



Department
of Energy &
Climate Change

Smart Metering Implementation Programme

Explanatory document to support the designation of the first version of the Smart Metering Equipment Technical Specifications (SMETS 1).

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Table of Contents

- 1. Introduction..... 4
- 2. Great Britain Smart Metering Roll-out..... 6
- 3. Regulatory Framework..... 11
- 4. Smart Metering Equipment Technical Specifications 15

1. Introduction

The Government's vision is for every home and smaller business in Great Britain to have smart electricity and, where present, smart gas meters. Domestic consumers will also be offered an In Home Display (IHD). The roll-out of smart metering systems will play an important role in Britain's transition to a low-carbon economy and help us meet some of the long-term challenges we face in ensuring an affordable, secure and sustainable energy supply. It is also consistent with the European Directives 2009/72/EC and 2009/73/EC, collectively known as the "energy third package". The roll-out of smart metering systems by energy suppliers will take place in two phases: the Foundation Stage and mass roll-out. The Foundation Stage began in April 2011. During this phase Government is working with industry, consumer groups and other stakeholders to ensure all the necessary groundwork is completed for mass roll-out. Mass roll-out is expected start in 2014 and will be completed in 2019.

The Standard Electricity Supply and the Standard Gas Supply Licences¹ were amended for the purpose of the roll-out of smart metering systems on 30 November 2012. Licence condition 39 in the Electricity Supply Licence and 33 in the Gas Supply Licence "Smart Metering System – Roll-out, Installation and Maintenance" cover obligations to complete the roll-out of smart metering systems by 31 December 2019 and install only smart metering systems from a date to be specified by the Secretary of State. Licence condition 40 in the Electricity Supply Licence and 34 in the Gas Supply Licence "Provision of an In-Home Display" covers obligations on the offer and maintenance of IHDs to domestic consumers. Smart metering systems will be required to meet the minimum functionality requirements defined in the Smart Metering Equipment Technical Specifications (SMETS) extant when the smart metering system is installed.

The SMETS describes the minimum capabilities for gas and electricity smart metering systems and the IHD. SMETS 1 establishes the functional requirements that are required to be delivered in a consistent, defined way, such that any supplier will be capable of operating any meter with a clear understanding of the processing the equipment will undertake and the outputs they will receive.

Through smart metering systems, consumers will have real time information on their energy consumption to help them control energy use, save money and reduce emissions. There will be an end to estimated billing and switching between suppliers will be smoother and faster, which will be beneficial to many customers. New products and services will be supported in a vibrant, competitive, more efficient market in energy and energy management.

¹ www.ofgem.gov.uk/Licensing/Work/Pages/licence-conditions-consolidated.aspx

In addition suppliers will have access to accurate data for billing and to improve their customer service. They will also be able to reduce costs, for example by reducing call centre traffic, removing the need for a site visit to read meters and through better management of debt. Energy networks will have better information upon which to manage and plan current activities and the move towards smart grids which support sustainable energy supply.

The UK Government has carried out extensive analysis of the expected costs and benefits from rolling out smart metering in Great Britain. Benefits to the energy industry as well as to consumers have been identified and quantified. The impact assessments for the Programme expect a combined gross benefit across the domestic and smaller non-domestic of over £18.6 billion, with combined gross costs of around £11.5 billion. This results in an expected net present value benefit of around £7.2 billion over the appraisal period of 2012 to 2030.

2. Great Britain Smart Metering Roll-out

2.1 The energy market

The electricity and gas supply market is governed by licensing arrangements overseen by the Gas and Electricity Markets Authority (“the Authority”), the independent regulator of the gas and electricity industries. The Authority is supported by Office of Gas and Electricity Markets (“Ofgem”).

To take part in the generation, supply, distribution or transmission of energy, gas and electricity businesses must be licensed by Ofgem. Generation and supply operate in a competitive market and there is no regulation of prices. However, distribution and transmission are monopoly networks subject to price regulation by Ofgem.

In the retail sector, the energy supplier holds the contract with the consumer and is central to the provision of services, including, in particular, metering, to provide energy and peripheral services to the consumer. Unlike in most other European countries, Network Operators are not responsible for metering services.

The market for the provision of metering is itself competitive, i.e. there are a number of different firms offering metering services to suppliers. Some suppliers will choose to provide their metering requirements, in line with regulatory obligations in house while others will choose to subcontract to others to provide metering services. Such metering services include the financing of the assets (Meter Asset Providers) and the ongoing operation and maintenance of the meter (Meter Operators in the electricity sector and Meter Asset Managers in the gas sector). As such, although the supplier may itself have limited involvement with the day-to-day management of metering equipment, the regulatory obligations remain their concern (as the licensed party): this is known as the Supplier Hub Principle.

In addition, unlike most European energy markets, a large number of consumers utilise prepayment meters. These consumers are often provided with emergency credit arrangements, but they may have their supply disabled if they have applied insufficient credit to their meters.

Ensuring a secure energy supply, moving to a low carbon economy and keeping prices affordable are the key challenges that drive the UK’s energy and environmental policies. The introduction of smart metering systems will address these challenges.

2.2 Overview of the roll-out

The roll-out of smart metering systems will be taken forward by energy supply companies. The Government is responsible for:

- setting the policy and regulatory framework;
- developing the minimum technical requirements for smart metering systems and ensuring the overall system is interoperable;
- working to ensure that consumers are positively engaged and appropriate consumer protections are put in place;
- ensuring that industry has the right obligations and incentives to deliver the programme in a way that delivers the overall business case; and
- ensuring wider strategic interests are considered as the Programme develops, for example, the relationship with smart grids.

The Government concluded that energy suppliers were best placed to take on the responsibility of the smart metering roll-out. In addition to being consistent with the supplier hub principle, suppliers are best placed to ensure that the consumer experience of roll-out is a positive one and that it is conducted as efficiently and effectively as possible and delivers the intended benefits, including energy savings. The Smart Meter Prospectus Response was published in March 2011, setting out the overall strategy and timetable for delivering the roll-out of smart meters².

The Prospectus Response confirmed, after a rigorous assessment of the costs and benefits to consumers, the high-level functionality that smart metering systems should achieve. The Government also published a Functional Requirements Catalogue alongside the Prospectus Response, setting out a more detailed description of what the smart metering equipment should deliver. Following further consultation on the draft licence conditions and technical specifications for the roll-out of gas and electricity smart metering equipment in August 2011, the Government also concluded that a technical specification should be developed and mandated. This is considered important to ensure technical interoperability, such that equipment at any premises should not need to be exchanged following a change of supplier. This further work resulted in the development of the SMETS.

² Ofgem/DECC, Response to Consultation on the Smart Metering Prospectus, March 2011. www.decc.gov.uk/assets/decc/consultations/smart-meter-imp-prospectus/1475-smart-metering-imp-response-overview.pdf

Interoperability is a core requirement for the roll-out of smart meters. The effective operation of a competitive retail market for electricity and gas is dependent on customers being easily able to switch energy supplier. Because energy suppliers are responsible for the installation of meters, there needs to be standardisation in the equipment they install so that meters installed by one energy supplier can be operated by another energy supplier.

This interoperability of equipment means that:

- equipment is not unnecessarily replaced before the end of its economic life;
- the need for multiple visits (which incurs significant costs for suppliers) to consumer premises at the point of switching, is avoided;
- the consumer switching process is smooth and does not act as a disincentive for consumers to participate actively in the energy market and seek to reduce their energy costs; and
- the costs and risks associated with change of supplier are reduced such that they do not represent a barrier to entry for new entrants or provide a disadvantage for smaller suppliers.

The SMETS is a key part of the strategy to deliver interoperability. This first iteration of the SMETS requires suppliers to install equipment that offers the necessary functionalities to deliver the objectives for the roll-out of smart meters (see section 4 below). It will deliver “functional interoperability” of equipment, i.e. functional requirements must be delivered in a consistent, defined way, such that any supplier will be capable of operating any meter with a clear understanding of the processing the equipment will undertake and the outputs they, and their customers, will receive. In order to offer the full range of functionality to a consumer upon switching, the gaining supplier may need to take further actions, but by virtue of the SMETS, these actions will be clearly understood and accessible.

To further support interoperability, the Government is exploring whether in the future to include a communications standard(s) as part of the SMETS. This would help ensure that compliant smart meters are technically interoperable, including by speaking the same 'language' regardless of what brand of meter is installed. It may also reduce cost and complexity, avoiding the need for multiple translation services to be developed.

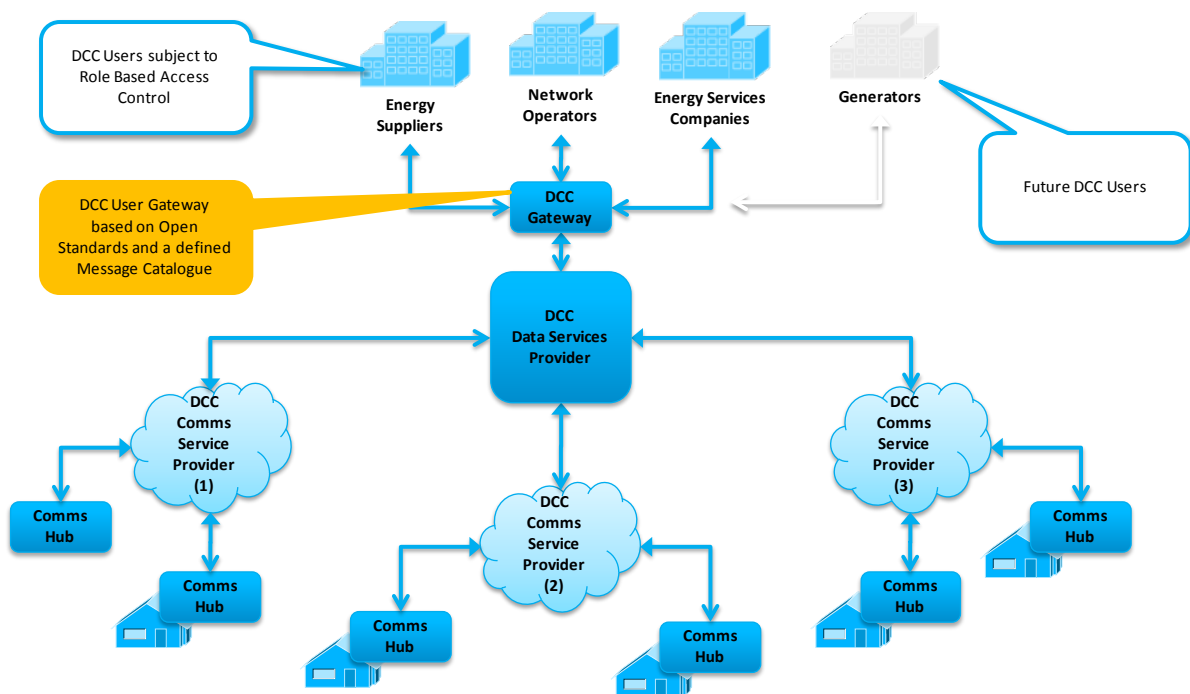
Another important component of the GB model as set out in the March 2011 Prospectus Response is the Data and Communications Company (DCC). The DCC, which will be appointed through a competitive process, will be primarily responsible for central competitive procurement and delivery of services to communicate with smart metering systems for domestic and some non-domestic consumers and with energy suppliers' and other users' head-end systems. The establishment of DCC will also help to ensure interoperability of smart metering systems communications i.e. where a consumer changes supplier, communications

with the smart metering system will continue to be undertaken via DCC without the need for the new supplier to replace communications equipment or establish new contracts with existing communications providers.

2.3 Proposed end-to-end smart metering architecture

The diagrams below provide an overview of the proposed architecture of smart meters. They also explain how in premises communications infrastructure could be configured and how consumer access to data will be supported.

Figure 1: overview of the proposed end-to-end smart metering architecture

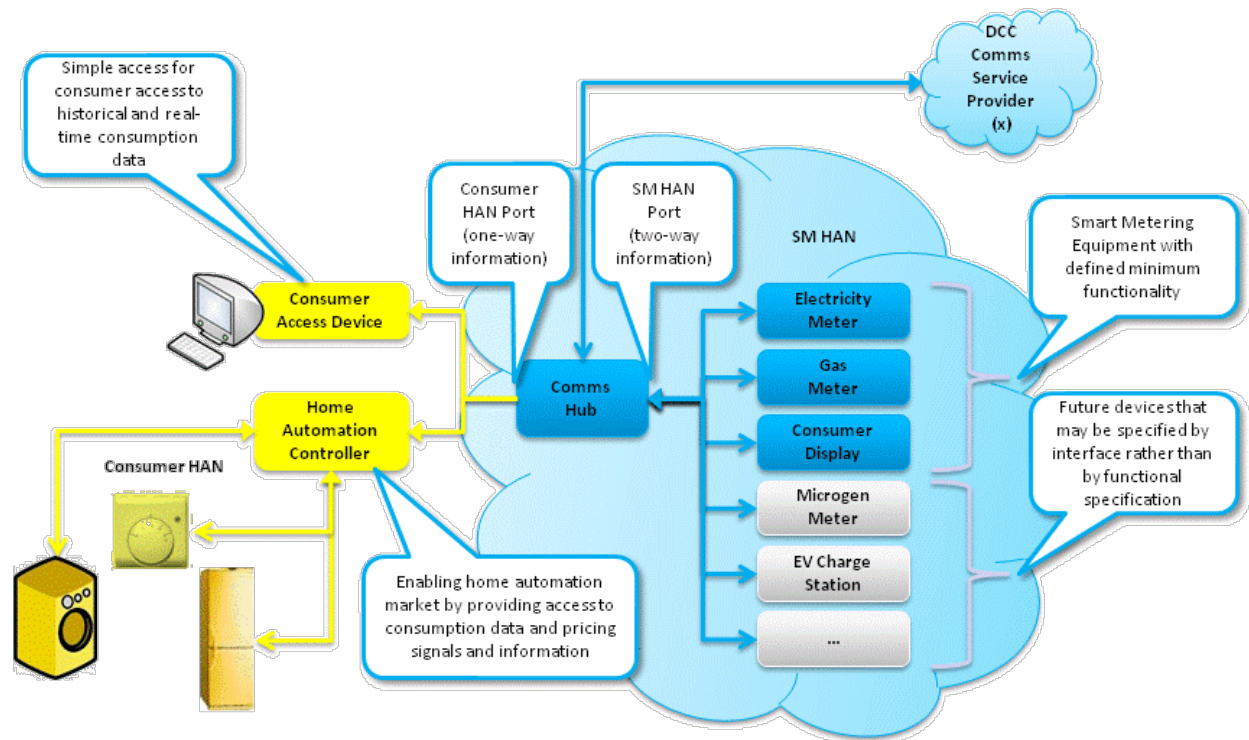


The key elements of the architecture are:

- Market Participants – Energy Suppliers, Network Operators, Energy Service Companies etc interface with the metering equipment in the home via the DCC Gateway. In practice, interactions may be delivered by metering services companies, under contract to suppliers or other parties;
- DCC Gateway – a user interface for market participants to connect with the DCC Data Services Provider;
- DCC Data Services Provider – responsible for access control and routing data between the market participants and the metering equipment in the premises;
- DCC Communications Services Provider – responsible for wide area network communications between the communications hub in the home and the DCC Data Services Provider; and

- Communications Hub – the WAN interface in the home. Also includes HAN interface and additional functionality (see below).

Figure 2: overview of possible connectivity in consumer premises



The data available via the consumer HAN includes real time and historical consumption data and energy pricing information for both electricity and gas. It provides a one-way flow of information from the smart metering system. It provides an important route for the consumer to access and proactively share information from the smart metering system, including with third parties. As such, it is expected to play an important role in supporting growth in home automation services, opening up the market to players other than existing utilities.

2.3 SMETS development approach

The process of developing specifications has been thorough and collaborative – it has been undertaken in cooperation with industry experts, including consumer bodies, metering manufacturers, energy suppliers, network operators and other interested parties. Several of these industry experts have also been involved in the European standardisation process. SMETS 1 was notified to the European Commission on 5 April 2012. The Commission provided comments on this draft, which were taken into account in SMETS 1.

3. Regulatory Framework

The electricity and gas supply market is governed by licensing arrangements overseen by Ofgem. The Energy Act 2008 gives the Secretary of State for Energy and Climate Change ('the Secretary of State') powers to amend existing supply licences and industry codes, and to create new licences and codes for the purpose of delivering smart metering until 2018. Any changes made under these powers, must first be the subject of consultation, including with Ofgem, before being approved by each of the Houses of Parliament.

The Standard Electricity Supply Licence and the Standard Gas Supply Licence were amended for the purpose of the roll-out of smart metering systems on 30 November 2012. Licence condition 39 in the Electricity Supply Licence and 33 in the Gas Supply Licence "Smart Metering System – Roll-out, Installation and Maintenance" cover obligations to complete the roll-out of smart metering systems by a specified target date and install only smart metering systems from a date to be specified by the Secretary of State (3.1). Licence condition 40 in the Electricity Supply Licence and 34 in the Gas Supply Licence "Provision of an In-Home Display" covers obligations on the offer and maintenance of IHDs to domestic customers (3.2).

The Government consulted on a draft DCC licence in April 2012 and published an updated version of the draft licence alongside its response to this consultation in November 2012³. Although this version of the licence represents the near final version, some further changes are expected as a result of the licence application process and consultations in other parts of the smart meters programme. The first active (as opposed to draft) DCC licence will be published when the licence is awarded in mid-2013.

3.1 Smart Metering System – Roll-out, Installation and Maintenance

The Roll-out Duty

This obligation requires suppliers to take all reasonable steps to roll-out smart metering systems (as defined in the SMETS) to domestic and smaller non-domestic premises by 31 December 2019. The intention of this licence condition is to ensure that by 31 December 2019 metering systems in domestic and smaller non-domestic premises meet the SMETS, effectively marking "completion" of roll-out. Setting the completion date in this licence condition will give suppliers certainty about their regulatory obligations so that they can develop plans for the roll-out.

³ www.decc.gov.uk/en/content/cms/consultations/cons_smip/cons_smip.aspx.

The New and Replacement Obligation

From a date designated by the Secretary of State, suppliers will be required to take all reasonable steps to only install smart metering systems that meet the SMETS. This applies to all new and replacement meters, whether installed as part of suppliers' accelerated replacement of meters necessary to meet the 2019 completion date, or as part of the 'business as usual' installations, such as those in new properties or the replacement of meters which have reached the end of their operational or economic life. This obligation will enter into force at a later date designated by the Secretary of State.

The duties after installation

The relevant supplier must take all reasonable steps to ensure that the smart metering system installed at any domestic or smaller non-domestic premises continues to comply with the SMETS extant on the date of installation. This is to ensure the smart metering system is maintained, including on change of supplier.

This obligation also provides for the Secretary of State to be able to require the replacement, modification or reconfiguration of smart metering systems (or parts of those systems) that have already been installed. This power would only be used in exceptional circumstances, for example to protect against newly emerging security threats or safety problems.

Exceptions to the Roll-out Obligations – Current Transformer Meters

Where electricity consumers have particularly high loads, and the electricity supplied is too great to measure through a whole-current meter, the supply is metered indirectly through a Current Transformer meter. Such meters cannot be provided with the range of functionality set out in the SMETS, in particular, remote disconnection and reconnection of supply. The electricity conditions do not, therefore, require a supplier to install a smart metering system where the meter is a Current Transformer Meter. This applies for both domestic and smaller non-domestic premises. Instead these meters should have advanced functionality. Around 25,000 of these meters are in use, almost entirely in the non-domestic sector.

Exceptions to the Roll-out Obligations – Large U16 gas Meters

In the gas licence conditions, the supplier does not have to install a smart metering system where there is a larger gas meter designed to measure gas flows of over 11 cubic meters per hour. The supplier is required instead to provide advanced metering. This is because there is not currently a technical solution available for these larger gas meters to provide the range of smart functionality set out in the SMETS, and it is unlikely in the medium-term that an economically viable smart solution will be achievable.

Exceptions to the Roll-out Obligations – Advanced Meters⁴

At small non-domestic sites only, this condition provides an exception from the roll-out licence condition by allowing a limited installation of advanced meters. This applies when either a) an agreement is in place to install advanced metering that has been satisfied before 5 April 2014; or b) a contract for an advanced meter has been entered into on or before 5 April 2014 and the contractual obligation to install the advanced meter is satisfied before 2019. This is in recognition of the existing market in advanced metering in the non-domestic sector and aims to allow the market to continue to deliver advanced metering and the related early carbon savings in the short to medium term. This exception reflects the fact that such meters are already being widely installed in the non-domestic market, often in tandem with the provision of detailed information about energy use. Maintaining, for a limited period and in limited circumstances, the ability to install such meters ensures that customers, especially multi-site organisations, are able to install common metering across their properties.

3.2 Provision of an In Home Display

The general duty; Exception to the general duty; The duty on request of Domestic Customers

This licence condition requires suppliers to offer domestic customers an IHD which meets the minimum technical specifications at the time of installation of the smart metering system. Where the domestic customer accepts this offer, the supplier must provide an IHD. There is an exception to this requirement where the premises has already been provided with an IHD.

The duty on request requirement allows a customer, having initially declined the offer of an IHD, to request and receive one from his supplier for a period of 12 months from the point of installation.

This obligation is required as the IHD is central to the delivery of information to consumers and realisation of benefits. However, there may be times when an IHD is not provided at the time of installation for example where an IHD is already in place or where a consumer does not want one. To avoid waste of resources, the licence conditions therefore make provisions for these circumstances.

The duty during the Relevant Period on and after the provision of an IHD

As with the requirement for smart metering systems, the relevant supplier must take all reasonable steps to ensure that the IHD provided at that premises continues to comply with the SMETS extant at the point of installation and makes any

⁴ Advanced meters are meters capable of providing half-hourly electricity or hourly gas data that can be remotely accessed by a supplier, with timely customer access to that data.

retrospective changes as directed by the Secretary of State. For IHDs, this is only applicable for a period of 12 months after the point of installation.

The duty to deal with faults

These obligations require suppliers to take all reasonable steps to repair or replace a faulty IHD for twelve months from the date of the original smart metering system installation. This is to ensure that suppliers deal with faults in the IHD so customers are able to access the information provided.

Exceptions

This exception means that the IHD conditions describe above relate only to the installing supplier – at a later date designated by the Secretary of State these will also apply to gaining suppliers where there is a change of supplier. This is needed because as the initial SMETS will not specify the HAN standard by which IHDs will communicate with the smart metering system, one supplier's IHD may not necessarily communicate with a meter installed by another supplier. The Government does not consider it would be appropriate for obligations on gaining suppliers to take effect until the SMETS are further developed in particular in relation to communication standards.

3.3 Enforcement

The Authority's principal objective when carrying out its functions under the Gas Act 1986 and the Electricity Act 1989 is to protect the interests of existing and future consumers. The transmission, distribution and supply of electricity, and the transportation, shipping and supply of gas, are activities that can only be undertaken under a licence granted by the Authority (with certain limited exceptions). These licences set out obligations that licensees must comply with in undertaking their respective functions. Under the Gas and Electricity Acts, the Authority has powers to ensure that persons licensed by the Authority to operate in the gas and electricity markets comply with licence conditions and any statutory requirements imposed directly on gas and electricity undertakings. As with all licence conditions, suppliers are responsible for ensuring their compliance with these obligations and Ofgem will be responsible for taking enforcement action in line with its Enforcement Guidelines on Complaints and Investigations⁵ if a supplier is not complying with the obligation. The Gas Act 1986 and Electricity Act 1989 provide for penalties of up to 10 per cent of a licensee's turnover for failure to comply with these obligations and/or enforcement orders to ensure compliance.

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www.ofgem.gov.uk/About%20us/enforcement/Documents1/Enforcement%20Guidelines%20post%20consultation.pdf

4. Smart Metering Equipment Technical Specifications

The SMETS sets out the minimum physical requirements and the minimum functional capabilities of the smart metering system.

In terms of physical requirements, as well as a meter that meets existing requirements such as the Measuring Instruments Directive (2004/22/EC MID), under the SMETS, a metering system is required to comprise:

- communications components based on open standards⁶;
- a data store;
- a power source;
- a user interface; and
- a load switch/valve (non-domestic gas smart metering systems are not required to contain a valve).

The rationale for including specific functionality in SMETS 1 is outlined below. The overarching rationale for all functionality contained in the SMETS is to ensure functional interoperability so that functions are standardised such that any supplier will be capable of operating any meter with a clear understanding of the operations the equipment will undertake and the outputs they will receive.

Explanation of key requirements

The rationale for including functionality is to:

- Provide consumers with access to better information on their energy consumption. This is supported in SMETS by the capability of displaying consumption and pricing information to a consumer on the metering equipment's user interface and an IHD (including meter balance, instantaneous Power in kW, cumulative consumption so far today, this week, this month); and the capability of providing information (historical profile consumption data and real-time consumption and pricing data) to a consumer access device via the HAN, or to authorised parties via the WAN communications interface.

⁶ Open standards are important in controlling costs over time and facilitating inter-operability between systems in the exchange of data, ensuring that smart meters enhance choices for individual consumers. Particular smart metering requirements, for example communications and security protocols, International and European standards often allow for reasonable and non-discriminatory terms for embedded IPR. To reflect this standards that allow for reasonable and non-discriminatory terms for embedded IPR will be acceptable in SMETS.

- provide accurate billing. This is supported in SMETS by the capability of recording and storing reads of the tariff registers at configurable billing times, and the capability of retrieving these reads remotely over the WAN communications interface.
- provide support for a range of time of use tariffs. This is supported in SMETS by the capability of applying Time-of-use Pricing or Time-of-use with Block Pricing; the capability of recording consumption to up to 48 registers (electricity) and four registers (gas) according to the time the electricity or gas is used; and the capability of accumulating consumption to up to four block counters according to configurable consumption block thresholds for a sole (gas) or one of eight (electricity) time-of use bands.
- ensure that customers can continue to use metering systems in Prepayment or Credit mode and that Prepayment functionality is standardised. This is supported by the capability of the system to operate in Credit Mode and Prepayment Mode and of being remotely switched from one mode to the other; and the capability of maintaining a meter balance. When in prepayment mode it is also supported by the capability of providing emergency credit, recovering debt, disconnecting supply when credit and emergency credit are exhausted, suspending the Disablement of Supply during non-disconnection periods, and processing local or remote top-ups to the meter balance.
- ensure support for the development of smart grids. This is supported in SMETS by the capability of load limiting; the capability of recording voltage quality information, import and export active and reactive energy consumption; and the capability of logging outage times and dates
- ensure support for Microgeneration. This is supported in SMETS by the capability of forwarding requests for information to a Microgeneration meter; and of sending information received from a Microgeneration Meter to authorised parties via the WAN interface; and by the capability of measuring and recording electricity export from a premises.
- ensure that metering systems are operated securely and with sufficient safeguards with respect to the delivery of data access and privacy policy framework. This is supported by the capability to protect the integrity of the device, security components and any personal data, with a breach of integrity logged in the Security Log and an alert raised; the capability to secure transactions over the network interfaces through establishing mutual authentication between the sender and receiver, data integrity, protection against replay attacks and checking the content of the transaction for critical commands; the capability to record security events in a Security Log and raising alerts; and the capability to check the authenticity, intended recipient and rejecting duplicate entries for unique transaction reference numbers entered via the user interface.

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