home display.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

Does not affect the overall costs of smart metering, because the use of a home display or other home automation appliances is not mandatory and has to be paid by the customer himself. Please note: A CBA has to be conducted by the Austrian Ministry of Economy according to Article 83 para 1 of the Austrian Electricity Industry and Organisation Act (in

transposition of the directive 2009/72/EC). The Austrian regulatory authority E-Control conducted a separate CBA last year which does not so far represent the official CBA according to Art. 83 para 1 of the Austrian Electricity Industry and Organisation Act. Therefore, each answer regarding the total costs of specific functionalities only refers to the regulatory authority's CBA.

BE

Functionality 1 considered in the CBA?

Yes Partly No

Comments on the functionality

The smart meter is equipped with a user accessible communication port, by which the data is transmitted to in-house device (optional device)

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

Even if the sharing of costs and benefits among market segments is evaluated, the impact on the total cost for each functionality was not assessed. We cannot then address this aspect of your questions.

FR

Functionality 1 considered in the CBA?

Yes Partly No

Comments on the functionality

Le compteur dispose d'une prise interopérable (Télé-information client) mettant à disposition les données de comptage. Cette prise peut être équipée: - d'un module de communication sans fil (radio, HAN ou autre) - d'une liaison filaire

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

Cette fonctionnalité étant incluse dans la solution de base, elle n'a pas fait l'objet d'une évaluation technico-économique séparée

IE

Functionality 1 considered in the CBA?

Yes Partly No

Comments on the functionality

This answer refers to the HAN comms.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

NL

Functionality 1 considered in the CBA?

Yes Partly No

Comments on the functionality

Via P1-gate various methods of meter reading are optional (with additional signal transmitters).

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

This has not been measured according your question.

NO**Functionality 1 considered in the CBA?**

Yes Partly No

Comments on the functionality

Our provisions require that the meter has a user accessible communications port. With this port the customer may decide on the method of data transmission to other devices.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

PL**Functionality 1 considered in the CBA?**

Yes Partly No

Comments on the functionality

It is assumed that meter can be equipped with port enabling HAN communication equipment or other communication with customer's equipment.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

This functionality will be available only for interested customers. As a Percentage ___5-10___%

PT**Functionality 1 considered in the CBA?**

Yes Partly No

Comments on the functionality

The most important piece of the meter interface considered was the LCD display, allowing the visualization of the different metering values. The study has detected that the display cost was significant. It was mentioned that this would have to be studied further in a future pilot project of the different available alternatives for this functionality.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

General Remark: The CBA developed by ERSE in 2007 included the following steps: 1. Information gathering from network operators about existing installed meters 2. Analysis of international experiences of meter rollout 3. Inquiry to meter manufacturers about technology maturity, standardisation, meter capabilities and costs 4. Public consultation to stakeholders This process defined three different scenarios as possible, AMR, AMM and AMM+MU (AMM plus multi-utility). The following list describes the minimum functionality subset proposed by ERSE in the public consultation: 1. Energy measurement – Record of consumption and emission to the network of active energy, in each 15 minute period; Record of reactive energy; record of maximum power in 15 min. 2. Storage capacity – Record of 15 min data for at least three months. 3. Tariffs specification – Measurement aggregation in 6 programming periods; local and remote parameterisation capacity; pre-payment possibility; several tariffs possibility, enabling to merge the structure of the regulated network tariffs with other defined by the supplier. 4. Meter communication – modular solution, enabling to use several communication protocols (GSM, GPRS, PLC, etc) rather public combined with normalised data message format. 5. Remote Meter functioning/parameterisation - meter cycle change; tariff option, contracted power and other parameters; power regulation and control; interruption and reactivation of supply possibility. 6. Consumer interface – Visualisation on the LCD display of accumulated consumption for receipt validation; Instantaneous power value access 7. Quality of service

– Record of number and duration of long interruption of supply (duration higher than 3 minutes); record of the interval in which the effective (rms) value of the voltage is outside the European standards. The CBA considered the AMM scenario to be the most favourable, including bidirectional communications with central systems and allowing besides more advanced energy metering functionalities, remote parameterisation and power control. This solution enables for instance the remote change of the contracted power or the applicable tariff options. The information gathered from the network operators and the manufacturers included cost relevant data. It was not possible to determine the cost of each functionality separately, since the feed-back from the manufacturers was mostly through bundled solutions. It was concluded that the cost is mainly related to some specific functions (like two-way communication or control over the main switcher, for example). Then, extra functionalities can be added with few extra costs. The costs of this solution, AMM, considered a value of 169 € per meter (including the costs of the metering device, the central processing system and OPEX costs). The expected benefits included the avoided local operations as well as the change of consumption habits. The CBA considered the replacement of all installed meters (approximately 6 million), a lifetime of 20 years, a discount rate of 5% and an inflation rate of 2%. Two different risks assumptions were made, one not considering energy efficiency savings or energy transfers from peak to off-peak hours and another one, more optimistic, considering energy efficiency savings of 2% and energy transfer from peak to off-peak hours of 1%. Depending on the assumptions made the benefits varied from 255 M€ to 1164 M€. The total cost obtained was 1014 M€ which means that the obtained profit varied from (-759 M€) to 150 M€. ERSE considered AMM plus the referred energy savings (2%) and energy transfers (1%) as the best scenario, and submitted it as a proposal to the government. In this proposal, ERSE suggested also the need to carry out a pilot project, including around 7500 LV consumers, in order to validate the CBA assumptions, studied functionalities and conclusions. In addition the pilot project should try to gather more information, namely studying different alternatives for the communication process between the meter and the consumer. The government approval wasn't granted and so the process stopped. As defined by the third package, a new study will have to be deployed. According to the transposition legislation, already done in Portugal, ERSE will conduct a new CBA that shall be presented to the government up to the 30th of June, 2012.

SE

Functionality 1 considered in the CBA?

Yes Partly No

Comments on the functionality

The CBA did not take such functionalities into consideration. The meter-reading is not automatically transmitted to the customer from the meter. However, the information goes to the DSO who then informs the supplier and the customer.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

See answer above

SI

Functionality 1 considered in the CBA?

Yes Partly No

Comments on the functionality

This functionality was recommended only as an option, because of lack of standardisation of the HAN port. Providing readings via Internet was considered as non-standard service.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

UK**Functionality 1 considered in the CBA?**

Yes Partly No

Comments on the functionality

The GB smart metering system includes an IHD that will be offered to all consumers and which will provide information to enable them to understand and modify their energy consumption. It is proposed that the Smart Metering system should be capable of transmitting price and consumption related information across the Smart Metering HAN (SM HAN) to In Home Displays (IHD) and smart appliances. Typically the SM HAN would be wireless but a wired solution or mains signalling HAN may be appropriate for some consumers and premises. The SM HAN will have to be secured to a level proportionate to the risks and threats, and must be based on open and non-proprietary standards. It is proposed that the consumer will be able to control who else will be able to access the consumption data recorded by the meter, unless it is required for a supplier or network to fulfil the requirements of their licence (for regulated duties). The SM HAN would typically link the electricity and gas meters, Wide Area Network (WAN) and IHD. The UK Government is also proposing that consumers will be able to connect other smart equipment (for example, smart appliances) to the SM HAN via a bridging device. This device would have to meet certain security protocols and only be accepted into the system following authentication (for example, through a robust pairing procedure) to ensure that the end-to-end smart metering system is not compromised. This will enable consumers to securely connect the SM HAN with a consumer owned network that may already be present within their home (e.g. WiFi, Bluetooth).

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

As a Percentage ___ less than 15% of equipment costs. Equipment costs exclude operating costs. Applies to both electricity and gas. HANs do not solely serve this purpose and therefore support a range of benefits of the smart metering system.

Functionality 2: Updates these readings frequently enough to allow the information to be used to achieve energy savings

Explanations

This Functionality relates purely to the Demand side, namely the end customer, and in particular to the requirements of Directive 2006/32/EC.

Points to be considered within this Functionality include:

- Installation of Smart Meters should lead to Energy savings by the customers;
- That the information flow to the customer is fast enough to allow the customer to react to excessive loads;
- That a clear benefit arises to the Customer.

Points not to be considered here but within other Functionalities include:

- Provision of information across the WAN to the energy supplier or to the network operator. These are considered in Functionality 5 and Functionality 7

Statistics

| | | | |
|-----------------------------------|---|------------|--------|
| Was this Functionality considered | Yes — 10 | Partly — 1 | No — 0 |
| Cost Impact | Minimal to Low Minimal: 1 Low: 4 Medium: 1 High: 1 ⁶ | | |
| Consensus Level ⁷ | 10.5 | | |

⁶ The one high cost answer relates to more than just the provision of these readings from the meter.

⁷ When assessing the consensus level for each Functionality, a YES scored 1, a PARTLY scored ½ and a NO scored 0

Comments made

A majority of those responding are suggesting that the update interval is in line with the national demand profiling or meter reading intervals, normally 15, 30 or 60 minutes; four countries however are specifying updates every few seconds.

Conclusions

Member States have agreed that the key to achieving energy savings is accurate and timely information for energy saving decisions. If consumers are to rely on the information provided by the system, they need to see the information responding to their actions. The rate has to be adapted to the response time of the energy consuming or producing products. The general consensus is that a **15 minute update** rate is needed at least; further developments are likely to lead to faster communications which will be the subject of a future CBA.

Full answers

AT

Functionality 2 considered in the CBA?

Yes Partly No

Comments on the functionality

A 15-minutes-intervall is the basis of the Austrian market model (balancing, clearing etc.) and therefore chosen as the basis for the costumer information (e.g. via web portal). This refers to the technical possibility to save this data within the meter and does not state how often the meter will actually be readout.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

BE

Functionality 2 considered in the CBA?

Yes Partly No

Comments on the functionality

The electricity meter readings are recorded every 15 minutes and the gas once every one hour.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

Even if the sharing of costs and benefits among market segments is evaluated, the impact on the total cost for each functionality was not assessed. We cannot then address this aspect of your questions.

FR

Functionality 2 considered in the CBA?

Yes Partly No

Comments on the functionality

La courbe de charge peut être relevée à un pas de 30 minutes, pouvant potentiellement être abaissée à 10 minutes.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

Cette fonctionnalité étant incluse dans la solution de base, elle n'a pas fait l'objet d'une évaluation technico-économique séparée

IE

Functionality 2 considered in the CBA?

Yes Partly No

Comments on the functionality

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

NL

Functionality 2 considered in the CBA?

Yes Partly No

Comments on the functionality

Realtime optional. P1 will do actual readings; P4 per day.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

This has not been measured according your question.

NO

Functionality 2 considered in the CBA?

Yes Partly No

Comments on the functionality

Current load is continuously registered and may be reported to the customer with their chosen method of communication. Consumption data is recorded every 60 minutes at the outset, but the provisions require that it shall be possible for all meters to change the interval to every 15 minutes.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

PL

Functionality 2 considered in the CBA?

Yes Partly No

Comments on the functionality

The meter should allow to observe current electricity consumption. The technical solution should depend on the consumer choice (i.e. current capacity or change in energy consumption in defined period of time). Meter should be equipped with additional

communication module. The information will be transferred locally from meter to the customer's equipment.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

Presently the cost is not low but after 5 years should be lower As a Percentage ___5-10___%

PT

Functionality 2 considered in the CBA?

Yes Partly No

Comments on the functionality

The CBA considered that the meters would be able to show to the customer the instantaneous energy and power consumption as well as the usual information on the total energy consumed. The CBA study considered energy efficiency savings of 2% and an energy transfer from peak to off-peak hours of 1%.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

The CBA did not estimate a specific cost for this functionality. Nevertheless the Notes & Comments general remark given in functionality 1 should be taken into account.

SE

Functionality 2 considered in the CBA?

Yes Partly No

Comments on the functionality

The regulation states that the meter reading should be done for household customers (under 63 Ampere) every month and hourly for larger consumers.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

The effect on the total costs of these two demands is not easily deductible. The costs of the change of the metering-systems are put in total costs including these functions. However the estimated impact on the total cost would need to be high since this was the main driver for exchanging existing systems.

SI

Functionality 2 considered in the CBA?

Yes Partly No

Comments on the functionality

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

UK

Functionality 2 considered in the CBA?

Yes Partly No

Comments on the functionality

It is proposed that consumption information should be updated on the IHD or could be displayed on other consumer owned devices (e.g., PC, smart phone). We have proposed that the IHD will be required to receive and refresh information on the display at better than 10 second intervals. Due to the way that gas is consumed (consistent and relatively

longer periods of use) and because gas meters will be battery powered we have proposed that the minimum communication update for gas will be 30 minutes.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

As a Percentage less than 5% of equipment costs. Equipment costs exclude operating costs. Applies to both electricity and gas. Costs for HAN transceiver is £2.5 per meter.

Detailed questions

| | Considered in the CBA? | Time | Units |
|-----------|-------------------------------|------|---------|
| AT | yes | 15 | minutes |
| BE | yes | | |
| FR | yes | 2 | seconds |
| IE | yes | 3 | seconds |
| NL | yes | 15 | minutes |
| NO | yes | 15 | minutes |
| PL | yes | 15 | seconds |
| PT | yes | | |
| SE | yes | 1 | hours |
| SI | partly | 1 | seconds |
| UK | yes | 5 | seconds |

Functionality 3: Provides these readings in a form easily understood by the untrained consumer, and with calculations enabling final customers to better control their energy consumption.

Explanations

This Functionality relates just to the Demand Side.

Points to be considered within this Functionality include:

- That the information on energy consumption is provided in a fashion that does not require any numerical computation or energy literacy to understand.
- Examples include display of cost rather than kWh or cubic metres;
- High consumption warning designed to minimise the risk being ignored;
- Where Time-of-Use tariff is in use, information on impending tariff changes;
- Installation of a Smart Metering System will not lead to increases in measured consumption & cost;
- For Pre-payment systems, customer information on outstanding available credit (and how long it is likely to support present consumption);
- For credit customers, the accrued cost in the current billing period;
- For systems incorporating remote switching or power limitation, customer information on the present status and, if applicable for impending power limitation, the effect of continued consumption at the present level. Similarly if a block tariff is implemented.

Points not to be considered here but within other Functionalities include:

- Status of a switch or valve controlling supply. This is considered under Functionality 10.

Statistics

| | | | | |
|-----------------------------------|-----------------|------------|-----------|---------|
| Was this Functionality considered | Yes — 6 | Partly — 3 | No — 2 | |
| Cost Impact | Minimal to High | | | |
| | Minimal: 1 | Low: 2 | Medium: 2 | High: 1 |
| Consensus Level ⁸ | 7.5 | | | |

Comments made

Only 2 countries seem to have considered this functionality in any detail; others are awaiting the results of further projects, consider it out of the scope of the CBA or the remit of the DSO, or are leaving it to the market.

Conclusions

Although this Functionality is considered of substantial importance, there is little consensus on whether this is a Functionality of the Smart Meter device or a Functionality of the overall system. Some countries place this Functionality at other free market Energy Service devices or systems.

Full answers

AT

Functionality 3 considered in the CBA?

Yes Partly No

Comments on the functionality

This functionality is not regulated in the rules on the technical requirements of the smart meter and will be topic of further regulations which have not yet been defined in Austria. The information to the customer (e.g. via web portal or monthly information) has been part of the CBA but only as far as the costs of providing the information itself is concerned (e.g. construction a web portal sending the monthly information).

Impact on the costs

High Medium Low Minimal NA

⁸ When assessing the consensus level for each Functionality, a YES scored 1, a PARTLY scored ½ and a NO scored 0

Comments on the impact on the costs

BE

Functionality 3 considered in the CBA?

Yes Partly No

Comments on the functionality

It depends on the user's choice to use in-house devices. Indeed, the smart meter is equipped with a user accessible communication port, by which the data is transmitted to in-house device (optional device).

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

Even if the sharing of costs and benefits among market segments is evaluated, the impact on the total cost for each functionality was not assessed. We cannot then address this aspect of your questions.

FR

Functionality 3 considered in the CBA?

Yes Partly No

Comments on the functionality

En France, le traitement et la valorisation des données de comptage en vue d'actions de MDE ne relèvent pas des missions des gestionnaires de réseaux de distribution. Ces fonctionnalités n'ont donc pas été intégrées dans le compteur, qui a cependant été conçu de sorte à être interopérable avec les services qui pourront être proposés à l'aval du compteur. Le compteur prévoit 10 index dont la dénomination est laissée au choix du fournisseur.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

IE

Functionality 3 considered in the CBA?

Yes Partly No

Comments on the functionality

This relates to the provision of the IHD.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

NL

Functionality 3 considered in the CBA?

Yes Partly No

Comments on the functionality

It depends on de display and functionalities.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

This has not been measured according your question.

NO

Functionality 3 considered in the CBA?

Yes Partly No

Comments on the functionality

Methods of display are not explicitly considered in the CBA. The Norwegian provisions require what types of data the grid operator must collect and store.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

Costs depend widely on which means are used for displaying the meter readings. The costs of home displays are currently rather expensive, and it was not recommended that such devices should be provided by grid operators. The solution is that the customer may decide on the method of displaying the meter readings (e.g. on a pc, mobile phone, home display or other devices that are directly connected to smart metering systems or to the Internet).

PL

Functionality 3 considered in the CBA?

Yes Partly No

Comments on the functionality

The communication module of meter should at least inform the consumers about: 1. consumed energy taken from DSO grid 2. consumed capacity in 15 minutes intervals 3. signals from DSO (also functionalities 4-7) 4. information on change of prices for next hour (also functionalities 8-10) 5. other data, i.e. metering data of other media meters The above mentioned possibilities of display could be provided by the HAN, not only by meter. There are solutions that meter has no display.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

The information about comparison of present consumption to the historic values should be available by internet applications.

PT

Functionality 3 considered in the CBA?

Yes Partly No

Comments on the functionality

The CBA mentioned that in a future pilot project, these alternatives should be studied in more detail.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

The specific costs and benefits of this functionality were supposed to be obtained from the pilot-study that didn't take place.

SE

Functionality 3 considered in the CBA?

Yes Partly No

Comments on the functionality

This functionality is not part of the functionalities since we believe that the method of information to the customers should be separated from the technical demands of the meter itself. However the customer receives information on actual consumption each month and also a comparison of the consumption over the last 13 months.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

See above answer

SI

Functionality 3 considered in the CBA?

Yes Partly No

Comments on the functionality

Use of In-House Displays (IHD) and WEB portals were considered as an option (non-standard service).

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

High (IHD); Low (WEB)

UK

Functionality 3 considered in the CBA?

Yes Partly No

Comments on the functionality

It is proposed that the IHD should show the following information as a minimum: electricity - indicative real-time usage in kW; electricity - indicative real-time rate of consumption in pence per hour; gas and electricity - indicative cumulative consumption in kWh and £p for current day, week and month; gas and electricity - a high-level requirement that historical data should be presented in a meaningful way so as to allow a consumer to compare current usage with past usage; gas and electricity - current tariff rate (i.e. cost per unit in pence per kWh); In addition, information on instantaneous electricity demand should, as a minimum, be displayed in a visual (non-numerical) way that allows a consumer to easily distinguish between low, medium and high current consumption.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

As a Percentage __N/A__% Applies to both electricity and gas. This is the cost of providing software on the meter to do the relevant calculations. We cannot provide an exact figure but expect costs to be minimal. This excludes the cost of the IHD.

Detailed questions

| | Considered in the CBA? | Method of display | | | | Comparison to previous | | | | | |
|-----------|------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| | | Consumption as a Cost | Instantaneous | Averaged | Averaged Energy | Comparison | Hour | Day | Week | Month | Year |
| AT | yes | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| BE | partly | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| FR | no | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| IE | yes | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| NL | yes | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| NO | yes | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| PL | partly | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| PT | partly | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| SE | no | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| SI | yes | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| UK | yes | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

Functionalities for grid & network support:

Functionality 4: Allows remote reading of meter registers by meter operators and by third parties

Explanations

This Functionality relates to the Supply Side (Metering Operators).

Points to be considered within this Functionality include:

- Facility for both on-demand and frequent regular readings being available to the meter operator;
- Provision of meter reading information by the supplier to the customer. This would include interval readings or peak demands where the tariff is based on these;
- Ability of linking several meters (electric, gas, water, etc) into a single Smart Meter System in order to facilitate communications;
- Data storage within the meter;
- Correct billing, both on a regular basis or on demand (say on the change of occupier or energy supplier);

Points not to be considered here but within other Functionalities include:

- Provision of meter readings from the meter directly to the customer. This is considered under Functionality 1.
- Security and privacy. This is considered under Functionality 11.

Statistics

| | | | | |
|-----------------------------------|-----------------|------------|-----------|---------|
| Was this Functionality considered | Yes — 11 | Partly — 0 | No — 0 | |
| Cost Impact | Minimal to High | | | |
| | Minimal: 1 | Low: 1 | Medium: 3 | High: 3 |
| Consensus Level ⁹ | 11 | | | |

Comments made

Logically, since remote reading is a key part of smart metering, all the responses indicate that this was to be implemented, with the reading rate varying between 15 minutes and daily. The indicated cost of this does however seem to vary quite considerably. In some countries, legal constraints limit access to the meter just to the DSO which then makes the necessary data available to other parties.

Following clarifications received at the workshop, the three ‘*partly*’ replies were amended to ‘*yes*’.

Conclusions

This Functionality has unanimous consensus.

Full answers

AT

Functionality 4 considered in the CBA?

Yes Partly No

Comments on the functionality

In Austria it's only the grid operator who is allowed and obliged to read the meter. It is defined in the Austrian Electricity Industry and Organisation Act that the grid operator has to readout the values saved within the smart meter once a day.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

⁹ When assessing the consensus level for each Functionality, a YES scored 1, a PARTLY scored ½ and a NO scored 0

BE**Functionality 4 considered in the CBA?**

Yes Partly No

Comments on the functionality

DSO is legally responsible for all operations related to metering (installation, maintenance, meter reading...)

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

Even if the sharing of costs and benefits among market segments is evaluated, the impact on the total cost for each functionality was not assessed. We cannot then address this aspect of your questions.

FR**Functionality 4 considered in the CBA?**

Yes Partly No

Comments on the functionality

Le système de comptage prévoit une remontée quotidienne d'un certain nombre d'informations (index de consommation, puissance maximale en consommation atteinte la veille) pour une mise à disposition des consommateurs et des fournisseurs et tiers autorisés par le consommateur. Le compteur peut remonter quotidiennement la courbe de charge et enregistre les informations sur la courbe de charge pendant deux mois glissants.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

Il s'agit de dépenses d'investissements dans les systèmes d'information.

IE**Functionality 4 considered in the CBA?**

Yes Partly No

Comments on the functionality

Supplier cant remotely read the meter this a Network function.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

This refers to the costs of the WAN.

NL**Functionality 4 considered in the CBA?**

Yes Partly No

Comments on the functionality

15 Minutes for electricity. Every hour per day for Gas.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

This has not been measured according your question.

NO**Functionality 4 considered in the CBA?**

Yes Partly No

Comments on the functionality

It shall be possible to fetch meter reading on demand. Hourly data shall be available for suppliers AND customers daily, with yesterday's consumption available the next day by 0900..

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

PL

Functionality 4 considered in the CBA?

Yes Partly No

Comments on the functionality

We assumed that remote reading will be under control of DSO and results will be available to other parties. The energy supplier will receive metering data from Grid Operator.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

As a Percentage __15-25__%

PT

Functionality 4 considered in the CBA?

Yes Partly No

Comments on the functionality

Meters would keep records for 3 months.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

The Notes & Comments general remark given in functionality 1 should be taken into account

SE

Functionality 4 considered in the CBA?

Yes Partly No

Comments on the functionality

The grid operator – the DSO – is capable of remotely reading the meter. This information is then sent to relevant market actors, such as the supplier, for billing purposes for example. The meter value management is strictly regulated in secondary law. The "frequency-rate" varies from every 15 minutes to hourly or every 18hours in practice and is not regulated.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

This functionality was part of the CBA made and is the key functionality when it comes to the smart metering roll-out. Nonetheless this is not a mandated demand in legislation. It is up to each DSO to determine which solution is the most efficient for the respective network area.

SI

Functionality 4 considered in the CBA?

Yes Partly No

Comments on the functionality

Fastest reading rate is determined by the selected technology. In case of PLC communications, only 15-min load profiles can be granted on daily basis.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

UK

Functionality 4 considered in the CBA?

Yes Partly No

Comments on the functionality

It is proposed that consumption and tariff data for each register will be available over the SM HAN. We have proposed the requirement that the meter is capable of capturing consumption and demand data at 5 second intervals for the electricity meter and at 6 minute intervals for the gas meter. While the system will allow data to be available from a smart meter at the above intervals, but it is expected that the minimum ongoing remote read by suppliers would be at ½ hourly intervals. The Government has proposed that suppliers or grid operators will have to gain the consumer’s consent to gain access to more detailed level of consumption, or demonstrate that it is required to fulfil a regulated duty. This is in-line with the ERGEG best practice principle.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

As a Percentage ____ less than 20 % of equipment costs. Equipment costs exclude operating costs which will be technology dependent. Applies to both electricity and gas. The WAN module which sits within the Communications Hub is necessary to provide this functionality. Estimates of the Communications Hub costs lie within the range of £22-29 per customer, depending on the architecture of the hub with the WAN element between £5-15. We are currently seeking views through a consultation on different architectural design approaches [1] . The WAN does not solely serve this purpose and therefore support a range of benefits of the smart metering system. [1] The annexed table showing cost breakdown by item is reflective of the preferred architectural design of a separate communications hub with fixed WAN.

Detailed questions

| | Considered in the CBA? | Energy Supplier | | Grid operator | |
|-----------|------------------------|-----------------|---------|---------------|---------|
| | | Time | Units | Time | Units |
| AT | yes | | | 1 | days |
| BE | partly | | | 1 | hours |
| FR | yes | 1 | days | 1 | days |
| IE | yes | | | 1 | hours |
| NL | yes | 15 | minutes | 15 | minutes |
| NO | yes | | | 1 | days |
| PL | partly | | | 15 | minutes |
| PT | yes | 15 | minutes | 15 | minutes |
| SE | yes | | | | |
| SI | yes | 15 | minutes | 15 | minutes |
| UK | yes | 5 | seconds | 5 | seconds |

Functionality 5: Provides two-way communication between the meter and external networks for maintenance and control of the meter

Explanations

This Functionality relates to both the Demand Side and the Supply Side (both supply & grid).

Points to be considered within this Functionality include:

- Removal of the need for manual intervention under any normal operating conditions;
- Ability to remotely upgrade the firmware in any meter or attached device;
- Monitoring of the status of the meter and of attached devices with the ability to provide warnings of actual or impending problems;
- Time synchronisation;
- Upload of new tariff details, including changes in cost and/or switching times.

Points not to be considered here but within other Functionalities include:

- Fraud prevention which is covered under Functionality 12, although it is dependant on effective 2 way communications;
- Security and privacy. This is considered under Functionality 11.

Statistics

| | | | | |
|-----------------------------------|---------------|------------|-----------|---------|
| Was this Functionality considered | Yes — 8 | Partly — 2 | No — 1 | |
| Cost Impact | Low to Medium | | | |
| | Minimal: 1 | Low: 2 | Medium: 2 | High: 1 |
| Consensus Level ¹⁰ | 9 | | | |

¹⁰ When assessing the consensus level for each Functionality, a YES scored 1, a PARTLY scored ½ and a NO scored 0

Comments made

In the two countries where this has not been considered in the CBA, it is either generally available (over 90% of meters) or has been left to the DSO; in that case, it was felt that the DSO had enough commercial incentive to include this anyway.

Following clarifications received at the workshop, one ‘no’ reply was amended to ‘yes’.

Conclusions

There is almost universal consensus that this is a key functionality.

Full answers

AT

Functionality 5 considered in the CBA?

Yes Partly No

Comments on the functionality

This is a key functionality of the minimum requirements in Austria.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

A two-way-communication seems to be a standard functionality in most smart meters nowadays. But of course the ability to read out data in a two-way-communication has an impact on the communication network and therefore may increase the overall costs. On the other side it has to be stated that a smart metering-system without two-way-communication seems to be not very “smart” and future-proven.

BE

Functionality 5 considered in the CBA?

Yes Partly No

Comments on the functionality

DSO is legally responsible for all operations related to metering (installation, maintenance, meter reading...). Indeed, the two-way communication is only possible between the meter and DSO.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

Even if the sharing of costs and benefits among market segments is evaluated, the impact on the total cost for each functionality was not assessed. We cannot then address this aspect of your questions.

FR**Functionality 5 considered in the CBA?**

Yes Partly No

Comments on the functionality

Le système de comptage permet une mise à jour à distance des programmes et logiciels, des plages tarifaires ainsi que des téléopérations (mise en service, mise hors service, coupure, augmentation et réduction de puissance, déclenchement pointe mobile).

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

Il s'agit de dépenses d'investissements dans les systèmes d'information.

IE**Functionality 5 considered in the CBA?**

Yes Partly No

Comments on the functionality

No direct two comms to Supply.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

Part of the functionality from the cost of WAN.

NL**Functionality 5 considered in the CBA?**

Yes Partly No

Comments on the functionality

Is part of 'Smart Grid Advantage'

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

This has not been measured according your question.

NO**Functionality 5 considered in the CBA?**

Yes Partly No

Comments on the functionality

This issue is important in terms of reducing operational costs for the grid (and meter) operator. We consider that the grid operator has sufficient incentives to choose the most efficient solutions.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs**PL****Functionality 5 considered in the CBA?**

Yes Partly No

Comments on the functionality

There should be communication between the meter and the metering systems of DSO.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

As a Percentage 15 - 25 %

PT

Functionality 5 considered in the CBA?

Yes Partly No

Comments on the functionality

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

We assume that the cost of the two-way communication between the meter and the external networks (supply & grid) is approximately 30% of AMM solution. This percentage was determined indirectly as the relative difference between AMR and AMM solutions. Although some other functionalities are present in the AMM solution, the main difference between AMM and AMR solutions is related to the functionality of two-way communication. For more details please consider the Notes & Comments general remark given in functionality 1.

SE

Functionality 5 considered in the CBA?

Yes Partly No

Comments on the functionality

This functionality has not been considered but nonetheless many of the installed systems have this capability.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

See answer above

SI

Functionality 5 considered in the CBA?

Yes Partly No

Comments on the functionality

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

UK

Functionality 5 considered in the CBA?

Yes Partly No

Comments on the functionality

It is proposed that for all domestic and most small businesses(*) the smart metering system will be provided via a single data communications company (the DCC). This will provide the two way remote communications link between individual meters and end users (including supply and grid) of the data. The requirements for the smart metering include maintenance (including firmware upgrades), alerts, control functions that will be initiated remotely. (*) NOTE - small business suppliers are not mandated to use DCC and may elect to use their own communications provider

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

As a Percentage less than 20 % of equipment costs. Equipment costs exclude operating costs which will be technology dependent. Applies to both electricity and gas. See

comments for functionality 4. The Communications Hub does not solely serve this purpose and therefore support a range of benefits of the smart metering system (including for gas meters)

Detailed questions

| | Considered in the CBA? |
|-----------|-------------------------------|
| AT | yes |
| BE | partly |
| FR | yes |
| IE | yes |
| NL | yes |
| NO | no |
| PL | yes |
| PT | yes |
| SE | yes |
| SI | yes |
| UK | yes |

Functionality 6: Provides for the monitoring of Power Quality

Explanations

This Functionality relates to both the Demand Side and the Supply Side.

Points to be considered within this Functionality include:

- Provision of a warning to the customer should voltage quality fall to such a level that equipment could be damaged. Factors affecting voltage quality include sags & surges, high harmonic content, etc;
- Provision of warning to the supplier and the grid in the event of any problems, including excessive harmonic currents;
- Logging of power quality issues (such as outages in excess of a defined time).

Points not to be considered here but within other Functionalities include:

- None. Power Quality is an independent Functionality, but depends on Functionality 5 (2 way communications) for operation.

Statistics

| | | | |
|-----------------------------------|----------------|------------|-------------------|
| Was this Functionality considered | Yes — 5 | Partly — 3 | No — 3 |
| Cost Impact | Minimal to Low | | |
| | Minimal: 2 | Low: 2 | Medium: 0 High: 1 |
| Consensus Level ¹¹ | 6.5 | | |

¹¹ When assessing the consensus level for each Functionality, a YES scored 1, a PARTLY scored ½ and a NO scored 0

Comments made

Seven of the countries are monitoring some aspects of power quality, or have the ability to do so. There does not however seem to be consensus as to what is monitored — it could be outages, voltage sags & swells, voltage distortion, etc. One country considered this too expensive to monitor.

Conclusions

There is no consensus on this Functionality. At present most such measurements can adequately be carried out at the sub-station level although in the future, with the growth of distributed generation, there will be greater need for this to be done at the meter.

It is noted that this was functionality was not part of the final ERGEG GPP E10-RMF-29-05.

Full answers

AT

Functionality 6 considered in the CBA?

Yes Partly No

Comments on the functionality

Not part of the minimum requirements in Austria.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

BE

Functionality 6 considered in the CBA?

Yes Partly No

Comments on the functionality

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

FR

Functionality 6 considered in the CBA?

Yes Partly No

Comments on the functionality

Le compteur enregistre également les excursions de la plage de tension autorisée ($\pm 10\%$)(horodate et valeur de la tension).

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

Cette fonctionnalité étant incluse dans la solution de base, elle n'a pas fait l'objet d'une évaluation technico-économique séparée.

IE

Functionality 6 considered in the CBA?

Yes Partly No

Comments on the functionality

Supply failures the meter should be configurable. The meter will measure voltage within a range.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

NL

Functionality 6 considered in the CBA?

Yes Partly No

Comments on the functionality

As part of Smart Grid Advantage.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

NO

Functionality 6 considered in the CBA?

Yes Partly No

Comments on the functionality

Voltage quality metering is considered too costly to include in the meter.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

Most available meters in the market are not able to record low voltage levels (from 1-50 % of nominal voltage), which means that they are not able to register voltage failures according to the adopted definition of voltage loss.

PL

Functionality 6 considered in the CBA?

Yes Partly No

Comments on the functionality

There should be monitored information on: - power outages - the length of outages and the time of power restoration - voltage distortion over accepted values (time of incident and value of their value) The Power Quality could be measured both by consumer meters (the longer outages) and by DSO balancing meters (the shorter outages).

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

As a Percentage __5__%

PT

Functionality 6 considered in the CBA?

Yes Partly No

Comments on the functionality

The CBA also assumed to record the interval duration in which the effective voltage is outside the European standards.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

The Notes & Comments general remark given in functionality 1 should be taken into account.

SE

Functionality 6 considered in the CBA?

Yes Partly No

Comments on the functionality

Not part of the CBA

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

SI

Functionality 6 considered in the CBA?

Yes Partly No

Comments on the functionality

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

UK

Functionality 6 considered in the CBA?

Yes Partly No

Comments on the functionality

It is not proposed that the GB smart metering system will record Harmonic Distortion or frequency variations. This functionality had not been put forward by British distribution network operators. It is proposed that the Smart Metering System shall support measurement of power quality data including Real/Reactive import and export peak volts, RMS voltage, over/under voltage, sag/swell. This data will be stored by the meter for three months and can be accessed (if consumer consent given/required to fulfil a regulated duty) over the SMHAN or via the DCC. The GB minimum specification does not contain an alarm to alert consumers of reduced voltage quality, however this is not prohibited and therefore may be an area for product differentiation. The proposed smart metering functionalities were developed in consultation with GB Distribution Network Operators. The Government is currently consulting on providing maximum and minimum demand registers as part of the meter specification to support the delivery of this functionality.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

As a Percentage ___ less than 10% of equipment costs.

Detailed questions

| | Considered in the CBA? | Supply Failures | Min. duration | Units | Maximum recorded | Harmonic distortion | Voltage | Current | Neutral current |
|-----------|-------------------------------|-------------------------------------|---------------|---------|------------------|-------------------------------------|-------------------------------------|--------------------------|--------------------------|
| AT | no | <input type="checkbox"/> | | | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| BE | no | <input type="checkbox"/> | | | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| FR | yes | <input checked="" type="checkbox"/> | 1 | seconds | 100 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| IE | yes | <input checked="" type="checkbox"/> | | | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| NL | partly | <input type="checkbox"/> | | | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| NO | partly | <input checked="" type="checkbox"/> | | | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| PL | partly | <input checked="" type="checkbox"/> | 1 | seconds | all | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| PT | yes | <input checked="" type="checkbox"/> | 3 | seconds | | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| SE | no | <input type="checkbox"/> | | | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| SI | yes | <input checked="" type="checkbox"/> | | | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| UK | yes | <input type="checkbox"/> | | | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Functionality 7: Allows readings to be taken frequently enough to allow the information to be used for network planning

Explanations

This Functionality relates to both the Demand Side and the Supply Side.

Points to be considered within this Functionality include:

- Whether grid control is being considered at a micro (e.g. local) level or a macro (e.g. sub-station) level;
- The information provided to the grid;
- The frequency at which the data is updated. This will depend on whether micro or macro control is used.

Points not to be considered here but within other Functionalities include:

- None. Grid Control is an independent Functionality, but depends on Functionality 5 (2 way communications) for operation.

Statistics

| | | | |
|-----------------------------------|-----------------------|------------|-------------------|
| Was this Functionality considered | Yes — 8 | Partly — 0 | No — 3 |
| Cost Impact | Minimal Minimal: 3 | Low: 1 | Medium: 0 High: 0 |
| Consensus Level ¹² | 8 | | |

¹² When assessing the consensus level for each Functionality, a YES scored 1, a PARTLY scored ½ and a NO scored 0

Comments made

Two countries are implementing this at sub-station level while one country felt that the DSO had enough commercial incentive to include this anyway. One negative reply was due to a lack of exact requirements. Most countries indicate a high enough reading frequency to implement this, or can increase the reading rate.

This information is provided to the Meter Operator, in most countries the DSO. It is thus of use in network planning, not primarily for grid control. In the future, it should prove of value to the DSO for monitoring power quality.

Conclusions

There is a reasonably high consensus about this functionality.

Full answers

AT

Functionality 7 considered in the CBA?

Yes Partly No

Comments on the functionality

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

As this data already exists for the costumers, it's not very costly for the grid operator to use it for grid control purposes (the use of this data may require approval by the costumer).

BE

Functionality 7 considered in the CBA?

Yes Partly No

Comments on the functionality

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

Even if the sharing of costs and benefits among market segments is evaluated, the impact on the total cost for each functionality was not assessed. We cannot then address this aspect of your questions.

FR

Functionality 7 considered in the CBA?

Yes Partly No

Comments on the functionality

Les données, y compris les celles relatives à la qualité de l'alimentation, sont remontées quotidiennement dans les systèmes d'information. En cas de besoin, il est possible d'interroger ponctuellement des grappes de compteurs à une fréquence plus élevée.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

Cette fonctionnalité étant incluse dans la solution de base, elle n'a pas fait l'objet d'une évaluation technico-économique séparée

IE

Functionality 7 considered in the CBA?

Yes Partly No

Comments on the functionality

This was not explicitly allowed for as the exact nature of the requirements were not known.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

NL

Functionality 7 considered in the CBA?

Yes Partly No

Comments on the functionality

15 Minutes for electricity. Every hour per day for Gas (P4). P1 can do real time readings.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

This has not been measured according your question.

NO

Functionality 7 considered in the CBA?

Yes Partly No

Comments on the functionality

We recognise that grid control is a very important issue, and that smart metering may provide additional tools for smart grid solutions. We assume that DSOs takes this into account when implementing smart metering systems, as they have strong incentives to run grid operations cost efficiently under the economic regulation.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

PL

Functionality 7 considered in the CBA?

Yes Partly No

Comments on the functionality

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

This functionality will be provided by aggregating meters. As a Percentage 5 %

PT

Functionality 7 considered in the CBA?

Yes Partly No

Comments on the functionality

Although the reading rate would allow it, the use of this data for grid control was not considered since this control is done at the more centralized distribution substation level. For the same reason the smart grid concepts were not considered as well.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

The Notes & Comments general remark given in functionality 1 should be also taken into account.

SE

Functionality 7 considered in the CBA?

Yes Partly No

Comments on the functionality

This is line with the meter readings collected for larger customers, hourly, and for smaller customers, monthly, as previously stated.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

Same effect as the meter reading frequency overall.

SI

Functionality 7 considered in the CBA?

Yes Partly No

Comments on the functionality

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

UK

Functionality 7 considered in the CBA?

Yes Partly No

Comments on the functionality

As mentioned in earlier functionalities it is proposed that the requirement that the meter is capable of capturing consumption and demand data at 5 second intervals for the electricity meter and at 6 minute intervals for the gas meter. We have consulted with DNO's and developed WAN requirements to meet their existing and future needs. While economic and technical constraints make it unlikely that the WAN will match SMHAN transmission frequencies, the frequency of delivery of smart metering data is being designed to ensure grid control is enabled. In addition, the Government is currently consulting on providing maximum and minimum demand registers specifically to provide better information to grid operators.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

As a Percentage less than 5% of equipment costs. Equipment costs exclude operating costs. Applies to electricity and gas. Grid control will require frequent readings to be sent across the WAN, this may increase the OPEX above low impact.

Detailed questions

| | Considered in the CBA? | Fastest reading | Units |
|-----------|---------------------------------------|--------------------|---------|
| AT | yes | 15 | minutes |
| BE | yes | 60 | minutes |
| FR | yes | | |
| IE | no | | |
| NL | yes | 15 | minutes |
| NO | no | 15 | minutes |
| PL | yes | 15 | minutes |
| PT | yes | 15 | minutes |
| SE | yes | | |
| SI | no | | |
| UK | yes | | |

Functionalities for commercial aspects of energy supply:

Functionality 8: Supports advanced tariff systems.

Explanations

Includes advance tariff structures, time of use registers, remote tariff control, etc.; this Functionality relates to both the Demand Side and the Supply Side.

Points to be considered within this Functionality include:

- Data storage capacity within the Smart Meter System to allow effective comparison of consumption profiles.
- Storage of other applicable tariff related data together with any necessary associated information. (e.g. Peak Demands with date/time of occurrence);
- Support for time-of-use, block and demand based tariffs;
- Support for remote control of tariffs; switching times, unit costs, etc;
- Provision of active tariff information to the customer.

Points not to be considered here but within other Functionalities include:

- Depends on Functionality 5 (2 way communications) for operation.

Statistics

| Was this Functionality considered | Yes — 8 | Partly — 3 | No — 0 |
|-----------------------------------|------------|------------|-------------------|
| Cost Impact | Low | | |
| | Minimal: 0 | Low: 5 | Medium: 1 High: 0 |
| Consensus Level ¹³ | 9.5 | | |

¹³ When assessing the consensus level for each Functionality, a YES scored 1, a PARTLY scored ½ and a NO scored 0

Comments made

All the responses show that Smart Meters have the ability to implement advanced tariffs in some form or another (Time-of-Day, Demand and Block), either individually or in combination. In at least one case, it appears that this will be done at the system level rather than at the meter. In many cases, these will include remote control of tariffs and of tariff switching.

Following clarifications received at the workshop, the one ‘partly’ and one ‘no’ replies were both amended to ‘yes’.

Conclusions

Advanced tariff structures are part of the Demand Response scheme; it should help consumers achieve energy efficiencies. This Functionality, together with Functionalities 1 & 2, is a key driving force for empowering the consumer and for achieving energy efficiency.

Full answers

AT

Functionality 8 considered in the CBA?

Yes Partly No

Comments on the functionality

According to the Austrian Standard Weights and Measures Law (Eichrecht), each interval measured within a meter approved by the Office of Weights and Measures may be used for billing purposes. Therefore, advanced tariffs can be calculated based on 15 minutes saved within the meter.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

The total costs may be of medium impact because of the high requirements for the license in connection with calibration by the Office of Weights and Measures.

BE

Functionality 8 considered in the CBA?

Yes Partly No

Comments on the functionality

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

FR

Functionality 8 considered in the CBA?

Yes Partly No

Comments on the functionality

Le système de comptage offre un ensemble de 10 index fournisseurs, 4 index tarifs réseau, une courbe de charge paramétrable au pas de temps 1heure, 30 minutes et 10 minutes. 11 plages horaires peuvent être définies par le fournisseur permettant d'appliquer pour chacune un index fournisseur, y compris une pointe mobile. Les grilles tarifaires sont enregistrées dans le compteur et peuvent être modifiées à distance. Ce système permet aux fournisseurs de pratiquer des tarifs progressifs, selon des périodes qu'ils définissent (au minimum 10 minutes par utilisation de la courbe de charge), des tarifs pointe fixe et pointe mobile ou des tarifs horosaisonnalisés au maximum de 10 index (6 actuellement utilisés dans le tarif réglementé Tempo).

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

Cette fonctionnalité étant incluse dans la solution de base, elle n'a pas fait l'objet d'une évaluation technico-économique séparée

IE

Functionality 8 considered in the CBA?

Yes Partly No

Comments on the functionality

We do not envisage tariffs on the meters, we have 48 half hourly intervals and suppliers could therefore have up to 48 different ToU tariffs.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

NL

Functionality 8 considered in the CBA?

Yes Partly No

Comments on the functionality

This not defined in the meter but systems related to the meter.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

This has not been measured according your question.

NO

Functionality 8 considered in the CBA?

Yes Partly No

Comments on the functionality

Provisions have not yet been made on tariff and payment systems. It is however required that the implemented smart metering systems are able to provide such solutions in the future. Multiple tariffs includes any form of tariff that splits consumption into time periods; examples are Time-of-use, Real Time Pricing, Critical Peak Pricing, etc. Demand tariffs includes any tariff structure where the charge (or part of the charge) depends on the peak consumption, normally averaged over a time period. Block tariff refers to tariff structures

where the total cost depends on the consumption during a defined billing period. Normally, the per-unit cost is fixed at a low initial level & then rises consumption exceeds a set value. Such tariffs reward low consumption.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

The CBA did not include costs related to other systems than the actual metering systems, meaning that broader IT-related costs are not included in the CBA.

PL

Functionality 8 considered in the CBA?

Yes Partly No

Comments on the functionality

The infrastructure should allow to deal with all mentioned above schemes (if the supplier introduces them).

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

As a Percentage __15-20__%

PT

Functionality 8 considered in the CBA?

Yes Partly No

Comments on the functionality

The specification considered that the measurements should be aggregated in 6 programmable intervals.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

The Notes & Comments general remark given in functionality 1 should be taken into account.

SE

Functionality 8 considered in the CBA?

Yes Partly No

Comments on the functionality

No such (separated) considerations, the majority of the meters installed do have the capability of hourly readings and thus capable of advanced tariffs.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

SI

Functionality 8 considered in the CBA?

Yes Partly No

Comments on the functionality

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

UK

Functionality 8 considered in the CBA?

Yes Partly No

Comments on the functionality

The meter will store up to 13 months of consumption data to allow effective comparison of consumption profiles. It is proposed that the meter will be capable of supporting: Import and export tariffs including all existing tariff types and future tariff types. Time-of-Use (TOU) and Block tariffs accommodating a structure of up to (48 (TOU) x1) for supplier import tariffs. The electricity meter shall support a combined Time of Use & Block tariff structure, up to (8 TOU tariffs and 4 Block tariffs) and three threshold levels for supplier import tariffs. For gas meters, bands will be one or more whole days, i.e. TOU can be applied to whole days only. Gas meters will support up to four blocks. Each block shall work in the same way as electricity blocks and can be reconciled and reset on a minimum granularity of one day. Critical Peak Pricing (CPP), for both price increases and reductions. Real Time Pricing -dynamic pricing used to reflect the changing wholesale price of electricity. For export (supplier) tariffs, the meter shall support a 4 rate (including 1 rate for CPP) TOU only structure (i.e. no blocks).

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

As a Percentage = less than 10% of equipment costs

Detailed questions

| | Considered in the CBA? | Multiple tariffs | Max. N° Tariffs | Minimum Tariff. Period (min.) | Remote control of tariff switching | Remote control of tariff switching times | Demand based tariffs | Demand Period min. | Log of peaks with date / time | Logging of demand profiles | Block tariffs |
|-----------|-------------------------------|-------------------------------------|-----------------|-------------------------------|-------------------------------------|--|-------------------------------------|--------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| AT | yes | <input checked="" type="checkbox"/> | | 15 | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | 15 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| BE | partly | <input checked="" type="checkbox"/> | 10 | 60 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| FR | partly | <input checked="" type="checkbox"/> | 10 | 30 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| IE | no | <input type="checkbox"/> | | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| NL | yes | <input checked="" type="checkbox"/> | | | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| NO | partly | <input type="checkbox"/> | | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| PL | yes | <input checked="" type="checkbox"/> | | | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| PT | yes | <input checked="" type="checkbox"/> | | | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| SE | yes | <input type="checkbox"/> | | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| SI | yes | <input checked="" type="checkbox"/> | | | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| UK | yes | <input checked="" type="checkbox"/> | | | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

Functionality 9: Supports energy supply by pre-payment and on credit

Explanations

This Functionality relates to both the Demand Side and the Supply Side.

Points to be considered within this Functionality include:

- Ability to switch between Credit & Pre-payment; and back;
- Advice to customer of change of payment method;
- Net benefit to the customer of the change in payment method.

Points not to be considered here but within other Functionalities include:

- Customer information on outstanding available credit (and how long it is likely to support present consumption). This is covered in Functionality 3.
- Depends on Functionality 5 (2 way communications) for operation;
- Depends on Functionality 10 (ON/OFF Control) for operation.

Statistics

| Was this Functionality considered | Yes — 5 | Partly — 2 | No — 4 | |
|-----------------------------------|------------|------------|-----------|---------|
| Cost Impact | Low | | | |
| | Minimal: 2 | Low: 4 | Medium: 0 | High: 0 |
| Consensus Level ¹⁴ | 6 | | | |

¹⁴ When assessing the consensus level for each Functionality, a YES scored 1, a PARTLY scored ½ and a NO scored 0

Comments made

One country has not considered this functionality, one (gas) solution does not include a valve while seven countries could implement this at a system level.

Conclusions

Switching is a commercial matter between the supplier and the consumer. There is no consensus on this Functionality to be considered to be a key functionality of a Smart Meter.

Full answers

AT

Functionality 9 considered in the CBA?

Yes Partly No

Comments on the functionality

This is no direct requirement but is covered by the basics functionalities (e.g. reading out of 15-min-values and the possibility to deactivate the meter).

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

BE

Functionality 9 considered in the CBA?

Yes Partly No

Comments on the functionality

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

FR

Functionality 9 considered in the CBA?

Yes Partly No

Comments on the functionality

La fonctionnalité de prépaiement n'a pas été prévue dans le compteur. Néanmoins le système permet des offres à durée limitée par utilisation de la fonctionnalité de réduction de puissance ou de coupure.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

IE

Functionality 9 considered in the CBA?

Yes Partly No

Comments on the functionality

We have costed a thin prepayment solution with the electronic purse with the supplier. No incremental cost on the meter.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

NL

Functionality 9 considered in the CBA?

Yes Partly No

Comments on the functionality

This is not defined in the meter, but in systems related to the meter. The Smart is meter is not a prepaid meter, but one can have prepaid services with a smart meter.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

This has not been measured according your question.

NO

Functionality 9 considered in the CBA?

Yes Partly No

Comments on the functionality

Remote switching between credit and prepayment has not been considered. Otherwise, we have made the same assessment as for functionality 10. Prepayments schemes will thus be based on remote ON/OFF control or power limitation.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

PL

Functionality 9 considered in the CBA?

Yes Partly No

Comments on the functionality

The possibility of choosing the pre-payment function should be one of the basic functionalities supported to the consumers.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

As a Percentage __10-15__%

PT

Functionality 9 considered in the CBA?

Yes Partly No

Comments on the functionality

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

The Notes & Comments general remark given in functionality 1 should also be taken into account.

SE**Functionality 9 considered in the CBA?**

Yes Partly No

Comments on the functionality

No such considerations

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

SI**Functionality 9 considered in the CBA?**

Yes Partly No

Comments on the functionality**Impact on the costs**

High Medium Low Minimal NA

Comments on the impact on the costs

UK**Functionality 9 considered in the CBA?**

Yes Partly No

Comments on the functionality

Pre-payment is envisaged for both gas and electricity, this is already a prevalent payment type within GB. The electricity meter will contain contactors to allow the meter to disable a consumers supply. It is proposed that smart gas meters for domestic consumers will be fitted with a valve for safe enablement and disablement of gas supply into the premises. It shall be possible to arm or disable the valve either remotely or locally. The valve shall be capable of responding to prepayment commands and would allow for remote switching between credit and pre-payment modes. It is proposed that remote switching between credit and pre-payment is not required for current transformer meters or non-domestic gas customers. This is due to the additional cost to build in this functionality into the meters used in this sector.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

As a Percentage less than 10% of equipment costs. Costs for load switch and valve. Applies to electricity and gas.

Detailed questions

| | Considered in the CBA? | Remote switching between Credit & Pre- payment is possible |
|-----------|---------------------------------------|---|
| AT | partly | <input type="checkbox"/> |
| BE | no | <input type="checkbox"/> |
| FR | no | <input type="checkbox"/> |
| IE | yes | <input checked="" type="checkbox"/> |
| NL | yes | <input type="checkbox"/> |
| NO | partly | <input type="checkbox"/> |
| PL | yes | <input checked="" type="checkbox"/> |
| PT | yes | <input checked="" type="checkbox"/> |
| SE | no | <input type="checkbox"/> |
| SI | no | <input type="checkbox"/> |
| UK | yes | <input checked="" type="checkbox"/> |

Functionality 10: Allows remote ON/OFF control of the supply and/or flow or power limitation

Explanations

This Functionality relates to both the Demand Side and the Supply Side.

Points to be considered within this Functionality include:

- Net benefit to the customer of the application of power limitation or supply disconnection;
- Protection of vulnerable customers;
- For electricity, the projected life of the disconnect switch;
- For gas, the projected battery & operational life of the valve;
- Safety considerations, of disconnection as well as connection.
- Customer information on status. This is NOT covered in Functionality 3.

Points not to be considered here but within other Functionalities include:

- Depends on Functionality 5 (2 way communications) for operation;

Statistics

| | | | |
|-----------------------------------|---------------|------------|-------------------|
| Was this Functionality considered | Yes — 9 | Partly — 2 | No — 0 |
| Cost Impact | Low to Medium | | |
| | Minimal: 1 | Low: 4 | Medium: 2 High: 0 |
| Consensus Level ¹⁵ | 10 | | |

¹⁵ When assessing the consensus level for each Functionality, a YES scored 1, a PARTLY scored ½ and a NO scored 0

Comments made

Although only three countries have implemented direct remote switching, a further four could implement this as a system function. One (gas) solution does not include a valve while one further country did not consider this in their CBA (though most meters have this function). Seven countries confirmed that they provide customer warnings and, where safety is concerned, require a customer acknowledgement. Legal conditions apply in some countries.

Following clarifications received at the workshop, one ‘no’ reply was amended to ‘yes’.

Conclusions

There was a high consensus on the provision of this Functionality.

It provides additional protection for the consumer at allowing for grades in the limitations

It speeds up processes such as when moving home — the old supply can be disconnected and the new supply enabled quickly and simply.

It is needed for handling technical grid emergencies.

Full answers

AT

Functionality 10 considered in the CBA?

Yes Partly No

Comments on the functionality

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

BE

Functionality 10 considered in the CBA?

Yes Partly No

Comments on the functionality

Remote off control is possible under legal conditions.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

Even if the sharing of costs and benefits among market segments is evaluated, the impact on the total cost for each functionality was not assessed. We cannot then address this aspect of your questions.

FR

Functionality 10 considered in the CBA?

Yes Partly No

Comments on the functionality

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

Cette fonctionnalité étant incluse dans la solution de base, elle n'a pas fait l'objet d'une évaluation technico-économique séparée

IE

Functionality 10 considered in the CBA?

Yes Partly No

Comments on the functionality

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

NL

Functionality 10 considered in the CBA?

Yes Partly No

Comments on the functionality

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

This has not been measured according your question.

NO

Functionality 10 considered in the CBA?

Yes Partly No

Comments on the functionality

Provisions of customer warning etc. has not yet been made.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

PL

Functionality 10 considered in the CBA?

Yes Partly No

Comments on the functionality

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

As a Percentage _5_%

PT

Functionality 10 considered in the CBA?

Yes Partly No

Comments on the functionality

Provisions of customer warnings were not directly mentioned in the study.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

The Notes & Comments general remark given in functionality 1 should be taken into account. In general the CBA considered a global parameterisation benefit of 90 M€ (avoided cost of local interventions).

SE**Functionality 10 considered in the CBA?**

Yes Partly No

Comments on the functionality

No such (separated) considerations. However many of the installed metering systems have this capability.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs**SI****Functionality 10 considered in the CBA?**

Yes Partly No

Comments on the functionality**Impact on the costs**

High Medium Low Minimal NA

Comments on the impact on the costs**UK****Functionality 10 considered in the CBA?**

Yes Partly No

Comments on the functionality

Load limiting can encompass both interrupting supply beyond a pre-agreed level of consumption and for providing only a limited flow of energy over a given time period. The facility for interrupting supply beyond a pre-agreed level of consumption is provided for both electricity and gas in the domestic market and electricity in the non-domestic market (due to the lack of gas isolation valve within non-domestic gas meters It is proposed that the supply through an electricity meter may be interrupted (e.g. for prepayment or on request by the supplier or consumer), locally or remotely. For safety reasons, it will not be possible to restore the gas supply without human intervention. The metering system will also check for any unexpected gas flows before restoring supply. It is also not possible to limit gas flow via partial closure Acknowledgement by the consumer will not be required before supply is disabled. It is also proposed that the meter will provide a visual supply status indicator to show whether the energy supply is on or off.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

As a Percentage less than 10% of equipment costs. Equipment costs exclude operating costs which will be technology dependent. Applies to both gas and electricity. Note that the switch, valve and WAN do not solely serve this purpose.

Detailed questions

Provision of Customer warning

| | Considered in the CBA? | Remote ON/OFF Control | Remote supply restriction | On Switch OFF | On Switch ON | Acknowledgement required before change |
|-----------|-------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|--|
| AT | yes | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| BE | partly | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| FR | partly | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| IE | yes | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| NL | yes | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| NO | yes | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| PL | yes | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| PT | yes | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| SE | yes | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| SI | yes | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| UK | yes | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

Functionalities for security and privacy:

Functionality 11: Provides Secure Data Communications

Explanations

This Functionality relates to both the Demand Side and the Supply Side.

Points to be considered within this Functionality include:

- Privacy and Security are separate and different;
- Privacy is the restriction of information to the customer and those authorised by the customer to have access to it;
- Security is the prevention of access to information by unauthorised 3rd parties.
- Security of communications between the Smart Meter and energy suppliers / grid operators;
- Privacy of communication within a customer's premises;
- Access to information or equipment that could lead to a breach of security or privacy;
- Is security and privacy integral to the design of the Smart Meter System, or added;
- Provision for improvements in security and privacy in the event that existing processes are shown insufficient.

Points not to be considered here but within other Functionalities include:

- Depends on Functionality 5 (2 way communications) for operation;
- Notification of any breaches, or attempted breaches, of security or privacy is covered in Functionality 12.

Statistics

| | | | | |
|-----------------------------------|---------------|------------|-----------|---------|
| Was this Functionality considered | Yes — 11 | Partly — 0 | No — 0 | |
| Cost Impact | Low to Medium | | | |
| | Minimal: 0 | Low: 3 | Medium: 3 | High: 0 |
| Consensus Level ¹⁶ | 11 | | | |

Comments made

Security and privacy are legal requirements in all member states.

Six countries have explicitly considered this as part of their CBA, with a low to medium cost.

In the case of two countries, this was not included as it is part of national law.

Following clarifications received at the workshop and further discussions, three ‘no’ replies was amended to ‘yes’.

Conclusions

High levels of security are essential for all communications between the meter and the Meter Operator. This is both for direct communications with the meter and for any messages that may be being passed through the meter to or from any appliances or controls within the consumer’s premises.

For local communications within the consumer’s premises, both privacy and security are required.

Full answers

AT

Functionality 11 considered in the CBA?

Yes Partly No

Comments on the functionality

¹⁶ When assessing the consensus level for each Functionality, a YES scored 1, a PARTLY scored ½ and a NO scored 0

In Austria it's a minimum requirement that all data interfaces and the communication are secured (also against access from outside) and encrypted at the state of the art. But there are no specific security protocols, standards etc. defined. Please note: The securing of the data communication is also part of the Austrian data privacy laws.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

BE

Functionality 11 considered in the CBA?

Yes Partly No

Comments on the functionality

It is assumed that technologies with security requirements will become standards in the future.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

Even if the sharing of costs and benefits among market segments is evaluated, the impact on the total cost for each functionality was not assessed. We cannot then address this aspect of your questions.

FR

Functionality 11 considered in the CBA?

Yes Partly No

Comments on the functionality

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

Cette fonctionnalité étant incluse dans la solution de base, elle n'a pas fait l'objet d'une évaluation technico-économique séparée

IE

Functionality 11 considered in the CBA?

Yes Partly No

Comments on the functionality

Security and privacy are built into all the elements of the solution.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

NL

Functionality 11 considered in the CBA?

Yes Partly No

Comments on the functionality

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

NO

Functionality 11 considered in the CBA?

Yes Partly No

Comments on the functionality

Not part of CBA. Investigation of this issue is underway.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

PL**Functionality 11 considered in the CBA?**

Yes Partly No

Comments on the functionality

Security on the WAN: According to the best practices on data security. Security on the HAN: According to the best practices on data security. Privacy on the HAN: The data are owned by the consumer and the transfer of data is possible only if the agreement is signed (i.e. consumer – supplier)

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

As a Percentage __15-25__%

PT**Functionality 11 considered in the CBA?**

Yes Partly No

Comments on the functionality

The functionality was supposed to be considered on the future pilot project.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

The Notes & Comments general remark given in functionality 1 should be taken into account.

SE**Functionality 11 considered in the CBA?**

Yes Partly No

Comments on the functionality

This has not been considered (separated) as such. We would though like to point out that legislation on security and privacy is always applicable and should therefore always be part of any considerations a company makes.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

SI**Functionality 11 considered in the CBA?**

Yes Partly No

Comments on the functionality**Impact on the costs**

High Medium Low Minimal NA

Comments on the impact on the costs

UK**Functionality 11 considered in the CBA?**

Yes Partly No

Comments on the functionality

A risk assessment has been carried out for the end to end Smart Metering system and this has then been used to produce proposals for an appropriate risk mitigation framework. Following this assessment, security and privacy requirements for the metering equipment within a premises, have been included in the industry technical specifications.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

As a Percentage _____ less than 5%

Detailed questions

| | Considered in the CBA? |
|----|------------------------|
| AT | yes |
| BE | yes |
| FR | yes |
| IE | yes |
| NL | yes |
| NO | yes |
| PL | yes |
| PT | no |
| SE | yes |
| SI | yes |
| UK | yes |

Functionality 12: Fraud prevention and detection

Explanations

This Functionality relates to the Supply Side.

Points to be considered within this Functionality include:

- Design appraisal that considers potential attempts to breach the security and privacy of the Smart Metering System;
- Detection and storage of any breaches, or attempted breaches, of security; also notification (if possible) to the energy supplier;
- Notification to the energy supplier of the lack of any security breach (AOK signal).

Points not to be considered here but within other Functionalities include:

- None. Fraud Prevention is an independent Functionality, but depends on Functionality 5 (2 way communications) for operation.

Statistics

| Was this Functionality considered | Yes — 9 | Partly — 2 | No — 0 | |
|-----------------------------------|------------|------------|-----------|---------|
| Cost Impact | Low | | | |
| | Minimal: 1 | Low: 5 | Medium: 0 | High: 0 |
| Consensus Level ¹⁷ | 10 | | | |

¹⁷ When assessing the consensus level for each Functionality, a YES scored 1, a PARTLY scored ½ and a NO scored 0

Comments made

In one case, a loss reduction over 20 year with an NPV of 1200 M€ was identified. Only one country did not consider it as part of their CBA; all other countries are implementing methods of Fraud Prevention and Fraud Detection.

Following clarifications received at the workshop, one 'no' reply was amended to 'yes'.

Conclusions

Security, and safety in case of access, is covered by the MID Directive. The high consensus shows the importance attached to this Functionality. This is necessary to protect the consumer, say from hacking access, and not just for fraud prevention.

Full answers

AT

Functionality 12 considered in the CBA?

Yes Partly No

Comments on the functionality

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

BE

Functionality 12 considered in the CBA?

Yes Partly No

Comments on the functionality

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

Even if the sharing of costs and benefits among market segments is evaluated, the impact on the total cost for each functionality was not assessed. We cannot then address this aspect of your questions.

FR

Functionality 12 considered in the CBA?

Yes Partly No

Comments on the functionality

Le système de comptage permet de détecter toute intervention sur le compteur et permettra un meilleur suivi de la consommation et donc une meilleure détection des fraudes.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

Cette fonctionnalité étant incluse dans la solution de base, elle n'a pas fait l'objet d'une évaluation technico-économique séparée. L'étude technico-économique menée par la CRE a estimé un gain sur les pertes non techniques de 3Twh pour un montant en valeur actualisée nette (VAN) de 1,2 Milliards d'euros sur 20 ans.

IE**Functionality 12 considered in the CBA?**

Yes Partly No

Comments on the functionality**Impact on the costs**

High Medium Low Minimal NA

Comments on the impact on the costs**NL****Functionality 12 considered in the CBA?**

Yes Partly No

Comments on the functionality**Impact on the costs**

High Medium Low Minimal NA

Comments on the impact on the costs**NO****Functionality 12 considered in the CBA?**

Yes Partly No

Comments on the functionality

This function is a critical part of smart metering systems. Costs of fraud prevention have not been analysed separately, but rather taken into account as an integral part of smart metering.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs**PL****Functionality 12 considered in the CBA?**

Yes Partly No

Comments on the functionality**Impact on the costs**

High Medium Low Minimal NA

Comments on the impact on the costs

As a Percentage __5-15__%

PT**Functionality 12 considered in the CBA?**

Yes Partly No

Comments on the functionality

An expected benefit of 19 M€ was considered at the CBA.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

The Notes & Comments general remark given in functionality 1 should be taken into account.

SE

Functionality 12 considered in the CBA?

Yes Partly No

Comments on the functionality

Has not been considered (separated).

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

SI

Functionality 12 considered in the CBA?

Yes Partly No

Comments on the functionality

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

UK

Functionality 12 considered in the CBA?

Yes Partly No

Comments on the functionality

It is proposed that: the metering system should contain tamper alarms which can be sent to the appropriate supplier via the WAN. This is in addition to physical measures such as tamper evident seals. In addition to tamper detection and preventions as smart meters include a communications network and the electronic passing of pre-payment, the methods for attempting to defraud the system may change. We are working on introducing proportionate security measures to combat fraud and security risks and the measures to detect and prevent fraud will need to be reviewed over the lifetime of the smart meter.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

As a Percentage _less than 10% of equipment costs. Applies to both gas and electricity. Cost of tamper alarm sensors. Cost of communication for fraud prevention and detection.

Detailed questions

| | Considered in the CBA? | Fraud prevention | Fraud detection |
|-----------|-------------------------------|-------------------------------------|-------------------------------------|
| AT | yes | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| BE | yes | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| FR | yes | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| IE | yes | <input type="checkbox"/> | <input type="checkbox"/> |
| NL | partly | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| NO | partly | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| PL | yes | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| PT | yes | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| SE | yes | <input type="checkbox"/> | <input type="checkbox"/> |
| SI | yes | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| UK | yes | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |

Functionalities to allow distributed generation:

Functionality 13: Provides Import / Export & Reactive Metering

Explanations

This Functionality relates to both the Demand Side and the Supply Side.

Points to be considered within this Functionality include:

- Provision of 4 quadrant measurement of active energy (kWh) — import & export;
- In a 4 quadrant kWh meter, differentiation between net energy and generated energy;
- Provision of 2 quadrant measurement of reactive energy (kvarh) — import/export or inductive/reactive;
- Provision of 4 quadrant measurement of reactive energy (kvarh) — import/export and inductive/reactive;
- Communication of high reactive energy to relevant actors.

Points not to be considered here but within other Functionalities include:

- Depends on Functionality 5 (2 way communications) for operation;

Statistics

| Was this Functionality considered | Yes — 8 | Partly — 2 | No — 1 |
|-----------------------------------|----------------|------------|-------------------|
| Cost Impact | Minimal to Low | | |
| | Minimal: 3 | Low: 3 | Medium: 1 High: 0 |
| Consensus Level ¹⁸ | 9 | | |

¹⁸ When assessing the consensus level for each Functionality, a YES scored 1, a PARTLY scored ½ and a NO scored 0

Comments made

Only one country gave a negative reply as this was not considered in their CBA, it is however available in some meters while in other cases a new meter is supplied. All other countries have allowed for this, and a majority appear to be planning full 4-quadrant measurement.

One country expressed concern as to the potentially larger costs for the DSO.

Conclusions

Most countries are allowing for the necessary functionalities to allow renewable and local micro-generation thus future-proofing the meter installation;

Full answers

AT

Functionality 13 considered in the CBA?

Yes Partly No

Comments on the functionality

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

BE

Functionality 13 considered in the CBA?

Yes Partly No

Comments on the functionality

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

Even if the sharing of costs and benefits among market segments is evaluated, the impact on the total cost for each functionality was not assessed. We cannot then address this aspect of your questions.

FR

Functionality 13 considered in the CBA?

Yes Partly No

Comments on the functionality

En mode producteur, le compteur mesure le courant dans les quatre quadrants.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

Cette fonctionnalité étant incluse dans la solution de base, elle n'a pas fait l'objet d'une évaluation technico-économique séparée.

IE**Functionality 13 considered in the CBA?**

Yes Partly No

Comments on the functionality**Impact on the costs**

High Medium Low Minimal NA

Comments on the impact on the costs**NL****Functionality 13 considered in the CBA?**

Yes Partly No

Comments on the functionality**Impact on the costs**

High Medium Low Minimal NA

Comments on the impact on the costs**NO****Functionality 13 considered in the CBA?**

Yes Partly No

Comments on the functionality**Impact on the costs**

High Medium Low Minimal NA

Comments on the impact on the costs

Testing of meters in all four quadrants may impose larger costs for the grid operator. For this reason the functionalities must be initiated by the customer before the grid operator has to ensure the quality of the relevant functionalities.

PL**Functionality 13 considered in the CBA?**

Yes Partly No

Comments on the functionality

The measured reactive energy should be measured above certain level of installed capacity.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

As a Percentage ___15-25___%

PT**Functionality 13 considered in the CBA?**

Yes Partly No

Comments on the functionality

Reactive measurements on all four quadrants.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

The Notes & Comments general remark given in functionality 1 should be taken into account.

SE**Functionality 13 considered in the CBA?**

Yes Partly No

Comments on the functionality**Impact on the costs**

High Medium Low Minimal NA

Comments on the impact on the costs

Not considered.

SI**Functionality 13 considered in the CBA?**

Yes Partly No

Comments on the functionality**Impact on the costs**

High Medium Low Minimal NA

Comments on the impact on the costs**UK****Functionality 13 considered in the CBA?**

Yes Partly No

Comments on the functionality

In order to support micro-generation, it is proposed that the electricity meter be capable of recording active and reactive power exported through it. It will also be able to record active and reactive import through it. The smart metering system is designed to be able to communicate with suitable micro-generation meters to allow meter readings, and other data, to be provided remotely.

Impact on the costs

High Medium Low Minimal NA

Comments on the impact on the costs

As a Percentage ___ less than 10% of equipment costs. Applies to electricity.

Detailed questions

| | | Active Energy | Reactive Energy | | |
|-----------|-------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|--------------------------|
| | Considered in the CBA? | Exported active energy | Imported active energy | Exported active energy | No differentiation |
| AT | partly | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| BE | yes | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

| | | | | | |
|-----------|---------------|-------------------------------------|-------------------------------------|-------------------------------------|--------------------------|
| FR | yes | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| IE | yes | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| NL | yes | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| NO | yes | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| PL | yes | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| PT | yes | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| SE | no | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| SI | partly | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| UK | yes | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

Annex: Source Material for the Functionalities

The questionnaire was based on the Smart Meter Functionalities as developed by ERGEG and published in their publication C11-RMC-44-03 and on the work of the CEN/CLC/ETSI Smart Meter Coordination Group (SM-CG).

SM-CG

In their May 2011 Technical Report '*Functional Reference Architecture for Communications in Smart Metering Systems*', the SM-CG defined six key functionalities. These are:

1. Remote reading of metrological register(s) and provision to designated market organisations
2. Two-way communication between the metering system and designated market organisation(s)
3. To support advanced tariffing and payment systems
4. To allow remote disablement and enablement of supply and flow/power limitation
5. To provide secure communication enabling the smart meter to export metrological data for display and potential analysis to the end consumer or a third party designated by the end consumer
6. To provide information via web portal/gateway to an in-home/building display or auxiliary equipment

This Technical Report on communications only considered additional functionalities to the extent necessary to ensure that there are smart metering communications standards to support the functionalities envisaged.

The smart metering system may be used for a further important functionality:

To enable communication of AMI components with devices or gateways within the home / building used in the provision of energy efficiency and demand-side management services.

In this role, this functionality is directly linked to smart grid functionalities using building and home automation systems. Building and home automation are outside the scope of this mandate; however their interfaces with the smart meter will be treated in co-operation with the SM-CG.

The current Functionalities (based on the ERGEG "Status Review on Regulatory Aspects"¹⁹ report issued Sept 09, page 51) are:

| | Measuring 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

There is no equivalent table for Gas

In the ERGEG
 “Final Guidelines
 of Good
 Practice”²⁰ issued
 Feb 2011 (page 8)
 the
 recommendations
 are:

| ELECTRICITY AND GAS | |
|---------------------------|---|
| Data security & integrity | E/G 1. Customer control of metering data |
| ELECTRICITY | |
| Customer services | E 2. Information on actual consumption and cost, on a monthly basis, free of charge |
| | E 3. Access to information on consumption and cost data on customer demand |
| | E 4. Easier to switch supplier, move or change contract |
| | E 5. Bills based on actual consumption |
| | E 6. Offers reflecting actual consumption patterns |
| | E 7. Remote power capacity reduction/increase |
| | E 8. Remote activation and de-activation of supply |
| | E 9. All customers should be equipped with a metering device capable of measuring consumption and injection |
| | E 10. Alert in case of non-notified interruption |
| | E 11. Alert in case of exceptional energy consumption |
| | E 12. Interface with the home |
| | E 13. Software to be upgraded remotely |
| | Costs and benefits |
| Roll-out | E 15. All customers should benefit from smart metering |
| | E 16. No discrimination when rolling out smart meters |
| GAS | |
| Customer services | G 2. Information on actual consumption and cost, on a monthly basis, free of charge |
| | G 3. Access to information on consumption and cost data on customer demand |
| | G 4. Easier to switch supplier, move or change contract |
| | G 5. Bills based on actual consumption |
| | G 6. Offers reflecting actual consumption patterns |
| | G 8. Remote enabling of activation and remote de-activation of supply |
| | G 11. Alert in case of exceptional energy consumption |
| | G 12. Interface with the home |
| | G 13. Software to be upgraded remotely |
| Costs and benefits | G 14. When making a cost benefit analysis, an extensive value chain should be used |
| Roll-out | G 15. All customers should benefit from smart metering |
| | G 16. No discrimination when rolling out smart meters |

Table 1: ERGEG's guidelines of good practice on regulatory aspects of smart metering

Comparison between ERGEG & SM-CG Functionalities

The relationship of these ERGEG recommendations and the defined Functionalities in Mandate M/441

See pages 35 & 36 of the ERGEG Public Consultation Paper E10-RMF-29-05 of 10th June 2010

| ELECTRICITY | Additional functionalities according to Mandate M/441 | | | | | |
|---|---|---------------------------|----------------------------------|-----------------------|--|--|
| | Remote reading, meter reading of injected and consumed energy, F1 | Two-way communication, F2 | Interval metering/ registers, F3 | Remote management, F4 | Interface with the home/ home automation, F5 | Information through webportal/ gateway, F6 |
| E 2. Information on actual consumption, on a monthly basis, free of charge | | | | | | |
| E 3. Access to information on consumption data on customer demand | | | | | | |
| E 4. Easier to switch supplier, move or change contract | | | | | | |
| E 5. Bills based on actual consumption | | | | | | |
| E 6. Offers reflecting actual consumption patterns | | | | | | |
| E 7. Remote power capacity reduction/increase | | | | | | |
| E 8. Remote activation and de-activation of supply | | | | | | |
| E 9. All customers should be equipped with a metering device capable of measuring consumption and injection | | | | | | |
| E 10. Alert in case of non-notified interruption | | | | | | |
| E 11. Alert in case of exceptional energy consumption | | | | | | |
| E 12. Interface with the home | | | | | | |
| E 13. Software to be upgraded remotely | | | | | | |

Table 2: Correlation of Mandate M/441 additional functionalities and ERGEG Electricity recommendations

| GAS | Additional functionalities according to Mandate M/441 | | | | | |
|--|---|---------------------------|----------------------------------|-----------------------|--|--|
| | Remote reading, meter reading of injected and consumed energy, F1 | Two-way communication, F2 | Interval metering/ registers, F3 | Remote management, F4 | Interface with the home/ home automation, F5 | Information through webportal/ gateway, F6 |
| G 2. Information on actual consumption, on a monthly basis, free of charge | | | | | | |
| G 3. Access to information on consumption data on customer demand | | | | | | |
| G 4. Easier to switch supplier, move or change contract | | | | | | |
| G 5. Bills based on actual consumption | | | | | | |
| G 6. Offers reflecting actual consumption patterns | | | | | | |
| G 8. Remote enabling of activation and remote de-activation of supply | | | | | | |
| G 11. Alert in case of exceptional energy consumption | | | | | | |
| G 12. Interface with the home | | | | | | |
| G 13. Software to be upgraded remotely | | | | | | |

Table 3: Correlation of Mandate M/441 additional functionalities and ERGEG Gas recommendations

List of Links to CBAs provided in the ERGEG report C11-RMC-44-03

Austria

http://www.econtrol.at/portal/pls/portal/portal.kb_folderitems_xml.redirectToItem?pMasterthingId=1605211

Belgium

<http://www.vreg.be/vreg/documenten/rapporten/RAPP-2008-10.pdf>

Denmark

http://www.ens.dk/d_adk/info/nyheder/nyhedsarkiv/2009/sider/intelligenteforbrug.aspx

France

<http://www.cre.fr/en/content/download/10348/173506/file/100129ComptageEvolueGaz-Notedesynthesephase1-en.pdf>

Hungary

(<http://www.eh.gov.hu/home/html/index.asp?msid=1&sid=0&hkl=610&lng=2>)

Italy

<http://www.autorita.energia.it/allegati/docs/08/155-08argengsummary.pdf>

Ireland

www.cer.ie/en/information-centrereports-andpublications.aspx?article=f948d38ea9cf-4b82-aa26-f8f4b4de217e

The Netherlands

<http://www.rijksoverheid.nl/documenten-enpublicaties/rapporten/2010/09/03/intelligente-meters-nederlandherziene-financieleanalyse-enadviezen-voorbeleid.html>

Poland

http://www.piio.pl/bszpre_cele_projektu.php

Portugal

http://www.erse.pt/pt/consultaspublicas/historico/Documents/CP_18/18_3/Func_Plano_Subcontadores_F.pdf

Slovenia

http://www.cigre-cired.si/Images/File/Coga/Posvet_2/7_SmartGrids_CIGRE_2_EIMV_Souvent.pdf

Sweden

<http://www.ei.se/upload/Rapporter/EI/M%C3%A5nadsvis%20av%20sn%C3%A4ring%20av%20el%C3%A4tare.pdf>

<http://www.ei.se/Bibliotek/Rapporter-2010/Okatinflytande-forkunderna-paelmarknaden---Timmatning-orelkunder-medabonnemang-omhogst-63-ampere-EI-R-201022/>

UK

http://www.decc.gov.uk/en/content/cms/consultations/smart_metering/smart_metering.aspx