ofgem ofgem E-Serve Promoting choice and value for all gas and electricity customers

Smart Metering Implementation Programme: Statement of Design Requirements

Document type: Supporting Document

Ref: 94b/10

Date of publication: 27 July 2010

Deadline for response: 28 September 2010

Target audience: Energy suppliers and network operators, consumers, consumer organisations and representatives, environmental bodies, meter asset providers, meter asset managers, meter operators and metering and communication equipment manufacturers, academics and other interested parties

Overview:

This document is one of a number of supporting documents published alongside the Smart Metering Implementation Programme Prospectus.

This document sets out the proposed smart metering system functional requirements. These are designed to deliver the range of currently identified benefits and to be able to evolve as the future requirements of smart grids become clearer. In particular we are proposing that the communications device should be modular or separate so it can be upgraded without replacing the meter. Through the proposed Smart Metering Design Expert Group we will look to industry to develop the functional requirements into technical specifications.

Contact name: Margaret Coaster

Tel: 020 7901 7000

Email: smartmetering@ofgem.gov.uk

Team: Smart Metering Team, Ofgem E-Serve

Context

The Government is committed to the rollout of electricity and gas smart meters to all homes in Great Britain and to the broad delivery framework underpinning the development of policy to date.

On behalf of the Department of Energy and Climate Change (DECC), Ofgem E-Serve has been managing the first phase of a central programme to design and implement new cross-industry arrangements for the delivery of smart metering. Ofgem E-Serve's smart metering work has been undertaken in conjunction with Ofgem's Sustainable Development Division.

The Prospectus represents the joint views of DECC and the Gas and Electricity Markets Authority (GEMA) based on the work conducted so far during the initial phase of the Smart Metering Implementation Programme ('the programme'). It sets out detailed proposals for consultation on the design and delivery of the smart metering system. Alongside the Prospectus, Ofgem is publishing a number of supporting documents which set out in more detail the alternative options considered.

Reflecting the approach adopted to date, the remaining work to scope the regulatory framework will be led by Ofgem E-Serve on behalf of DECC. Later this year, the governance and management arrangements for subsequent phases of the programme will be decided upon.

Associated Documents

DECC and Ofgem have jointly published the Smart Metering Implementation Programme Prospectus. This document is one of a number of Ofgem supporting documents published alongside the Prospectus.

DECC has also published updated impact assessments for the domestic and non-domestic sectors and a paper on disablement/enablement functionality for smart gas meters.

To help inform the programme, Ofgem also commissioned specific research (carried out by FDS) into consumer awareness of, and attitudes towards, smart metering.
All documents are available on the Ofgem website at the following location:

http://www.ofgem.gov.uk/Pages/MoreInformation.aspx?docid=40&refer=e-serve/sm/Documentation

Table of Contents

Summary

Government is committed to the broad framework for the rollout of smart metering. In order to achieve the full benefits, the smart metering system for gas and electricity needs to be capable of supporting a range of functions. The required high-level functionality of the smart metering system has been set out previously. This includes the ability to manage and read meters remotely and the need for meters to communicate over a local communications network with an in-home display (IHD) providing consumers with real-time information about their energy consumption.

Agreement on a set of common functional requirements (what the system must do) and technical specifications (how will the system do it) are essential to provide the interoperability that is needed to ensure that consumers can change gas or electricity supplier without having to change their meter or face additional transfer costs or restrictions. Early confirmation of the smart metering equipment technical specifications is vital in providing certainty to suppliers to enable them to prepare for rollout.

Over the past six months the smart metering programme, managed by Ofgem E-Serve on behalf of DECC, has worked with stakeholders to develop the next level of detail around these requirements. We have set out in this document proposals on which we are seeking views. This includes requirements for meters, communications services to be provided and the IHD.

In terms of the metering equipment we have set out the next level of detail that is required to deliver the high-level list of functional requirements. For example, following discussion with industry and consumer groups we have set out more detail on the prepayment capability required. We have also identified a small number of additional areas of functionality where there is a clear benefit, which we believe can be delivered for little extra cost. This includes "last gasp" capability, which enables alerts to suppliers or network companies if the supply is interrupted. We are also proposing that the meter should have the capability to store up to twelve months of half hourly data to make it easier for the consumer to access their own historical consumption data.

We recognise that smart metering requirements will develop over time. A key requirement is therefore that the meters and communications equipment will be able to be upgraded remotely through the download of firmware. This requirement predominantly reflects the international experience where upgrade problems are starting to arise in early rollouts. We have also proposed that the communications device providing contact with the central data communications function (referred to as DataCommsCo (DCC)) should be modular or separate from the meter. This will allow the communications hardware to be upgraded as technology develops without the need for the meter to be replaced. In terms of the communications services to be provided by DCC we have set out the types of data services offered, estimates of likely data volumes, how frequently data will be transferred, and service level requirements.

Our proposal is that basic service data will be downloaded at frequencies agreed between the consumer and their supplier. This will be determined by the tariffs and services consumers opt for from a range of products offered by suppliers and third

parties, where the consumer agrees to release smart metering data. Similarly, network operators will be able, within the constraints of data privacy obligations, to receive information more frequently. The draft functional requirements will also facilitate development of smart grids. Contribution to the process from network operators was used in our analysis and cost benefit evaluation.

These requirements are brought together in our proposed Smart Metering System Functional Requirements Catalogue (the "Catalogue"). This covers the smart metering system for both domestic and smaller non-domestic customers[1].

In developing our proposals we have focussed on the needs of the energy sector. However, we recognise that the communications link may be a valuable route to enable other services. This includes smart water metering or, where the consumer agrees to release data, those provided by third party providers. The requirements for communication services make allowances for such developments.

We have set out the minimum functional requirements for the mandated IHD within the Catalogue. This will provide a baseline for taking forward proposals set out in the “IHD” supporting document.

We welcome comments on the functional requirements in terms of whether there are any additional requirements which should be included or whether there are requirements we have included but which could be disproportionately expensive to provide.

The programme intends to make the functional requirements within the Catalogue mandatory for metering equipment installed and used under the smart metering regulatory framework. To take this forward, the programme will work with industry to help develop the next level of detail and how best to reflect the requirements in the regulatory arrangements. Building on the Catalogue, the programme will look to industry under appropriate governance structures to develop the more detailed technical specifications that will ensure interoperability across suppliers and technologies. The programme plans to facilitate this through the Smart Metering Design Group (SMDG), one of two expert groups to be set up by the programme. This process will be informed by the work that we recognise has already been undertaken by industry. We would encourage participants to submit any industry developed specifications for SMDG to consider.

We recognise that early delivery of technical specifications is key to facilitating swift rollout. We have therefore decided to reduce the consultation on this document to eight weeks to enable early decisions and confirmation of the draft functional requirements. Once the final decisions are issued with respect to the functional requirements we intend to move forward with industry in developing the technical specifications within six to nine months. Industry stakeholders have indicated that these timescales are realistic.

We also recognise that the technical specifications must be developed with appropriate security measures and that this is integral to the ‘end to end’ smart

[1] Non-domestic electricity customers with meters on profile classes 3 and 4 and non-domestic gas customers with consumption of less than 732 MWh per year.

metering security system. The technical specification development process will be closely linked to the ongoing security design work of the programme.

We propose that the supply licence condition mandating rollout will oblige suppliers to install smart meters that comply with the Catalogue and technical specifications. Once DCC is established, the Functional Requirements Catalogue and the Technical Specifications will be incorporated into the Smart Energy Code, with responsibility for change control and dispute mechanisms being considered under the wider code governance structure.

The programme will continue engagement with the European Commission as our detailed proposals are developed, and may notify draft functional requirements and technical specifications to the Commission under the EU Technical Standards and Regulations Directive (98/34/EC) in due course. We are aware that European standards for smart metering are at an early stage of development and recognise the need to take account of this process as we develop our proposals.

We welcome views on the requirements set out in this document which we believe will deliver the benefits anticipated by Government in deciding to mandate the rollout of smart metering.

1. Introduction

Context

1.1. Establishing a set of minimum functional requirements for the smart metering system that can then be developed into technical specifications is important in order to ensure technical interoperability and promote effective operation of the end-to-end system. This is fundamental for the smooth functioning of the retail market. The required high-level list of functional requirements for domestic consumers is set out in Table 1. The Government's view is that, subject to consultation, the valve should form part of the minimum requirements of all smart gas meters in the domestic sector.

Table 1 – The high-level list of functional requirements for domestic consumers

	High-level functionality	Electricity	Gas
A	Remote provision of accurate reads/information for defined time periods - delivery of information to customers, suppliers and other designated market organisation	✓	✓
B	Two way communications to the meter system; communications between the meter and energy supplier or other designated market organisation; upload and download data through a link to the wide area network; transfer data at defined periods; remote configuration and diagnostics, software and firmware changes	✓	✓
C	Home area network based on open standards and protocols; provide "real time" information to an in-home display; enable other devices to link to the meter system	✓	✓
D	Support for a range of time of use tariffs; multiple registers within the meter for billing purposes	✓	✓
E	Load management capability to deliver demand side management; ability to remotely control electricity load for more sophisticated control of devices in the home	✓	
F	Remote disablement and enablement of supply that will support remote switching between credit and pre-pay	✓	✓
G	Exported electricity measurement; measure net export	✓	
H	Capacity to communicate with a measurement device within a microgenerator; receive, store, communicate total generation for billing	✓	

1.2. Non-domestic smart meter functionality requirements replicate those required for domestic smart meters with the exception of a gas valve and the provision of an IHD which are both excluded. The requirements of non-domestic consumers are considered further in the "Non-domestic Sector" supporting document.

1.3. We set out in this document and the associated appendices the detailed functional requirements for the smart metering system and the services to be provided by the DataCommsCo (DCC). DCC is the new central function that will provide both data and communications services for the smart metering system. Further detail on DCC is provided in the "Communications Business Model" supporting document.

1.4. Establishing a set of minimum functional requirements which can then be developed into technical specifications is important in order to ensure technical interoperability and enable rollout. In the absence of a common specification different suppliers could take different approaches which could create barriers to consumers changing supplier (as they might need a new meter) and prevent effective operation of the end-to-end system.

1.5. Ensuring technical interoperability is therefore important and suppliers will be required to install and supply electricity and gas through smart meters which comply with the functional requirements and technical specifications.

Objectives

1.6. The objectives of this document are to:

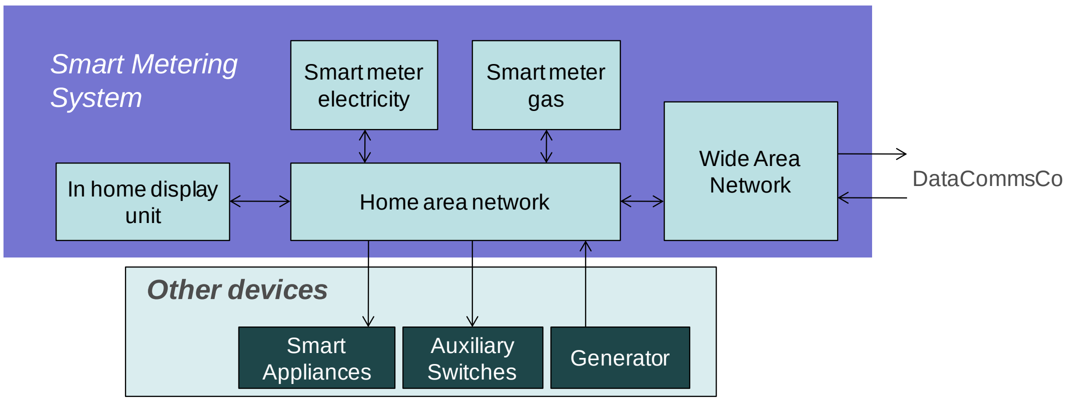
- Describe the approach by which the functional requirements and services were derived;
- Provide a summary of the functional requirements and services;
- Explain the implications of the proposed functional requirements for the consumer home/premise; and
- Define the next steps and governance arrangements required in developing the functional requirements into detailed technical specifications to ensure technical interoperability.

Scope

1.7. The Smart Metering System Functional Requirements Catalogue (the "Catalogue") describes the minimum functional requirements required to deliver the benefits set out in the Government's updated impact assessment. The Catalogue builds on the high-level list of requirements previously identified. The functional requirements are a description of what the system must deliver and not how it will deliver it. As such, multiple solutions may be possible using a variety of equipment. The scope of the requirements covers the consumer premise technology and associated communication interfaces. Figure 1 shows the scope of the Catalogue.

1.8. The consumer premise equipment associated with the smart metering minimum functional requirements comprises the electricity meter, the gas meter, communications modules and the IHD - where it is mandated for domestic consumers.

Figure 1 – Scope of Functional Requirements Catalogue



1.9. The components shown outside the scope of the smart metering system include smart appliances, auxiliary switches and generation. By this we mean that the functional requirements and technical specifications will not cover the functionality of these components and that these components are not mandated (i.e. they are optional). However, messaging to these devices is provided for in the Catalogue. It should be noted that the auxiliary switch is not the same as the main supply enablement/disablement functionality mandated in the functional requirements. The optional auxiliary switch could be integral within a meter or separate, as is the case for the "teleswitches" currently used for Economy 7 tariffs[2]. Fitting an auxiliary switch is optional and is therefore left to supplier choice.

1.10. The communications interfaces comprise the home area network (HAN) and wide area network (WAN). The HAN provides the communication between the meters, communications hubs, IHDs and any load control devices within the premises. The WAN provides the communication between the premise and the DCC.

Structure of the document

1.11. This document covers the following topics:

- Chapter 2 - Developing the Functional Requirements - describes the process used to derive services that will deliver the benefits and to then identify the critical functions to enable these services.
- Chapter 3 - Overview of the Smart Metering System Functional Requirements Catalogue - provides an overview of the scope of the Catalogue (which is

[2] Economy 7 is the name of a tariff that provides cheap off-peak electricity. The night (off-peak) period lasts for seven hours.

published as Appendix 2 to this document) and a description of the areas covered.

- Chapter 4 - Implications of the Smart Metering System Functional Requirements Catalogue - an overview of what this means for the consumer home/premise and DCC. Also what this means in terms of functions that can be delivered at DCC and/or consumer premise level.
- Chapter 5 - Achieving Technical Interoperability - how the functional requirements will be developed into the detailed specification.
- Chapter 6 - Conclusions and Next steps - activities and milestones in the later stages of the programme.
- Appendix 1 - sets out all of the questions raised in this document and how to respond.
- Appendix 2 - The Proposed Smart Metering System Functional Requirements Catalogue - provides the smart metering minimum functional requirements for each element of the smart metering system covering what needs to be delivered.
- Appendix 3 - The European Regulatory and Standards Framework - provides a description of the relevant European legislation and describes the actions that we will be taking in view of this key area.
- Appendix 4 - Smart Grids - gives a more detailed description of smart grids.
- Appendix 5 - Glossary - of terms used in this document.

2. Developing the functional requirements

This chapter describes the approach we took in developing the functional requirements and the next steps for developing them into the detailed technical specifications.

Approach

2.1. To develop the functional requirements for the smart metering system we first defined services that will deliver the benefits set out in the Government's updated impact assessment. We then used the services to identify areas of smart metering system functionality which will enable the service delivery. Within each functional area a number of requirements were then defined.

2.2. The updated impact assessment highlights a number of consumer (domestic and non-domestic) and industry benefits that the programme considers should be delivered by a smart metering system. The benefit areas are shown in Table 2 below.

Table 2 – Impact assessment benefits

Benefit Area	Benefit Description
Consumer Benefits	Energy savings
	Load shifting
	Customer Switching
	Time-of-use tariffs
	CO_2 reduction
Supplier Benefits	Avoided meter reading
	Inbound enquiries
	Customer service overheads
	Debt handling
	Avoided prepayment costs (domestic only)
	Remote disconnection
	Avoided site visit
Other Benefits	Reduced losses
	Reduced theft
	Microgeneration

2.3. We have considered the potential for a number of benefit areas from other stakeholder perspectives. We have sought to include functional requirements that will facilitate smart grids, as well as ensuring that the smart metering system does not preclude developments in other areas such as smart water metering and other value added services such as energy management and access to home automation initiatives.

Regulatory Framework

2.4. In developing our proposals we have taken account of European legislation relating to technical requirements for smart meters, including the EU Technical Standards and Regulations Directive[3] and the EU Measuring Instruments Directive[4].

2.5. The EU Technical Standards and Regulations Directive applies to products and information society services. The Directive seeks to prevent the creation of new technical barriers to trade and lays down a procedure for the provision of information in the field of technical standards and regulations. Member States are obliged to notify to the Commission, in draft, proposed technical regulations and to observe a three month standstill period (which may be extended for a further three months) before the regulation is made or brought into force. This is to provide an opportunity for the Commission and other Member States to comment if they consider that the proposed regulation has the potential to create a technical barrier to trade.

2.6. The draft functional requirements and the technical specifications may need to be notified to the Commission under the EU Technical Standards and Regulations Directive. There is a standstill period for all elements notified.

2.7. The EU Measuring Instruments Directive applies to a number of different measuring instrument types, including gas and electricity meters. The Directive seeks to create a single market in measuring instruments across Europe by requiring measuring instruments to undergo conformity assessment procedures before they are placed on the European market. The EU Measuring Instruments Directive is implemented in the United Kingdom by the Measuring Instruments (Active Electrical Energy Meters) Regulations 2006 and the Measuring Instruments (Gas Meters) Regulations 2006.

2.8. One of the conformity assessment routes is to demonstrate compliance with a relevant EU Standard, for example EN 50470[5] (MID Compliance). We note that on 16 March 2009 the European Commission issued a mandate to the European Standards Organisations (ESOs) to develop smart metering standards. The overall objective is to ensure that a common approach is applied to smart meter requirements across the EU to ensure that free markets are maintained. Any functional requirements or technical specifications developed by the programme will take account of the EU Smart Metering Standard that is being developed.

[3] Directive 98/34/EC of the European Parliament and of the Council on 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations.
[4] Directive 2004/22/EC of the European Parliament and of the Council of 31 March 2004 on measuring instruments.
[5] Standard EN 50470 - Electricity metering equipment (a.c.). General requirements, tests and test conditions. Metering equipment (class indexes A, B and C)

2.9. The Gas Act 1986 and Electricity Act 1989 also regulate gas and electricity meters, including requirements for meters used for measuring quantities of gas or electricity supplied to consumers, responsibilities for meters and requirements for cases when meter accuracy is disputed.

2.10. Metering obligations also exist in gas and electricity licences and industry codes, such as the Balancing and Settlement Code and the Uniform Network Code. We expect that changes to licences and industry codes will be required in order to facilitate smart meters. These are discussed in detail in the "Regulatory and Commercial Framework" supporting document.

The Smart Metering System Services

2.11. We have used the benefits outlined in the updated impact assessment, plus input from stakeholders, to define a set of services that are to be offered by DCC. These services have been mapped against the benefits to ensure that the benefits will be delivered. A summary of the mapping is provided in Table 3.

2.12. The services shown in the table are at a high-level of detail. A more detailed description of the services is given within a specific section of the Catalogue. This can be found in Appendix 2.

2.13. Other inputs into the smart metering system services included industry workshops, consumer groups and information provided by industry stakeholders. The Ofgem Functional Specification workshop held in March 2010 provided valuable feedback on the nature of the proposed services and the areas of functionality that underpin them.

2.14. The services were also used as the basis for a high-level data traffic flow analysis to start to define the communications requirements between the premise and DCC. This is discussed further in Chapter 3.

Table 3 – Map of smart meter services to benefits

Service	Energy saving	Avoided meter reading	Avoided cost of carbon	Customer switching/NSS	Debt handling	Inbound enquiries	Avoided PPM COS premium	Load shifting	Avoided site visit	Time of use tariffs	Remote (dis)connection	Reduced losses	Reduced losses (networks)	Customer service overheads	Reduced theft	Microgeneration
Electricity quality read													y			
Load management	y		y					y		y						
Service life notification		y				y			y					y		
Message to consumers (IHD)	y		Y			y		y	y					y		
Download / clear existing data	y								y							
Registration of smart meter				y					y							
Check accuracy of master clock data						y								y		
Tamper alarm triggered															y	
Meter fault alarm triggered						y			y					y		
Diagnostics						y			y					y		
Firmware / software upgrade				y					y							
Test communication line									y							
Meter read	y	y														
Calorific value							y			y						
Remote enablement / disablement of supply					y		y		y		y					
Switch between credit and prepayment							y									
Prepayment	Y				y		y									
Credit balance update	Y						y									
Tariff update								Y		y						
Supply fault alarm triggered						y			y					y		
Consumer interaction									y							
Notification of failure to obtain reading		y														
Maximum demand read												y	y			
Read distributed generation and storage data																y
Feed in tariff Update																y
Remote configuration of settings				y		y	y		y							
Energisation status check						y						y	y			

Developing smart meter system functions

2.15. We have identified a number of functional areas that are required in order to deliver the benefits of smart metering. These are:

- Metrology - measuring the energy quantities;
- Data storage - storing measured quantities, configuration parameters, etc.;

- Data processing - timing functions, calculating values from measured quantities (e.g. for billing purposes), moving quantities from storage to other nodes on the network, authenticating access requests, decisions to trigger alarms, etc.;
- Communications - the links between the devices within the smart metering system;
- Enable or disable the energy supply - to connect or disconnect supply at a given point in the smart metering system;
- Power - an energy source for the smart metering system components that is reliable and that can maintain critical operation when primary supplies are unavailable; and
- Display - a means of displaying energy information to consumers.

2.16. A number of these functions may be performed either in the consumer premise or remotely in DCC. Clearly functions such as metrology, enablement/disablement of supply and display must be delivered locally within the consumer premise. However, for functional areas such as data processing and data storage there is the possibility of delivering the function in either location.

2.17. An example would be the calculation of values for billing purposes. Currently prepayment consumers have their billing values calculated locally whereas credit consumers have their bills calculated remotely in their supplier's IT systems. Another example would be the storage of consumption data for home energy management purposes. This could be achieved within devices in the home (meter, in home display, PC, etc.) or within DCC or other third party. These matters will be considered in the next phase of the programme, having particular regard to data privacy and security issues.

2.18. In deriving the functional requirements for the smart metering system the design principle has been to enable, where possible, the ability to perform functions both within the premise or remotely, subject to net benefits and data privacy/security.

3. Overview of the Smart Metering System Functional Requirements Catalogue

This chapter provides an overview of the scope of the Smart Metering System Requirements Catalogue and a description of the areas covered. The proposed Catalogue is attached to this document at Appendix 2.

Question 1: Should the HAN hardware be exchangeable without the need to exchange the meter?

Question 2: Are suitable HAN technologies available that meet the functional requirements?

Question 3: How can the costs of switching between different mobile networks be minimised particularly in relation to the use of SIM cards and avoiding the need change out SIMs?

Question 4: Do you believe that the Catalogue is complete and at the required level of detail to develop the technical specification?

Question 5: Do you agree that the additional functionalities beyond the high-level list of functional requirements are justified on a cost benefit basis?

Question 6: Is there additional or new evidence that should cause those functional requirements that have been included or omitted to be further considered?

3.1. The proposed Catalogue, which is published as Appendix 2 to this document, is divided into a number of sections. Short summaries of the requirements within each section are detailed below.

Installation and maintenance requirements

3.2. The installation and maintenance functional requirements cover aspects such as minimising consumer inconvenience during installation and any subsequent maintenance.

Operational requirements

3.3. The operational functional requirements cover aspects such as clock functions, power consumption, default modes of operation and fault recovery.

3.4. We propose a functional requirement to limit the average power consumption of any mandated equipment in the consumer premise to 2.6W total. This has been set in line with the values used in the updated impact assessment and is intended to ensure that the energy savings attributable to the installation of smart meters are not outweighed by the additional "smart" burden.

3.5. The gas meter is expected to be powered by a battery. We propose a functional requirement for a 15 year life under normal operating conditions (metrology, communications and valve operations where applicable) without the need to change a meter battery. It is recognised that there are limitations to battery technology in terms of shelf life (the amount of time a battery remains useful due to self discharge through its internal resistance) with conflicting industry views as to the feasibility of this lifetime. In developing the proposed services, especially in relation to the frequency of updates to the IHD from the gas meter, we have taken into account the much more limited power available from a battery. The energy consumption burden of a battery powered gas meter is significantly less than a mains powered electricity meter over the 15 year life.

Display and storage requirements

3.6. The display and storage functional requirements cover the visual interfaces of the smart metering system within the consumer premise as well as data storage.

3.7. We propose that the meter must be able to store twelve months of half hourly consumption data to enable more effective and informed supplier switching and home energy management initiatives.

Interoperability requirements

3.8. The interoperability functional requirements set out the minimum levels of technical interoperability of the smart metering system.

Prepayment and credit requirements

3.9. The prepayment and credit functional requirements define a common level of functionality associated with credit tariffs, prepayment credit and operation in the event of the WAN not being available.

Electricity specific requirements

3.10. The specific functional requirements for electricity include registers for consumption and demand data, enablement/disablement of supply, data to support network planning and maintenance and information to facilitate network management, via messaging, for load control.

Gas specific requirements

3.11. The specific functional requirements for gas include enablement/disablement, registers for consumption data and local storage of calibration data (defined here as calorific value and other conversion factors). Other functional requirements include frequency of data transmission for gas data, recognising the constraints imposed by the available battery life for gas meters. Maximum demand (peak flow) has also been included.

3.12. The Government's view is that, subject to consultation, the valve should form part of the minimum requirements of all smart gas meters in the domestic sector. The analysis underpinning this is set out in the DECC paper on "Disablement/enablement functionality for smart gas meters" published alongside this document and the analytical annex to the impact assessment.

Diagnostics requirements

3.13. The diagnostics functional requirements cover the need for an agreed set of configuration and diagnostics data that can be stored and accessed by third parties. This includes items such as fault logs, tamper alerts and communications status.

Data privacy and security requirements

3.14. The "Data Privacy and Security" supporting document sets out our initial proposals in relation to data privacy and security for the smart metering system. The programme is following privacy and security by design principles for the smart metering system and this is reflected in the proposed functional requirements. We propose that functional requirements ensure that information derived from smart meters is appropriately secure, proportionate to the risks identified. This is a key part of the 'end to end' smart metering security system.

HAN requirements

3.15. The HAN functional requirements describe the expected functionality of the links between the devices that are connected to the HAN, some of which are battery powered (e.g. the gas meter), are located at distance and must operate for 15 years. There is a functional requirement for the HAN solution to be backwards compatible to ensure that technology upgrades do not compromise the operation of devices connected to the original HAN. We also recognise that there is some degree of future proofing required given the emerging requirements of other "smart" applications. Some existing solutions have the ability to add new device classes. In terms of modularity, our current position is that there is no requirement for the HAN hardware to be exchangeable without exchanging the meter, but we welcome views in this area.

Question 1: Should the HAN hardware be exchangeable without the need to exchange the meter?

3.16. We do not propose a single HAN solution in recognition that there may not be a "one-size fits all option" for the varied premise types and locations found in GB. There is, however, a functional requirement that there should only be a single HAN within a consumer premise where technically possible. It is unclear how many HAN solutions will be required for GB coverage as none of the possible solutions have been tested in volume within GB. An undesirable consequence may be consumer confusion due to multiple HANs. This issue, as well as mitigating actions, is discussed in the next chapter.

3.17. As mentioned previously, the battery powered devices place a constraint on the solutions available for the HAN. High data rates and "always on" operation do not lend themselves to long battery life. We expect the HAN data volumes and rates associated with the functional requirements to be low, as shown in Table 4, which shows indicative potential data items and sizes. It should be noted that these data volumes are illustrative and further work will be needed taking into account the approach to data privacy and access.

3.18. We note that battery life constraints mean that any battery powered device will need to operate at less frequently, for example transmitting every 15 minutes rather than five seconds (as proposed for mains powered devices).

3.19. We also note that there are other home area networks, such as Wi-Fi, DECT, Bluetooth or home power line communication, which may be installed. It is essential that the smart metering HAN operates without undue interference to or from other home networks and conformance to existing standards will be required.

Question 2: Are suitable HAN technologies available that meet the functional requirements?

Table 4 - Illustrative HAN data volumes and rates. Values of 10k and 100k indicate 10,000 and 100,000 respectively.

HAN Data Item	Approximate size (bytes)	Frequency	Response
Power (kW)	10-100	5 seconds	determined by how frequently data is transmitted
Volume (gas e.g. m^3)	10-100	5 seconds	determined by how frequently data is transmitted
Import/Export registers (kWh)	10-100	5 seconds	determined by how frequently data is transmitted
Tariff (£ per kWh)	10-100	5 seconds	determined by how frequently data is transmitted
Up to 12 months of aggregated half hourly consumption data	10k-100k	monthly-yearly	minutes
Current balance (£)	10-100	daily-monthly	hours
Calorific Value (gas)	10-100	daily-monthly	hours
Time	10-100	5 seconds	determined by how frequently data is transmitted
Consumer messaging	100-1000	daily-monthly	seconds-minutes
Energisation status	10-100	daily-monthly	seconds
Load control switching event	10-100	hourly-daily	seconds
Local communications link status	10-100	5 seconds	determined by how frequently data is transmitted
Microgeneration read	10-100	daily-monthly	hours
Prepayment top-up	100-1000	daily-monthly	minutes
Meter alerts	100-1000	daily-monthly	seconds
Firmware	10k-100k	monthly-yearly	minutes-hours
Supply control switching event	10-100	monthly-yearly	seconds

WAN requirements

3.20. The WAN functional requirements describe the expected functionality of the link between the customer premise and DCC. The key parameters of bandwidth, availability and latency (responsiveness) are subject to the level of traffic associated with DCC services. We have included emerging smart grids requirements in the areas of data required for planning and near real time active management. We recognise that as real time requirements become more certain it may be necessary to upgrade the WAN module without replacing the meter. We are therefore proposing that the WAN should be modular or separate from the meter.

3.21. We have undertaken a high-level indicative data traffic analysis based on conservative assumptions and low/high scenarios to gain an order of magnitude estimate for the smart metering system total data volumes over the WAN. This analysis is shown in Figure 2(a). Again, these figures are illustrative and further work will be needed once the approach to data privacy and access has been decided.

3.22. Both scenarios assume a mix of consumption reads, diagnostics and other commands/alerts. The high scenario assumes a large penetration of smart grids services from the initial installation of smart meters consisting of monthly downloads of quality data (e.g. peak voltage, peak power, frequency, etc.). The high estimate is approximately double that of the Energy Network Association's (ENA) estimate. The low estimate assumes very little smart grids activity beyond appliance control events. The low estimate is approximately double that of analysis work commissioned by the European Smart Metering Industry Group (ESMIG). The profile of the increase in data is driven by the rate of roll out.

3.23. The payload assumptions are also shown in Figure 2 (b). These are conservative estimates without any compression taken into account.

Figure 2 (a) – Illustrative annual data volumes in terabytes for low and high case scenarios. Low scenario is mainly smart meter related. High scenario is smart meter and smart grids related. (1 terabyte is 1 million megabytes)

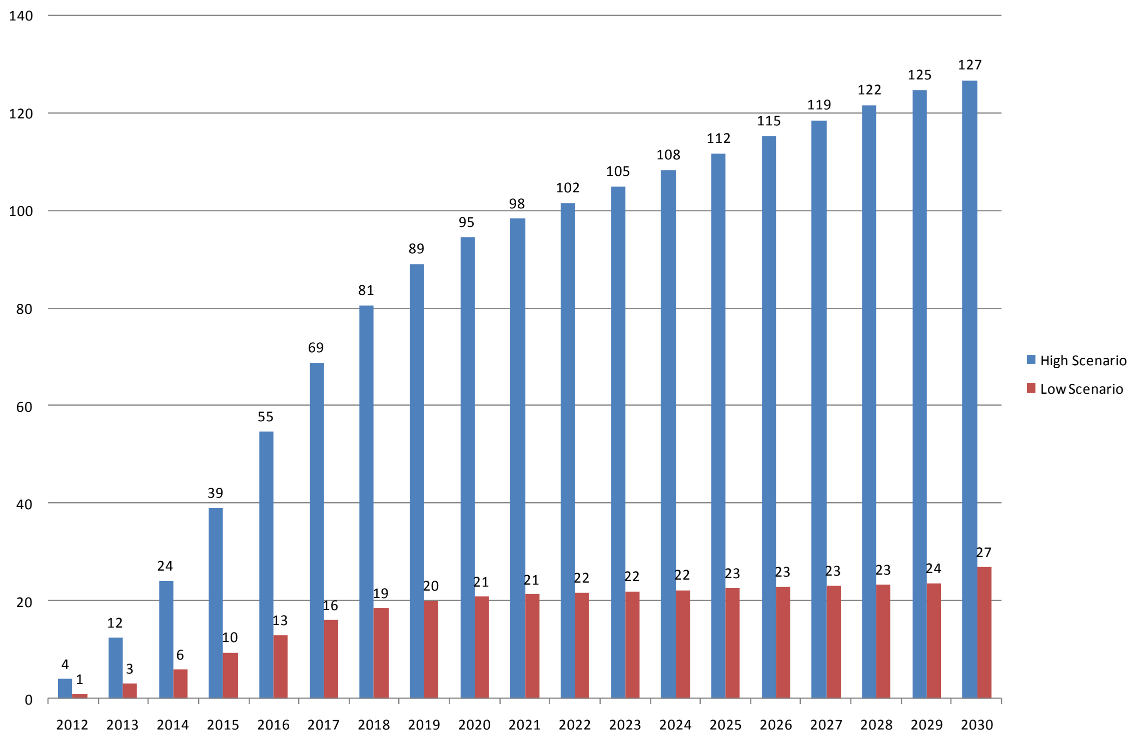
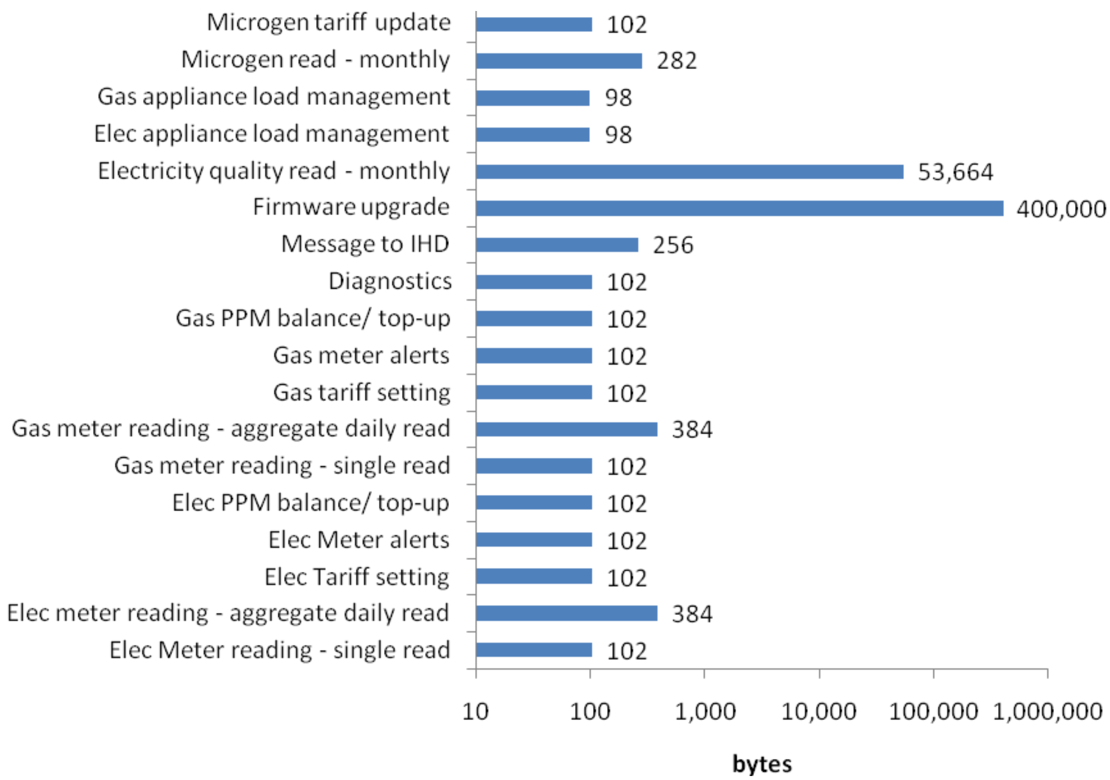


Figure 2 (b) - Indicative sizes for smart meter data (includes header information such as meter ID, date and timestamp and security). (Note log scale).



3.24. The additional volume of data due to smart grids (which accounts for the bulk of data volumes) has been estimated by the ENA and Engage Consulting to be up to two times greater than that associated with consumption data[6]. This is based on a mixture of use cases (planning, load management, diagnostics, etc.) with bulk data downloads on a quarterly basis and a number of infrequent meter interrogations/alarms. For reference the "base case" meter traffic for gas and electricity is given as ~10 terabytes (10 million megabytes) per annum and for smart grids is 60 terabytes per annum. By way of context one cellular operator in the UK reported a 2010 monthly average of 436 terabytes[7].

3.25. The analysis indicates that the data volumes and rates sit comfortably in a number of solution areas such as cellular, Power Line Carrier/Communications and radio. Latency (response rate) requirements will be dependent on the agreed service levels which will be defined in the technical specification. Again, latencies of minutes are compatible with the solutions listed previously. Latencies of seconds would

---

[6] High-level smart meter data traffic analysis ESMCR004-001 and ENA-CR008-001 prepared for ESMIG and ENA respectively

[7] *Orange Digital Media Index*, April 2010.

preclude the use of some of the solutions. In addition the ability to "broadcast" or simultaneously make contact with a number of meters within a defined time period may also preclude some solutions.

3.26. It is acknowledged that suppliers are already using cellular WAN technology and it may be the preferred option for the initial phase of the staged approach to implementation. It is likely that suppliers will choose different cellular network operators for these services. The programme will seek a level of WAN interoperability during the initial phase to ensure that consumers can switch between suppliers without the need to exchange the WAN module.

3.27. Whilst cellular technology is an option, stakeholders have raised concerns over the cost of switching between mobile networks on change of supply. This is particularly in relation to the use of SIM (Subscriber Identity Module) cards and avoiding the need to change out SIMs. We want to explore how the costs of switching between different mobile networks can be minimised and seek views from stakeholders on this point.

Question 3: How can the costs of switching between different mobile networks be minimised particularly in relation to the use of SIM cards and avoiding the need to change out SIMs?

IHD requirements

3.28. The IHD functional requirements set out the minimum requirements for the IHD that we propose to oblige suppliers to install in domestic premises as part of the mandated rollout. They are necessarily high-level (to avoid restricting innovation) and cover the minimum information provision as well as power requirements. However, we expect the IHDs will be developed with additional functionality which may be independently purchased by consumers or offered by suppliers for an upfront charge or as part of a new tariff package.

Existing metering system variants

3.29. There are a number of existing variants in terms of meter design such as polyphase supply and internal meter switches for specific circuits and devices in the home (e.g. Economy 7 and dynamic teleswitching). Solutions for these variants must also meet the minimum functional requirements.

Non-domestic Requirements

3.30. The smart metering system functional requirements were developed to include non-domestic consumers. In summary the only differences are provision of an IHD and the requirement to have valves fitted in gas meters which do not apply to non-domestic consumers.

3.31. Until detailed technical specifications are available it is not possible to assess whether currently available Automatic Meter Reading systems will be fully compatible in terms of technical interoperability.

Question 4: Do you believe that the Catalogue is complete and at the required level of detail to develop the technical specification?

Options analysis

3.32. Our view of the build up of meter functionality cost (with fully functional prepayment capability) is shown in Table 5. This analysis is a combination of previous cost breakdowns undertaken by the industry and a programme review. The impact assessment costs are £43 for an electricity smart meter (no WAN or HAN), £56 for a gas smart meter (no WAN or HAN), £15 for WAN functionality and £1-3 for HAN functionality. The asterisk against smart grids indicates that these benefits are not part of the updated impact assessment, and have yet to be fully quantified.

Table 5 - Breakdown of meter costs by functionality and service.

Function	Electricity (£)	Gas (£)	Benefit
Basic meter metrology	15	31	All
Interoperability level (HAN)	3	5	Energy savings, load shifting, Microgeneration, customer service overheads, avoided cost of carbon. NB all gas related benefits likely to depend on HAN.
Enablement/Disablement	6	12	Avoided prepayment, change of supplier, remote disconnection
Tamper proof	4	4	Reduced theft
Local data Management, Display and storage	6	4	Customer switching, smart grids*
Import/Export & Quality elements	9	N/A	Microgeneration, reduced losses (networks), smart grids*
Total	43	56	

3.33. We believe that our functional requirements within the Catalogue cover the level of functionality outlined in Table 5. It should also be noted that items such as non volatile memory have halved in cost over the last few years and are now significantly less than £1 per gigabyte (which could store over 100 years of half hourly consumption data). Other aspects of smart metering design such as the HAN and WAN modules are also easily available electronic component commodity items.

3.34. Each functional requirement was qualitatively evaluated against the high-level list of requirements, the updated impact assessment and whether it is currently a mandatory requirement. Where a requirement does not meet these criteria it was subject to a qualitative, and if required, quantitative cost/benefit analysis (where supporting information was available). The results of the cost benefit analysis are categorised as Acceptable or Rejected.

3.35. An Acceptable result implies that the functional requirement is one that demonstrates benefits or has little impact (under £10m) on the costs stated in the updated impact assessment. For example, where there is a functional requirement that can be implemented using the hardware and software already assumed in the impact assessment, then this would be considered Acceptable.

3.36. A Rejected result implies that the functional requirement is one that could add significant cost (more than £10 million) to the costs stated in the updated impact assessment without a commensurate benefit (either because it delivered limited benefit or as a result of poor or unavailable benefit data).

Question 5: Do you agree that the additional functionalities beyond the high-level list of functional requirements are justified on a cost benefit basis?

Functions beyond the minimum definition

3.37. The categories of functional requirements in the Acceptable category that we propose include:

- Diagnostic logs - already seen in smart meter manufacturer specifications;
- Tariff structures - already seen in smart meter manufacturer specifications;
- Prepayment functionality - already seen in smart meter manufacturer specifications (and existing prepayment meters);
- Data for planning purposes - ability to capture and store information other than consumption data (often referred to as power quality data and demand data) such as voltage, frequency, etc. for planning purposes. This is already seen in smart meter manufacturer specifications;
- Other meters and equipment - other meters and equipment would communicate via the HAN, which is already included in the cost estimate;
- Last gasp communications - does not add any new hardware to the metering system. Mainly a function of battery management (which is in the meter anyway for back up purposes); and
- Ability to exchange the WAN module without exchanging the meter - already seen in smart meter manufacturer specifications.

3.38. The categories of functional requirements in the Rejected category that we propose to exclude include:

- Temperature sensing - addition of a temperature sensor to detect overheating, for example due to loose meter connections. No benefit data was provided for this requirement. Costs are dependent on the sensitivity of the sensor required. Coarse sensitivity is often provided by microprocessors that have in built temperature sensors. Separate temperature sensors start at £0.10. However, low cost sensors are likely to lose accuracy and could be a cause of false alarms.

- Auxiliary switches - an auxiliary switch is a remotely controllable switch within the meter, or (usually) co-located with the meter, that can control specific circuits/loads such as electric storage heating. Existing examples include Economy 7 installations (controlled by radio teleswitches). This has been excluded from the requirements on the basis that few premises would benefit from an auxiliary switch integrated into the meter without significant rewiring and that the same functionality can be enabled using the HAN and WAN to convey switching signals to compatible switches at the appliance level.

- Pulse output - pulse enabled meters provide electrical or optical pulses as a measure of how much energy has been consumed. These pulses are sometimes used by third parties to provide, for example, advanced meter reading (AMR) or building energy management (BEM) services. In general, these third parties use a module attached to the meter to measure the pulses and convert them to data that is then transmitted over a wireless network. Smart meters will provide similar functionality (in terms of data availability) through the HAN that will be included in all smart meters. Third parties will also have access, where the consumer provides consent, to metering data from DCC. In view of this, there appears to be little benefit to consumers from the additional cost of providing pulse outputs. We have therefore not included a requirement for pulse outputs as it is unlikely it would be used when the functionality is already available in an enhanced form.

Question 6: Is there additional or new evidence that should cause those functional requirements that have been included or omitted to be further considered?

Comparison with other functional requirements documents

3.39. The functional requirements we propose are broadly in line with the requirements documentation prepared by authorities in other countries, trade associations and suppliers. The main areas of difference are:

- Level of detail - other documents developed by industry participants contain elements of technical specification, for example use of backlit displays and detailed tariff structures that we do not consider it appropriate to specify;
- Lack of detail - areas such as smart grids and prepayment functionality are not adequately covered in other documents; and
- Consumer context - there are few documents that reflect the needs of consumers such as protection and necessary interaction.

The proposed Smart Metering System Functional Requirements Catalogue

3.40. The proposed Smart Metering System Functional Requirements Catalogue is set out in Appendix 2 to this document.

International Experiences

3.41. Following stakeholder dialogue and views expressed it is recognised that there are some problems becoming apparent in early smart meter rollouts. For example, equipment that is not capable of upgrade or is vulnerable to external interference has been reported[8]. It is important to learn from the experiences of other countries

[8] *Outsmarting the problems with smart meters*, Mark England, Power Engineering International, May 2010.

that are rolling out smart meters. We have sought to use this experience in the drafting of the Catalogue and will continue to do so in the future development of technical specifications.

3.42. We are also working closely with European bodies involved in seeking to establish standards at an EU level.

4. Implications of the Smart Metering System Functional Requirements Catalogue

In this chapter, implications of the functional requirements for the different components are discussed. In particular, there are issues around the lack of a common HAN standard and the risk of multiple standards emerging. We also consider the potential implications of smart grids and new services such as smart water metering.

Smart metering system

4.1. The functional requirements allow flexibility for a number of technology solutions. The following sections describe the implications of the functional requirements on the possible smart metering equipment.

Gas and electricity meters

4.2. The functional requirements are broadly available within the smart gas and electricity meters now emerging from the market. The major meter manufacturers currently offer base model meters that include the hardware building blocks that would enable the majority of the functional requirements to be met (e.g. metrology Integrated Circuit (IC), Central Processor Unit (CPU), memory, enablement/disablement, WAN and HAN).

4.3. A possible exception is the functional requirements relating to security where some hardware change may be necessary to make smart meters more secure (for example through the addition of accredited security hardware). We are aware that some security specialists have raised some concerns in relation to the current level of security employed globally. Recent tests commissioned by utilities highlighted that the integrity of some current smart metering equipment needs to increase[9]. The nature of potential "security breaches" will also evolve over time and it is therefore important that the smart metering system can accommodate upgrades to address this risk.

In-home display

4.4. The high-level list of functional requirements for domestic consumers requires a mandated IHD to be provided with the smart meter to provide real-time information to domestic consumers.

4.5. The minimum information set to be provided on all gas and electricity IHDs is described in detail within the "In-Home Display" supporting document. The following summarises the proposed high-level requirements:

[9] *Advanced metering infrastructure attack methodology*, InGuardians, January 2009.

- Presentation of real-time information on electricity and gas consumption;
- Presentation of historical information on consumption so consumers can compare current and previous usage;
- To facilitate consumer understanding, usage information must be displayed in pounds and pence as well as kilowatts and kilowatt hours and the display must include a visual (i.e. non-numerical) presentation that allows consumers to easily distinguish between high and low levels of current consumption. We are seeking views on whether information on carbon dioxide emissions should also be included.
- Presentation of accurate account balance information (amount in credit or debit);
- Capability to display information on both gas and electricity consumption;
- Local time; and
- Status of communication link.

4.6. This proposed information set has been informed by views of the Consumer Advisory Group (CAG), a review of the efficacy of different information sets in international studies and provisional information from the Energy Demand Research Project (EDRP)[10].

4.7. The minimum real-time information update rate for electricity is a 5 second update frequency and for gas is 15 minutes (due to battery life considerations). IHD options and proposals are described in detail in the "In-Home Display" supporting document.

WAN, HAN, data protocols and interfaces

4.8. The interfaces between the smart meter, DCC and the components in the home need to be technically interoperable across different manufacturers' equipment. Standards for how data is transmitted and how devices on the network identify themselves are a way of ensuring this.

4.9. The high-level functional requirements include open standards and protocols for the HAN. Open standards and protocols help to ensure technical interoperability and also allow competition amongst equipment manufacturers (preventing single source issues). EU standards bodies oversee the standardisation process with resulting EU standards being considered to be open by Member States.

4.10. Possible solutions for the HAN that meet the functional requirements and can be considered to be based on open standards are currently few in number. We anticipate that there will be significant innovation in this area. HAN solutions to be used in GB need to be selected by the programme on evidence of compliance with the Catalogue. We also anticipate that solutions will be adopted within the scope of the European Standards Organisation's (ESO's) smart metering standards work.

[10] EDRP is a large scale, Great Britain-wide trial seeking to better understand how consumers react to improved information about their energy consumption. This part government funded project, being managed by Ofgem, is designed to measure the long term response to interventions.

4.11. There are a small number of HAN technology options that claim to be suitable for metering and related devices applications. All of these are at a low technology readiness level in terms of large deployments and do not demonstrate true technical interoperability between different manufacturers' devices and meters in a representative range of GB premise types. There are a number of pilots using a range of these HAN solutions that are not currently covered under EU standards.

4.12. Discussions with stakeholders have also indicated that more than a HAN solution may be required to achieve maximum GB coverage as there is no evidence that a 'one size fits all' solution exists. The efficacy of solution(s) would need to be monitored during the early stages of rollout with a governance structure in place that could deal with issues that may arise. As a result it is likely that solutions will stabilise rapidly in the early phases of rollout (similar to experiences with Betamax and VHS, Blu-ray and HD DVD) but it is likely that a small percentage of HANs may have to be upgraded. There are a number of issues associated with multiple HAN solutions that are explored below.

Issue: 1	**Multiple HANs lead to consumer confusion (Consumer does not know which HAN to use)**
Mitigation	If more than one HAN solution endures then it is likely that manufacturers will build flexibility into their solutions (as with mono band and quad band mobile phones). Further mitigation to this issue could come through third party Energy Services Companies who may help consumers install HAN devices because they have a commercial interest in doing so.

Issue 2	**Supplier 2 uses different HAN to Supplier 1 and cannot economically access Supplier 1 technology on meter install**
Mitigation	An industry agreed HAN solution(s) should identify the most economical solution(s). Suppliers could also choose to agree terms for fitting each other's meters in situations where there was a technology issue.

Issue 3	**HAN becomes obsolete**
Mitigation	The ongoing governance and oversight procedure for the functional requirements should monitor the ongoing HAN mix during the early stages of rollout to identify if any solutions are becoming less popular. Allowance should also be made for replacing a small percentage of HAN modules during the lifetime of the meter.

Issue 4	**Suppliers use same HAN but it is not interoperable**
Mitigation	As part of the process for selecting the HAN solution(s) industry will define interoperability tests to minimise this risk and therefore financial liabilities for failing to meet the requirement.

4.13. The standards situation for the WAN is less complicated in that there are a number of possible solutions in cellular and power line carrier technology that are based on open standards. Other technologies based on mesh radio and long range radio are usually proprietary with the WAN module only available from a single supplier. Most of these proprietary solutions are being presented to the ESO under the smart metering standards M/441 mandate.

4.14. In terms of data protocols for data exchange between the smart meter and DCC, Device Language Message Specification (DLMS) is a commonly used solution. DLMS is a suite of standards developed and maintained by the DLMS User Association. Companion Specification for Energy Metering (COSEM) includes a set of specifications that defines the Transport and Application Layers of the DLMS protocol. The technical specifications will define whether single or multiple data protocols should be adopted for this aspect of the smart metering system.

4.15. We propose that the WAN hardware should be modular or a separate box (with logical and physical security measures) close to the meter. This arrangement allows the WAN module to be changed without removing the meter. This arrangement mitigates the risk associated with the WAN life being less than the metrology life (15 years) which is viewed as a significant risk given the pace at which communications technology develops. Separate WAN equipment is also helpful in the event that a smart gas meter is installed ahead of the electricity smart meter.

4.16. There is emerging interest in end-to-end internet protocol (IP) solutions for smart metering systems. Claimed benefits include availability of solutions developed over many years for other application areas. A possible downside is the extra bandwidth overhead (IP uses more bytes to transmit information than other protocols) which may preclude some WAN technology solutions.

Ownership and responsibilities for smart metering equipment

4.17. In broad terms, the proposal is that the supplier is responsible for smart metering equipment. Initial IHDs are provided by the supplier unless the consumer buys a unit for themselves. After installation the supplier would provide a one year warranty without prejudice to any statutory/other rights. Additional complexities associated with single fuel suppliers as well as further details on roles and responsibilities can be found in the "IHD" supporting document. The situation for non-domestic consumers only differs for the IHD, where there is no obligation for a device to be fitted. We also recognise that some non-domestic consumers do take the option of having responsibility for meters. This aspect is covered in more detail within the "Non-domestic Sector" supporting document. Suppliers will continue to have a responsibility to ensure that any customer-supplied meter is appropriate.

Consumer Experience

4.18. We have paid particular attention to the needs of the consumer. The following issues have been considered in developing the functional requirements and further discussion of the consumer protection issues involved is included in the "Consumer Protection" supporting document.

4.19. Re-enabling supply - consumer and safety groups have raised concerns regarding re-enabling energy supply into the home. A key functional requirement for safety reasons, is that the consumer is present in the premise and acknowledges that certain criteria are met (e.g. appliances are off) when the supply is re-enabled after self or remote disconnection (which are distinct from outages due to supply faults). Possible solutions include a button on the meter or on the IHD. An advantage of the IHD approach would be the ability to provide instructions and also avoid the need for interaction with the meter if it is difficult for the consumer to access. However, given that the consumer may not retain the IHD it is essential that the meter also has this functionality. It is recognised that IHDs may be mislaid or may malfunction and any solution should take this into account where the IHD is an enduring part of the smart metering system. It is expected that the technical specification will define preferred solutions in this area.

4.20. Prepayment top up - the functional requirements include the ability for remote (e.g. over the WAN) and local (e.g. over the HAN) top up. Remote top-up could be via existing channels such as shops or garages, over the phone or at a cash machine where the payment signal would be sent to the meter via DCC and the WAN. Local top up over the HAN could be achieved through a keypad connected to the smart meter via the HAN (and utilising a code provided by the supplier). The latter solution could be used in exceptional situations where the WAN is absent or unreliable. These changes will allow more flexible payment methods (such as over the phone or via the internet). It is however essential that the ability to pay by cash will still be available with smart metering.

4.21. Prepayment configuration - the functional requirements include that the smart metering system has to support emergency credit, overnight credit, friendly credit, debt recovery configuration and safeguards that are supported in the token, card or key-based meters currently available. Also included are functionalities for new forms of disconnection such as trickle disconnection and time limited disconnection.[11]

4.22. Health and safety - any solution selected will have to meet national and EU obligations on health and safety. There are guidelines regarding unwanted interference with other devices in the home (so called electromagnetic compatibility) as well as exposure to non ionising radiation. In the UK the Health Protection Agency (HPA) issues guidelines in this area.

4.23. Home Energy Management – it is envisaged that Home Energy Management services will continue to grow. It is recognised that the smart metering system is a key enabler for competition in the Energy Services Companies (ESCOs) market.

4.24. We acknowledge that the uptake of home energy management services will be adversely impacted if the procedure is overly complex and/or unsecure. Possible solutions include use of pairing buttons so that only someone in the premise can attach devices by pressing a button on the meter and device within a fixed time

[11] "Trickle disconnection" is where the consumer is able to use limited levels of electricity to cover basic needs such as lighting and the fridge/freezer. Time limited disconnection involves restoring supply overnight or simply cutting off supply for short periods as a warning.

period. Alternatively pairing could be achieved through a phone call (or the internet) where the consumer gives a code printed on the device which allows it to join the HAN. The latter offers additional protection in that there is some form of user authentication (e.g. in the same way consumers are asked to identify themselves when they call suppliers or log onto supplier websites). It is recognised that the pairing procedure must be simple and secure, but that these are conflicting requirements and for some consumers assistance will be required, for example from ESCOs.

4.25. Power Consumption – a significant benefit of smart metering is that of consumer energy savings. The functional requirements place a limitation on the energy draw of any smart metering system components a consumer is required to have. This includes the meters in the home as well as the mandated IHD. We have followed the guidance in the updated impact assessment which assumes a combined average power draw of less than 2.6W for the smart metering system components (including the IHD) in the premise. This represents approximately 0.1% of the average consumption per annum of a dual fuel household and is offset by the expected 2.8% energy savings. It is also important to emphasise that, as in the current situation, any energy draw associated with the meters and communications equipment in the premise will be from the supply side of the meter and as such the consumer will not be billed. The IHD is an exception, but the 0.6W IHD assumed in the updated impact assessment would cost approximately 50 pence per year to run if left on all the time.

4.26. Hard to access meter location – where meters are currently in locations that are not convenient for consumers to interact with them it will be possible to provide a friendlier interface using the HAN and an IHD that duplicates the required meter functionality. In situations where the meter is not in the consumer premise or not easily accessible the consumer will be able to see, for example, meter or supply fault status on the IHD, although this is not part of the minimum information set.

Facilitating smart grids

4.27. The Electricity Networks Strategy Group (ENSG)[12], is an industry led policy advisory committee co-chaired by DECC and Ofgem. ENSG has developed the following definition:

- "A Smart Grid is an electricity network that can intelligently integrate the actions of all users connected to it - generators, consumers and those that do both - in order to efficiently deliver sustainable, economic and secure electricity supplies".

4.28. The term generally refers to electricity networks – although there are requirements for both gas and electricity.

[12] *A Smart Grid Vision*, Electricity Networks Strategy Group, November 2009

4.29. Anticipated changes in the generation of and demand for electricity will drive the need for more intelligent control of networks. Network Operators will need access to much more detailed operational data to achieve this. On the generation side the sector is moving towards an increasingly dynamic system because of the growth of intermittent generation (such as solar or wind power) much of which could be connected to distribution networks. On the demand side, the take up of electric vehicles and increasing use of heat pumps are expected to change patterns of demand.

4.30. The ENA has undertaken much work to enable the programme to consider how smart grids could be facilitated through smart meter rollout. This positive contribution is greatly appreciated by the programme.

4.31. It should be acknowledged however that a full and complete smart grids cost benefit analysis has not been completed for GB smart grids and is dependent to some extent on future trials (e.g. through the Low Carbon Network Fund - LCNF[13]) to provide detailed input data. This work is outside the scope of the programme but the output could influence, in particular, the specification for wide area communications at later stages of the rollout.

4.32. The smart metering system is an important enabler for the development of a smarter grid now and into the future. It could provide network businesses with detailed information about their networks and how they perform through measurement and control of energy at a local level. This should improve network management and inform better planning and investment decisions. In the longer-term the smart metering system could provide a means for more active management of gas and electricity use in the home.

4.33. The robustness of network development is heavily dependent on data about the existing network including the use that is being made of that network. For low voltage electricity distribution networks, traditionally data about usage at domestic premises has typically been based on generic assumptions about demand levels. This is because the costs of deriving more specific information from other sources was prohibitive – essentially the low-voltage network on which homes and many businesses sit has to date been largely invisible to network operators. With the changes expected to generation and demand patterns within the domestic sector, use of generic assumptions becomes less effective.

4.34. Measurement information from smart meters could offer robust data about consumer usage profiles. This could be aggregated at a network level to provide more relevant information on network utilisation leading to enhanced decision making and planning capability in respect of distribution network development and the associated expenditure.

4.35. It is also anticipated that the changes to generation and demand patterns within the domestic sector will increase the need for active management of distribution networks.

4.36. In consideration of these factors and future uncertainty we have developed functional requirements that should facilitate current network development as well as providing flexibility. These broadly cover:

- The smart metering system functional requirements broadly capture current and emerging network requirements - on the basis that most measurement data that will deliver supplier/consumer benefits are already included in the minimum functional requirements and are available in smart meters currently available;
- The functional requirements include the facility for firmware to be downloaded allowing for new functionality to be included in future; and
- The WAN module will be separate from the meter metrology functionality that allows the module to be exchanged for new enhanced technology before the meter comes to the end of its asset life.

4.37. It is likely that the gas network will also change due to initiatives to inject renewable bio gas, which might impact on gas quality. The capability in the smart metering system to accommodate changes to calorific value at a local level should assist both suppliers and network operators. Other measurements for gas include peak flow (maximum demand).

4.38. Areas where smart grids requirements are enabled by the programme include smart metering system functional requirements (e.g. smart meters), WAN equipment specification, the specification of the WAN and the commercial arrangements for third party access to data through the DCC. The arrangements for third party access to data and controls are covered in the "Communications Business Model" and the "Data Privacy and Security" supporting documents.

4.39. The broad technical and commercial arrangements enabling network operators to benefit from smart metering are summarised below:

- Smart meter functional requirements that support a wide range of smart grids requirements such as energy quality data (e.g. peak power, etc.);
- Making it possible for the WAN communications module to be exchanged for improved communications technology without changing the meter;
- Designing the initial WAN communications specification to provide for a range of smart grids applications, at an appropriate cost to network operators;
- Allowing flexibility for different WAN communications technologies where specific projects are employed at a geographic level (e.g. LCNF projects);
- Allowing DCC to offer flexible service levels as well as requiring it to set out plans for enhancing communications services as network requirements evolve. This will allow the WAN communications specification to be upgraded at the point contracts are retendered, when emerging network requirements become more certain;
- The opportunity to use the output from LCNF projects to influence future wide area communications requirements;
- Allowing network operators to have a direct relationship with DCC, thereby enabling them to negotiate appropriate service levels. DCC will be obliged to offer terms to network operators to gain access to relevant data, with charges based on cost-related parameters (e.g. frequency, size, timeliness); and

- As part of the proposed review of rollout to consider whether additional measures beyond normal commercial arrangements are required in order to ensure that suppliers respond on a reasonable and fair basis to requests from network operators to install smart meters in specific geographic areas (e.g. to support smart grids initiatives).

4.40. Further background on smart grids is provided in Appendix 4.

Future proofing

4.41. The smart metering system comprises a number of different technology areas, some of which will evolve at different rates. For example, communications technology has developed and continues to develop swiftly whereas the technology associated with measuring energy progresses far more slowly. This is clearly an issue for the smart metering system premise components with a minimum life requirement of 15 years and where repeated visits to a consumer premise to update the technology will be unacceptable. We recognise the key areas for future proofing are the HAN and WAN.

4.42. The WAN hardware carries a greater obsolescence risk than the HAN because it is dependent on an external infrastructure that is also evolving, for example from cellular 2G to 3G. In these instances there is a clear cost benefit in being able to exchange the WAN hardware in the consumer premise without changing the meter. We have therefore enabled this through a functional requirement that facilitates modular or separate solutions.

4.43. The HAN hardware carries less obsolescence risk in that it has no dependence on other infrastructure becoming obsolete. There is, however, still a question about the long term reliability of HAN hardware. Our current position is that there is no requirement for the HAN hardware to be exchangeable. We have also proposed a functional requirement that any HAN solution must have backward compatibility, can add new device classes and that any software associated with it can be remotely upgraded.

Enabling new services

4.44. We recognise that the smart metering infrastructure will be attractive for other applications such as smart water metering. The proposed functional requirement for a flexible HAN solution (i.e. one where new device classes can be accommodated) enables the smart metering infrastructure to be used for smart water metering, as well as other value added services, such as energy management and access to home automation initiatives, or healthcare monitoring services at the consumer’s request.

4.45. Ofwat has brought together a smart metering working group, of which Ofgem and DECC are members, to develop water industry requirements. The programme will continue to liaise with them as their thinking develops.

5. Achieving Technical Interoperability

A common technical specification will be necessary in order to achieve technical certainty and interoperability within the GB energy market. This chapter summarises the proposed preferred approach and governance options to achieve technical interoperability.

Question 7: Do you agree that the proposed approach to developing technical specifications will deliver the necessary technical certainty and interoperability?

Question 8: Do you agree it is necessary for the programme to facilitate and provide leadership through the specification development process? Is there a need for an obligation on suppliers to co-operate with this process?

Question 9: Are there any particular technical issues (e.g. associated with the HAN) that could add delay to the timescales?

Question 10: Are there steps that could be taken which would enable the functional requirements and technical specifications to be agreed more quickly than the plan currently assumes?

What is technical interoperability and why is it important?

5.1. Technical interoperability is important in protecting retail competition and delivering the full benefits of smart metering. Without technical interoperability a number of areas such as supplier switching and home energy management initiatives could be made more difficult. For example, if different manufacturers' equipment does not operate together it could frustrate the change of supplier process and in the worst case a home visit and meter exchange would be required. Equally, if a home energy management company is unable to add a smart appliance in the consumer premise there will be a loss in consumer benefits (e.g. energy savings). At a supplier level if meters are unable to support certain tariff structures this could inhibit innovation and limit retail competition.

5.2. Technical interoperability is the capability of systems or devices to provide and receive services and information between each other, and to use these services and information exchange to operate effectively together in predictable ways without significant user intervention. Within the context of smart metering systems, this means the end-to-end connectivity of hardware and software between the premise equipment and the DCC, suppliers, network operators and other authorised parties.

5.3. Technical interoperability covers the physical and communications connections between and among devices or systems (e.g. power plugs or USB ports) as well as the data content, meaning, and format of data and instructions flows.

5.4. Technical interoperability exists when items work together effectively. For example, when every smart meter on a system has the required connectivity irrespective of manufacturer. Interoperability makes it possible to build large-scale systems without extensive and piece-by-piece customisation. Openly available interface specifications or standards will allow suppliers to use multiple vendors. They will also promote competition through product technology, feature innovation, cost and performance.

5.5. The key areas of technical interoperability are the HAN and WAN. Interoperability in these cases is achieved through agreed interface specifications that cover the physical, media access control and application layers of the communications channel.

5.6. In the competitive retail market it is important that suppliers can make use of existing equipment in the consumer premise on change of supplier. Having a common minimum technical specification will ensure that the incoming supplier can use the equipment and facilitate the development of commercial terms (this is called "commercial interoperability" and is discussed further in the "Regulatory and Commercial Framework "supporting document).

5.7. The GB competitive metering market incentivises suppliers to seek best value from meter procurement, installation and management arrangements. It is clear that suppliers have different business models for delivering metering services that may not naturally encourage interoperability.

5.8. In the conventional metering market, where functionality is basic, interoperability has not presented significant problems. With the array of potential functionality available through smart metering the issue of interoperability becomes more important for the reasons set out above.

5.9. We have developed the high-level functional requirements list into more detailed functional requirements. The functional requirements set out what the smart meter system must do in order to deliver the Smart Metering Programme business case. However the functional requirements are not - on their own - sufficient to guarantee technical inter-operability.

5.10. The proposed functional requirements are set out in the appendices to this document. Further work will be required to turn these functional requirements into detailed technical specifications in order to ensure technical certainty and interoperability.

5.11. Examples of smart metering system technical specifications that have been developed from functional requirements include the Dutch Smart Meter Specification and the German open metering standard (OMS, Volumes 1 to 3)[14].

[14] Smart Meter Requirements B101 (February 2008) and Open Metering System Specification Volumes 1-3 (2009).

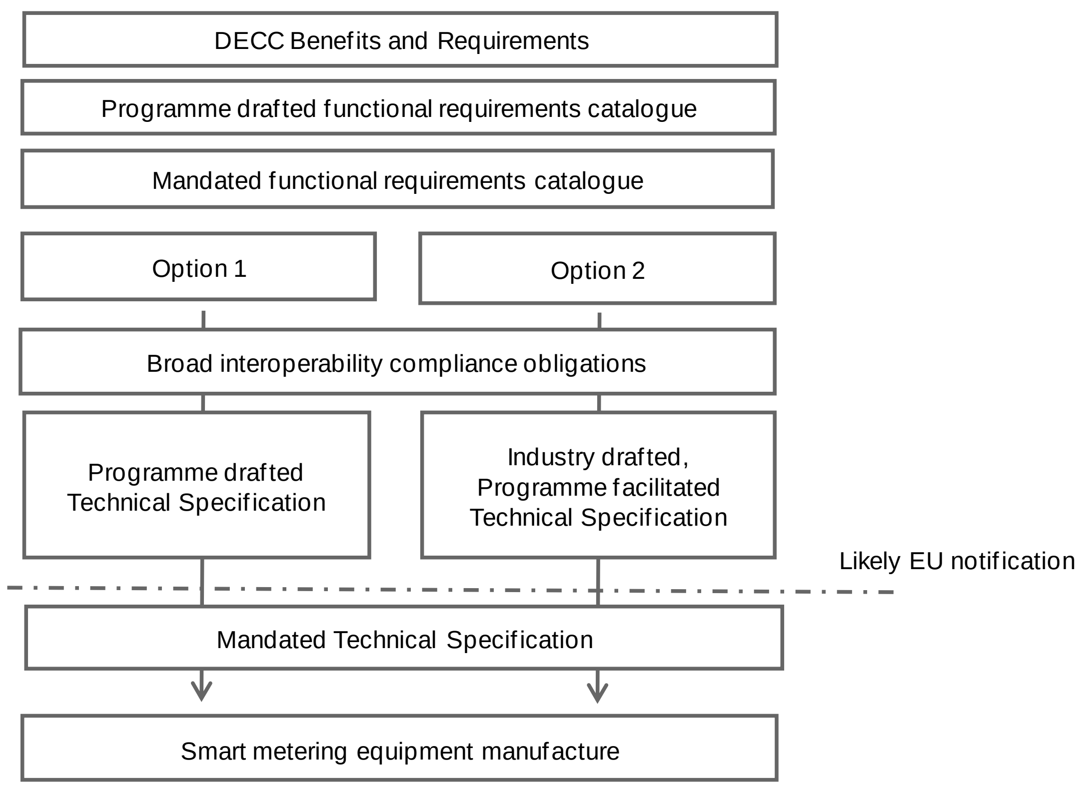
Delivering the technical specification

5.12. We have considered a number of options for delivering the necessary technical certainty and interoperability during the next phases of the programme. These options are described below:

- Option 1 – the programme develops functional requirements and then technical specifications; or
- Option 2 – the programme develops functional requirements and then facilitates the development of technical specifications by industry.

5.13. In both options, suppliers would be obliged to install and supply electricity and gas through smart meters which comply with the confirmed functional requirements and technical specifications. The two options would eventually lead to the same outcome - smart metering equipment manufactured to the same technical specifications. The route to achieving this in each case is set out in Figure 3 below.

Figure 3 – Potential options to deliver functional requirements and technical specification



5.14. The two Options are described below:

Option 1: Programme mandated technical specification

5.15. The programme would develop detailed technical specifications based on the proposed functional requirements. The programme would prepare the technical specifications without the direct contribution of industry or other interested stakeholders. Relevant European standards (published and emerging) and international precedents would inform the development process.

Option 2: Industry drafted/Programme facilitated technical specification

5.16. This option provides that a cross-industry/stakeholder expert group, with appropriate governance and oversight from the programme, would develop detailed technical specifications based on the proposed functional requirements. Technical specifications would be developed based on input from industry, government and consumer stakeholders. Relevant European standards (published and emerging) and international precedents would inform the development process.

Proposed approach

5.17. The fundamental difference between options 1 and 2 is the method of delivery. In our view the programme may not be best placed to undertake preparation of detailed technical specifications. In general, technical specifications and standards are developed by industry working groups and this is accepted as the preferable approach by most industry participants. For example this is the approach taken in developing Elexon technical Codes of Practice.

5.18. For this reason we propose that Option 2 is taken forward in which industry drafts the detailed technical specifications, facilitated by the programme under appropriate governance structures.

5.19. The timescales to achieve detailed specifications under both options are similar and it is estimated that they would be achieved in six to nine months. Industry stakeholders have indicated that these timescales are realistic.

5.20. We envisage that industry would be key participants in the development of the technical specifications. It is essential that all suppliers are given the opportunity to be involved in this process as suppliers will be obliged to install and supply electricity and gas through smart meters that comply with the functional requirements and technical specifications. In view of this, we seek views on whether the programme should place an obligation on suppliers to cooperate with developing the technical specifications.

5.21. We propose to establish a Smart Metering Design Group (SMDG) with relevant expertise to undertake the task of developing technical specifications from the functional requirements. The arrangements for expert groups under the programme are described in the "Implementation Strategy" supporting document.

5.22. We expect to notify the draft functional requirements and technical specifications to the European Commission under the EU Technical Standards and Regulations Directive and observe the required standstill period before the smart metering functional requirements and technical specifications are mandated.

Proposed governance arrangements

5.23. Governance for the Catalogue and technical specifications will need to be put in place including change control, a disputes mechanism and an approach for dealing with concerns that equipment does not meet the technical specifications and/or is not interoperable. This approach should also facilitate competition by providing clear unambiguous requirements to potential new market entrants.

5.24. We propose that the supply licence condition mandating rollout will oblige suppliers to install and supply electricity and gas through smart meters that comply with the Functional Requirements Catalogue and Technical Specifications. Once the DCC is established, the Functional Requirements Catalogue and the Technical Specifications will be incorporated into the Smart Energy Code, with responsibility for change control and dispute mechanisms being considered under the wider code governance structure.

Question 7: Do you agree that the proposed approach to developing technical specifications will deliver the necessary technical certainty and interoperability?

Question 8: Do you agree it is necessary for the programme to facilitate and provide leadership through the specification development process? Is there a need for an obligation on suppliers to co-operate with this process?

Question 9: Are there any particular technical issues (e.g. associated with the HAN) that could add delay to the timescales?

Question 10: Are there steps that could be taken which would enable the functional requirements and technical specifications to be agreed more quickly than the plan currently assumes?

6. Conclusions and Next Steps

This chapter summarises the key proposals, next steps and arrangements for developing technical specifications and the proposed regulatory governance framework for this process.

Summary of Proposals

6.1. We propose:

- The Smart Metering System Functional Requirements Catalogue (the "Catalogue") will describe all of the minimum functions that the smart metering system equipment within a home or premise must deliver;
- Functions to facilitate the development of smart grids are included in the Catalogue;
- A number of functions are included that go beyond the high-level list of functional requirements previously identified;
- Some functions suggested during stakeholder engagements are excluded from the Catalogue on the grounds that insufficient benefits can be demonstrated at this stage;
- Smart metering functionality for the gas and electricity sector has the ability to enable new services, such as water metering and home energy management;
- Industry and consumer representatives will be invited to develop technical specifications, through the Smart Metering Design Expert Group (SMDG). These will provide sufficient technical certainty to equipment manufacturers and industry participants to manufacture smart metering equipment that meets the requirements of the Catalogue and are interoperable;
- Suppliers will be responsible for installing smart metering equipment that complies with the Catalogue and technical specifications;
- Suppliers will be obliged under their licence to install and supply electricity and gas through smart meters that comply with the Functional Requirements Catalogue and Technical Specifications. Once the DCC is established, the Functional Requirements Catalogue and the Technical Specifications will be incorporated into the Smart Energy Code;
- To reflect the requirements of European legislation in our approach, in particular the EU Technical Standards and Regulations Directive which may require notification of the Functional Requirements and Technical Specifications; and
- A high-level plan that could allow technical specifications to be available by Winter 2011.

Next Steps

Consultation

6.2. Due to the timescales associated with the development of technical specifications and the need to provide technical certainty as swiftly as possible we have decided to bring forward questions in this document as an accelerated consultation process. Responses will be required by 28 September 2010.

Plans for developing technical specifications

6.3. As outlined in the previous chapter we now plan to move forward and set-up the SMDG to, amongst other tasks, develop technical specifications for each technical area. Where appropriate, the SMDG may be requested to consider issues raised in this document in parallel with this consultation in order to inform final decisions. We believe this collaborative approach is crucial in enabling us to accelerate the programme and bring forward the benefits of smart metering.

6.4. Once the final decisions in relation to the functional requirements are made, the Programme intends to work with industry to develop the technical specifications. The intention is to complete the development of technical specifications within six to nine months. We are keen to understand how the work on technical specifications could be brought forward.

6.5. We may need to notify the draft functional requirements and technical specifications to the European Commission under the EU Technical Standards and Regulations Directive and observe the required standstill period before the smart metering functional requirements and technical specifications are mandated.

6.6. We propose that the supply licence condition mandating rollout will oblige suppliers to install smart meters that comply with the Functional Requirements Catalogue and Technical Specifications. Once the DCC is established, the Functional Requirements Catalogue and the Technical Specifications will be incorporated into the Smart Energy Code, with responsibility for change control and dispute mechanisms being considered under the wider code governance structure.

6.7. We have set out in Table 6 below our proposed timeline for the next steps. The "Implementation Strategy" supporting document discusses this in more detail.

Table 6 - Plan for delivering technical interoperability.

Date	Milestone
Summer 2010	Consult on Functional Requirements
Winter 2010	Confirm Functional Requirements
Autumn 2011	Complete Technical Specifications
Winter 2011	Functional Requirements and Technical Specifications confirmed subject to outcome of expected notification under the EU Technical Standards and Regulations Directive

Appendices

Index

Appendix 1 – Consultation Response and Questions

1.1. We would like to hear the views of interested parties in relation to any of the issues set out in this document. When responding please state whether you are responding as an individual or representing the views of an organisation. If responding on behalf of an organisation, please make it clear who the organisation represents and, where applicable, how the views of members were assembled.

1.2. We would especially welcome responses to the specific questions included in each chapter and that are replicated here. These detailed questions sit behind the more high-level questions contained in the Prospectus.

1.3. We are determined to make progress with implementation of the smart metering rollout quickly. We are therefore seeking responses to the questions in this document by **28 September 2010**. Responses should be sent to:

- Margaret Coaster
- Smart Metering Team, Ofgem E-Serve
- 9 Millbank, London SW1P 3GE
- 020 7901 7000
- smartmetering@ofgem.gov.uk

1.4. Unless marked confidential, all responses will be published by placing them on the websites of Ofgem (www.ofgem.gov.uk) and DECC (www.decc.gov.uk). Respondents may request that their response is kept confidential.

1.5. Respondents who wish their responses to remain confidential should clearly mark the document(s) to that effect and include the reasons for confidentiality. Respondents are asked to put any confidential material in the appendices to their responses. It would be helpful if responses could be submitted both electronically and in hard copy.

1.6. Individual responses and information provided in response to this consultation, including personal information, may be subject to publication or disclosure in accordance with the access to information regimes (these are primarily the Freedom of Information Act 2000 (FOIA), the Data Protection Act 1998 (DPA) and the Environmental Information Regulations 2004).

1.7. In view of this, it would be helpful if you could explain to us why you regard the information you have provided as confidential. If we receive a request for disclosure of the information we will take full account of your explanation, but we cannot give an assurance that confidentiality can be maintained in all circumstances. An automatic confidentiality disclaimer generated by your IT system will not, of itself, be regarded as binding on the Department of Energy and Climate Change or Ofgem. We will process your personal data in accordance with the DPA. In the majority of circumstances, this will mean that your personal data will not be disclosed to third parties.

1.8. Any questions on this document should, in the first instance, be directed to:

- Margaret Coaster
- Smart Metering Team, Ofgem E-Serve
- 9 Millbank, London SW1P 3GE
- 020 7901 7000
- smartmetering@ofgem.gov.uk

1.9. You may make copies of this document without seeking permission. Further printed copies of the consultation document can be obtained from the contact above. An electronic version can be found on the Ofgem website at: www.ofgem.gov.uk. Other versions of the document in Braille, other languages or audio-cassette are available on request.

CHAPTER 3

Question 1: Should the HAN hardware be exchangeable without the need to exchange the meter?

Question 2: Are suitable HAN technologies available that meet the functional requirements?

Question 3: How can the costs of switching between different mobile networks be minimised particularly in relation to the use of SIM cards and avoiding the need change out SIMs?

Question 4: Do you believe that the Catalogue is complete and at the required level of detail to develop the technical specification?

Question 5: Do you agree that the additional functionalities beyond the high-level list of functional requirements are justified on a cost benefit basis?

Question 6: Is there additional or new evidence that should cause those functional requirements that have been included or omitted to be further considered?

CHAPTER 5

Question 7: Do you agree that the proposed approach to developing technical specifications will deliver the necessary technical certainty and interoperability?

Question 8: Do you agree it is necessary for the programme to facilitate and provide leadership through the specification development process? Is there a need for an obligation on suppliers to co-operate with this process?

Question 9: Are there any particular technical issues (e.g. associated with the HAN) that could add delay to the timescales?

Question 10: Are there steps that could be taken which would enable the functional requirements and technical specifications to be agreed more quickly than the plan currently assumes?

Appendix 2 – The Functional Requirements Catalogue

The smart metering system functional requirements are a description of what the smart metering system must deliver in order to achieve the benefits set out in the updated impact assessment.

The focus is on functional requirements, not the technical specifications that will be developed subsequently.

Table of Contents

Introduction

Context

1.1. The purpose of this document is to provide industry participants with a proposed minimum set of mandated smart metering system functional requirements to move towards technical and commercial interoperability. These are the functional requirements for the domestic and non-domestic sector. We welcome views on our proposed requirements.

1.2. This document refers to the "smart metering system" as a number of configurations of technology components are possible and will be required to meet the requirements. Referring to individual technology components such as the smart meter or communications hub could, in some cases, be solution specific. This is therefore avoided by phrasing all the functional requirements in terms of the smart metering system.

1.3. The scope of the functional requirements covers the functions of the system up to the DataCommsCo (DCC) and is defined in detail in the following section.

1.4. By definition, functional requirements are desired output based requirements that collectively define what is required rather than how it is achieved. A simple example would be the requirement for some form of local communications within the premise. Functional requirements describe what is required of the local communications in terms of the types of devices supported, data rates, etc. whereas a detailed technical specification would either specify a solution or make reference to an existing standard that meets the requirement.

1.5. These functional requirements do not specify solutions or standards. Reference to, or use of, published or emerging standards will be included in the technical specifications which it is proposed will be developed in later stages of the programme.

1.6. These functional requirements have been developed to deliver the benefits stated in the updated impact assessment and are based on the high-level list of functional requirements as set out in Table A2.1 below:

Table A2.1 - The high-level list of functional requirements for domestic smart meters

	High-level functionality	Electricity	Gas
A	Remote provision of accurate reads/information for defined time periods - delivery of information to customers, suppliers and other designated market organisation	✓	✓
B	Two way communications to the meter system; communications between the meter and energy supplier or other designated market organisation; upload and download data through a link to the wide area network; transfer data at defined periods; remote configuration and diagnostics, software and firmware changes	✓	✓
C	Home area network based on open standards and protocols; provide "real time" information to an in-home display; enable other devices to link to the meter system	✓	✓
D	Support for a range of time of use tariffs; multiple registers within the meter for billing purposes	✓	✓
E	Load management capability to deliver demand side management; ability to remotely control electricity load for more sophisticated control of devices in the home	✓	
F	Remote disablement and enablement of supply that will support remote switching between credit and pre-pay	✓	✓
G	Exported electricity measurement measure net export	✓	
H	Capacity to communicate with a measurement device within a microgenerator; receive, store, communicate total generation for billing	✓	

1.7. Non-domestic smart meter functionality requirements replicate those required for domestic smart meters with the exception of gas remote disablement and enablement of supply or the provision of an IHD which are both excluded.

1.8. The functional requirements that are beyond the high-level functional requirements list have been subject to cost benefit analysis where the supporting data is available.

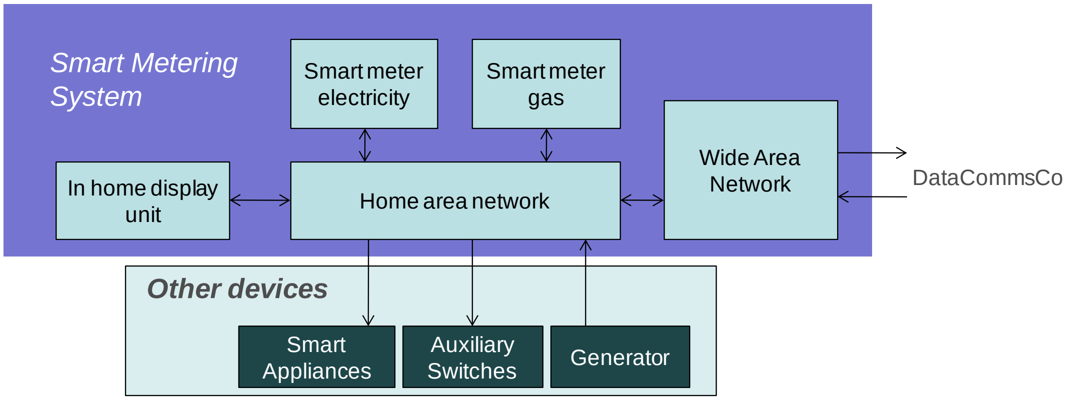
Scope

The smart metering system is the combination of physical (meters, communications hardware, etc.) and logical (software in the meter, commands and controls, etc.) technology.

The scope of the smart metering system functional requirements incorporates the premise technology, the communications interfaces and the commands and controls used by the DataCommsCo (DCC) to access the smart meters. The scope does not include IT systems within DCC or other parties.

1.9. The Smart Metering System Functional Requirements and Services are the minimum functions required to deliver the benefits set out in the updated impact assessment. They are a description of what the system must deliver and not how it will deliver it. As such multiple solutions may be possible using a variety of technologies. The scope of the requirements covers the customer premise technology and associated communication interfaces. They do not cover requirements beyond the premise. This is illustrated in Figure A2.1 below:

Figure A2.1: Scope of functional requirements



1.10. Although the boxes in the figure are shown separately, it should be noted that varying levels of integration will be possible. The "Auxiliary Switches" box represents specified circuits within the home such as electric storage heating or immersion heaters found in some Economy 7 installations.

1.11. It is recognised that possible exceptions to this configuration are blocks of flats or other situations where the metering system components are not co-located within a short distance of each other.

1.12. The following sections explore the implications of the functional requirements in terms of the premise technology.

Smart metering system physical components

1.13. Depending on the solution, the physical premise technology associated with the minimum functional requirements comprises the electricity and gas meters, communications hubs and, for a limited time, some aspects of the in-home display (IHD).

1.14. The principal hardware components are:

- Metrology - the legally controlled measuring device;
- Processing and memory - the computational functionality;
- Wide Area Network (WAN) hardware - the electronic components associated with the wide area communications;
- Home Area Network (HAN) hardware- the electronic components associated with the home area communications;
- Contactor/valve (where fitted) - the mechanism for enabling/disabling energy supply into the premise; and
- Visual interface - a display (which can be on the meter or other device such as an IHD).

1.15. A smart meter as a minimum generally comprises metrology, processing and memory, visual interface and HAN hardware.

1.16. Our proposal is that the WAN hardware should be exchangeable without physically exchanging the meter. For example, it could be modular within the meter housing or exist as a separate box outside of the meter housing. In this latter case it will communicate via the HAN to the smart meter and require its own consumer-independent power supply. Communication of meter readings to the WAN hardware is possible via a plug and socket interface (if co-located in the meter) or wirelessly via the HAN. The benefit of having the WAN either modular or separate from the meter is that it can be updated or changed as communication technology develops.

1.17. The HAN hardware will reside in any smart metering system component that has a need to communicate wirelessly with other smart metering system components. For example, a standalone "WAN hub" communicating wirelessly with a smart meter will require HAN hardware in the hub and in the smart meter.

1.18. The smart gas meter is unlikely to be available with a mains power supply during the roll out phase (for safety and economic reasons). Its power will therefore be provided by batteries, which will need to last 15 years. For this reason, the real time communications requirements for the gas meter are more relaxed than for the electricity meter (e.g. 15 minutes as opposed to 5 seconds).

Support for load control (electricity)

1.19. The high-level functional requirements call for load management capability. This can be achieved through internal switches in the meter, auxiliary switches close to the meter or at the appliance level. The smart metering system functional requirements do not specify a particular solution but instead call for a HAN and WAN that can support load control commands that can be used as the trigger for the solutions described above.

1.20. It is envisaged that if there is a preferred scheme for achieving this then the detailed technical specification will include it. Again, it should be noted that standards in this area are emerging and it will be important to select a solution with some level of future proofing.

Support for microgeneration

1.21. Microgeneration is a similar category to load control in that the detailed industry requirements are emerging. The potential solutions and standards for the associated hardware and communications interfaces are also at an early stage of development. The detailed technical specification can accommodate this uncertainty by selecting, for example, a HAN solution that can support new device classes as they become defined. In addition the functional requirements include import/export metrology.

Support for other applications

1.22. We recognise that the smart metering system infrastructure will be attractive for other applications such as smart water metering. The proposed functional requirement for a flexible HAN solution (i.e. one where new device classes can be accommodated) enables the smart metering infrastructure to be used for smart water metering, as well as other value added services, such as energy management and access to home automation initiatives.

Facilitation of smart grids

1.23. We have consulted industry stakeholders on emerging requirements to facilitate smart grids. It is acknowledged that much uncertainty still remains over changes to future demand (i.e. take up of electric vehicles, heat pumps, etc.) and the impact of microgeneration (e.g. solar, wind). However it is certain that there will be some change.

1.24. We have therefore considered the detailed work commissioned by the Energy Networks Association (ENA) and the functional requirements such as voltage, power quality and frequency are included.

Gas valve

1.25. Following extensive consultation with a range of stakeholders and independently commissioned analysis, the Government's view, subject to consultation, is that the policy benefits of including a gas valve in the minimum functional requirements for domestic smart meters and the certainty this brings outweigh those of leaving the inclusion of a gas valve to supplier choice. The analysis underpinning this is set out in the DECC paper on "Disablement/enablement functionality for smart gas meters" published alongside this document and the analytical annex to the impact assessment.

Defining the functional requirements and services

This chapter describes the process used for defining the functional requirements and the next steps for developing them into the detailed specifications. Also covered are the inputs into the functional requirements in terms of additional requirements that were not explicitly covered in the original minimum high-level functional requirements. For example, smart grids, vulnerable consumers, water metering and third party services.

Background

1.26. The impact assessment highlighted a number of consumer and industry benefits that could be delivered by a smart metering system. The high-level requirements supporting the benefits leave a number of open areas, for example:

- Lack of detail concerning prepayment functionality - what aspects of current token and card based prepayment functionality need to be included?
- Emerging smart grids requirements - what extra functions in the smart meter and associated communications interfaces need to be included?
- Solution optionality - are there any solutions that are possible but that would be undesirable from a consumer perspective?
- Communications - what are the high-level bandwidth, availability and latency requirements?

1.27. The following iterative approach has been used to define the functional requirements:

- Use the high-level functional requirements as well as existing industry specifications as a baseline;
- Gather requirements from areas in which there is insufficient detail (consumers, smart grids and other utilities);
- Define the minimum functional requirements and any associated communications burden;
- Check the requirements against the costed baseline functionality in the impact assessment;
- Check the requirements against solution availability; and

- Justify any requirements above the baseline through a cost benefit analysis (where possible or highlight as an area for further work where not).

1.28. The WAN communications functional requirements in terms of average/peak bandwidth, availability and latency have been defined on the basis of a high-level data traffic analysis set out in the supporting document. This is dependent on the expected mix of services and associated levels of demand. It is expected that the technical specification will select the WAN technology against more detailed traffic forecasts.

Smart metering system functional requirements

In this section the functional requirements are presented and discussed.

Presentation of functional requirements

1.29. The functional requirements set out in this section are the minimum requirements.

1.30. The functional requirements are presented in mini table form as show below.

Requirement	The requirement expressed as a sentence.
ID	The unique identifier for the requirement.
Narrative	An explanation of the requirement and its context.
Justification	Basis for inclusion. For example legislation, high-level list, or consumer groups/smart grids.
Domestic/Non-domestic	Does the requirement apply to domestic (D), non-domestic (ND) or both.

1.31. The functional requirements have been split into a number of logical sections. These sections are:

- Installation and Maintenance (IM);
- Operational (OP);
- Display and Storage (DS);
- Interoperability (IN);
- Prepayment and Credit (PC);
- Electricity Specific (ES);
- Gas Specific (GS);
- Diagnostics (DI);
- Security and Privacy (SP);
- HAN (HA);

- WAN (WA); and
- IHD (IH).

Installation and Maintenance Requirements

1.32. The installation and maintenance requirements relate to aspects of the smart metering system such as minimising consumer inconvenience during installation or any subsequent maintenance.

Requirement	The smart metering system components shall be installable in current existing meter locations in consumer premises.
ID	IM.1
Narrative	Smart meters should be a like for like replacement in the majority of locations.
Justification	To minimise disruption for the majority of consumers. There will be exceptions for meters in difficult to reach locations.
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall enable remote firmware upgrades.
ID	IM.2
Narrative	This avoids premise visits in the event that the software running on the meter needs changing.
Justification	High-level list B
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall support in situ exchange of WAN communication technology (without removal of meter).
ID	IM.3
Narrative	Encourages modular design to minimise costs associated with whole meter exchange.
Justification	Offsets risks associated with WAN life being less than 15 years.
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall resume normal operation without technician intervention after a failure in the metering system power supply.
ID	IM.4
Narrative	The system should "reboot" without the need for any physical intervention at the meter.
Justification	Impact assessment
Domestic/Non-domestic	D/ND

Requirement	The smart metering system components shall be uniquely identifiable electronically where applicable.
ID	IM.5
Narrative	Meters, communications modules, etc. must have a unique electronic identifier for audit trail purposes.
Justification	High-level list A
Domestic/Non-domestic	D/ND

Requirement	The smart metering system components shall be uniquely identifiable mechanically where applicable.
ID	IM.6
Narrative	Meters, communications modules, etc. must have a label/engraving with a unique identifier.
Justification	High-level list A
Domestic/Non-domestic	D/ND

Requirement	The smart metering system components’ batteries shall only be exchangeable by authorised personnel.
ID	IM.7
Narrative	Members of the public must not be able to exchange or remove the batteries, e.g. through use of seals.
Justification	High-level list A
Domestic/Non-domestic	D/ND

Requirement	The smart metering system components shall support local access and configurability by authorised personnel.
ID	IM.8
Narrative	For example to check/change the settings of the meter.
Justification	High-level list A
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall allow in situ maintenance for non safety critical maintenance.
ID	IM.9
Narrative	For example, changing any batteries without having to disconnect the gas supply. Changing any modules in the meter without supply interruption or meter exchange.
Justification	Consumer (shorter premise visits)
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall support remote identification (by authorised parties) of devices attached to the HAN.
ID	IM.10
Narrative	This will help with help desk calls. Subject to consumer consent.
Justification	High-level list B
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall self configure on installation without the need for manual data entry to the system components.
ID	IM.11
Narrative	Implies that meters should be supplied pre-configured or are configured using a simple handheld unit.
Justification	Consumer (shorter premise visits)
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall be installed and maintained in a manner that protects public safety.
ID	IM.12
Narrative	All smart metering equipment must conform to all applicable safety legislation and standards.
Justification	Public safety and Health and Safety at Work
Domestic/Non-domestic	D/ND

Operational Requirements

1.33. The operational functional requirements relate to aspects of the smart metering system such as timing, power consumption, minimum modes of operation and fault recovery.

Requirement	The smart metering system components necessary for remote reading in the consumer premise shall operate independently (normal operating conditions) of any consumer interaction (including provision of energy supply and communications).
ID	OP.1
Narrative	Billing cannot depend on any form of consumer interaction such as line rental or payment for energy to power the system components.
Justification	Existing obligation and high-level list A
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall use UTC for all timing functions/date & timestamps.
ID	OP.2
Narrative	UTC is Coordinated Universal Time which is another name for GMT (Greenwich Mean Time). This avoids confusion over time changeovers during the year.
Justification	High-level list A
Domestic/Non-domestic	D/ND

Requirement	The smart meter shall support "last gasp" communications to notify loss of energy supply.
ID	OP.3
Narrative	In the event of supply interruption the meter can communicate this event before reverting to its back up supply to keep the legal metrology function active.
Justification	High-level list B (remote diagnostics)
Domestic/Non-domestic	D/ND

Requirement	The smart metering system components in the consumer premises shall consume less than 2.6W average combined.
ID	OP.4
Narrative	Limits the amount of energy used to operate the system. Mandated equipment only.
Justification	Impact assessment
Domestic/Non-domestic	D/ND

Requirement	The smart metering system time shall be accurate to within 20 seconds of UTC.
ID	OP.5
Narrative	Consistent with requirement from COP 10 under the BSC (completion of each Demand Period shall be at a time which is within ± 20 seconds of UTC).
Justification	High-level list A
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall support a default mode of operation (reset to minimum functionality).
ID	OP.6
Narrative	In the event of a supplier switch/fault condition there should be a default mode of operation (as some suppliers may exceed minimum requirements).
Justification	High-level list A
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall support firmware upgrades while maintaining normal metrology functionality.
ID	OP.7
Narrative	Metrology software must be unaffected.
Justification	High-level list A
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall enable robust and reliable local (in consumer premise) user interaction to re-enable energy supply in the event of activation of the enablement mechanism.
ID	OP.8
Narrative	For safety reasons, a user should be in the premise when the supply is re-enabled in order to check that all appliances etc. have been switched off.
Justification	Consumer/safety
Domestic/Non-domestic	D/ND

Display and Storage Requirements

1.34. The display and storage functional requirements cover the visual interfaces of the smart metering system within the consumer premise as well as data storage. It should be noted that the European Measuring Instruments Directive also sets out specific requirements for the display of consumption data.

Requirement	The smart metering system shall display any billing information using £ and pence (but be Euro compatible).
ID	DS.1
Narrative	Possible future proofing in the event of currency change over 20 year operational life.
Justification	High-level list A
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall be capable of storing 12 months of half hourly consumption data.
ID	DS.2
Narrative	Allows analysis of usage profile by the consumer or suppliers and 3rd parties (subject to consumer approval).
Justification	Consumer
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall support display of mode of operation (credit or Prepayment).
ID	DS.3
Narrative	Can be implemented on meter and IHD. Could help in fault situations. May not be possible to rely on IHD alone.
Justification	Consumer
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall display energy supply status (enabled or disabled).
ID	DS.4
Narrative	Can be implemented on meter and IHD. Could help in fault situations. May not be possible to rely on IHD alone.
Justification	Consumer
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall display local time unambiguously (where it is displayed).
ID	DS.5
Narrative	To avoid confusion between UTC/GMT. Does not apply to time stamps.
Justification	Consumer
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall support erasure of any consumption data stored locally.
ID	DS.6
Narrative	For example when a consumer moves house. Must be done within the constraints of the Measuring Instruments Directive (MID).
Justification	Consumer
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall support the provision of information in a manner that takes account of the requirements of persons with disabilities.
ID	DS.7
Narrative	Covers any service offered by suppliers such as IHDs, websites, etc.
Justification	
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall support English and Welsh language for any human communication.
ID	DS.8
Narrative	Ensures consumers are able to understand messages, commands and instructions.
Justification	Consumer
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall unambiguously identify all of its registers.
ID	DS.9
Narrative	In the event of multiple registers it must be easy to distinguish them.
Justification	High-level list A
Domestic/Non-domestic	D/ND

Interoperability Requirements

1.35. The interoperability functional requirements set out the minimum levels of technical interoperability of the smart metering system.

Requirement	The smart metering system shall be capable of supporting two different suppliers (i.e. for gas and electricity) in the same premise as well as switching between any licensed suppliers.
ID	IN.1
Narrative	Technical interoperability requirement. Similar to that in other smart meter functional specifications.
Justification	High-level list A
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall allow for change of supplier remotely without premise visit.
ID	IN.2
Narrative	Technical interoperability requirement. Similar to that in other smart meter functional specifications.
Justification	High-level list A
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall support non proprietary data formats for information exchange with consumers
ID	IN.3
Narrative	Where consumers receive data electronically it should be in a format that can be read by freely available software (e.g. .txt, .csv files)
Justification	Consumer
Domestic/Non-domestic	D/ND

Prepayment and Credit Requirements

1.36. The prepayment and credit functional requirements define a common level of functionality associated with credit tariffs and prepayment, including operation in the event of WAN not being available.

Requirement	The smart metering system shall be remotely switchable between prepayment and credit mode of operation.
ID	PC.1
Narrative	Allows payment options to be remotely configurable without the need for a visit to the consumer's premises.
Justification	High-level list F
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall support "tokenless" prepayment mode of operation via remote top ups.
ID	PC.2
Narrative	Supporting token or key card based payment would require agreement on which ones to support and consumer interaction with the meter which is a common cause of faults currently.
Justification	High-level list F
Domestic/Non-domestic	D/ND

Requirement	The smart metering system operating in prepayment mode shall support remote configuration of emergency/friendly credit.
ID	PC.3
Narrative	Replicates the functionality found in some current prepayment systems. Covers requirements around energy supply overnight, during weekends and public holidays.
Justification	Consumer groups
Domestic/Non-domestic	D/ND

Requirement	The smart metering system operating in prepayment mode shall support remote configuration of debt recovery.
ID	PC.4
Narrative	Replicates the functionality found in some current prepayment systems.
Justification	Consumer groups
Domestic/Non-domestic	D/ND

Requirement	The smart metering system operating in prepayment mode shall be capable of maintaining supply to premise independent of WAN communications.
ID	PC.5
Narrative	Mainly for use in exceptional situations (emergencies, unreliable WAN, etc.).
Justification	Consumer groups
Domestic/Non-domestic	D/ND

Requirement	The smart meter operating in prepayment mode shall store top up, debt recovery, and emergency credit history for the last 3 months.
ID	PC.6
Narrative	Replicates the functionality found in some current prepayment systems.
Justification	Consumer groups
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall store data used for billing and settlement purposes for at least 3 months in non volatile memory.
ID	PC.7
Narrative	This depends on the tariff the consumer is on (i.e. quarterly read would see only one reading stored). MID requirement (Annex MI-003) requires that "…the amount of electrical energy measured shall remain available for reading during a period of at least 4 months". This refers to the availability of the display, and not data storage.
Justification	High-level list A
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall support real time remotely configurable tariff structures.
ID	PC.8
Narrative	This covers TOU, critical peak, real time, block (tiered) tariff structures.
Justification	High-level list D
Domestic/Non-domestic	D/ND

Requirement	The electricity smart meter shall support at least 48 configurable time of use periods for its consumption registers.
ID	PC.9
Narrative	Minimum requirement for half hourly settlement e.g. COP 10.
Justification	BSC
Domestic/Non-domestic	D/ND

Requirement	The smart metering system operating in prepayment mode shall support local credit top up.
ID	PC.10
Narrative	For example over the HAN, in the event of WAN difficulties or difficult to reach meters.
Justification	Consumer groups
Domestic/Non-domestic	D/ND

Requirement	The smart meter system shall support prompt and timely register of remote top ups.
ID	PC.11
Narrative	For example, within 30 minutes of a consumer making a payment.
Justification	Consumer groups
Domestic/Non-domestic	D/ND

Electricity Specific Requirements

1.37. The functional requirements associated with electricity include enablement/disablement, registers for consumption and demand data, smart grids data and support for load control.

Requirement	The smart metering system shall support remote connect and disconnect of supply into the consumer premise.
ID	ES.1
Narrative	For example, through use of a contactor within the smart metering system.
Justification	High-level list F
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall support at least one total register for import kWh.
ID	ES.2
Narrative	For metering active energy flow into the premise.
Justification	High-level list A
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall support at least one total register for export kWh.
ID	ES.3
Narrative	For metering active energy flow out of the premise where the consumer has installed microgeneration capability.
Justification	High-level list G
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall support import kVarh measurement.
ID	ES.4
Narrative	Reactive energy measurement capability.
Justification	Smart grids
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall support export kVarh measurement.
ID	ES.5
Narrative	Reactive energy measurement capability.
Justification	Smart grids
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall support import kW measurement.
ID	ES.6
Narrative	Expected to be stored at half hourly intervals where network planning information is required.
Justification	Smart grids
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall support export kW measurement.
ID	ES.7
Narrative	Expected to be stored at half hourly intervals where network planning information is required.
Justification	Smart grids
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall support import kVAr measurement.
ID	ES.8
Narrative	Expected to be stored at half hourly intervals where network planning information is required.
Justification	Smart grids
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall support export kVAr measurement.
ID	ES.9
Narrative	Expected to be stored at half hourly intervals where network planning information is required.
Justification	Smart grids
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall support measurement of other power quality data including: voltage, frequency and sag and swell information, harmonic distortion.
ID	ES.10
Narrative	Expected to be stored at half hourly intervals where network planning information is required.
Justification	Smart grids
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall support capture of consumption and demand data at 5 second intervals.
ID	ES.11
Narrative	Supports the requirement for real time information on an IHD.
Justification	High-level list C
Domestic/Non-domestic	D/ND
Requirement	The smart metering system shall allow the supply switch to be configurable to be open or closed for a range of non safety critical events.
ID	ES.12
Narrative	For example if agreed load is exceeded, if credit runs out, etc.
Justification	High-level list F
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall support auxiliary switching and load control commands from remote third parties.
ID	ES.13
Narrative	It is expected that switch time randomisation will be implemented at the local device level.
Justification	High-level list E
Domestic/Non-domestic	D/ND

Gas Specific Requirements

1.38. The functional requirements associated with gas include enablement/disablement, registers for consumption data and local storage of calibration data (defined here as calorific value and other conversion factors). Other requirements include how frequently gas data is transmitted, recognising that battery life for gas meters can be an issue.

Requirement	The smart metering system shall support local storage of calibration data (calorific value, conversion factors, etc.).
ID	GS.1
Narrative	Allows for possibility of more accurate and frequent billing calculation in the meter (e.g. for prepayment).
Justification	High-level list A
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall support at least one total register for gas consumption.
ID	GS.2
Narrative	Assumption is that a single import register is sufficient.
Justification	High-level list A
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall support at least 48 wake up events per 24 hour period.
ID	GS.3
Narrative	For battery life reasons the gas meter cannot be in permanent listening mode. It will wake up at predetermined times to send/receive data and commands.
Justification	High-level list A
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall support capture of gas consumption data at 5 second intervals.
ID	GS.4
Narrative	Does not imply the data has to be transmitted or stored at this interval.
Justification	High-level list C

Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall support a valve for enablement and disablement of gas supply.
ID	GS.5
Narrative	Through use of a valve within the smart metering system
Justification	High-level list F
Domestic/Non-domestic	D

Requirement	The smart metering system shall continue normal operation in the event of a gas supply interruption.
ID	GS.6
Narrative	This includes situations where the valve has operated.
Justification	High-level list A
Domestic/Non-domestic	D/ND

Requirement	The smart metering system valve shall be configurable to be open or closed in the event of battery failure.
ID	GS.7
Narrative	Allows configuration to protect consumers.
Justification	Consumer
Domestic/Non-domestic	D

Requirement	The smart metering system shall support 20 valve operations per year within the 15 year battery life requirement.
ID	GS.8
Narrative	Need to give an indication for battery life purposes.
Justification	High-level list F
Domestic/Non-domestic	D

Requirement	The smart metering system shall support measurement of peak demand for gas supply.
ID	GS.9
Narrative	Data item may be used by network operators for planning purposes.
Justification	Smart grids

Domestic/Non-domestic	D/ND

Diagnostics Requirements

1.39. The diagnostics requirements cover the need for an agreed set of configuration and diagnostics data that can be stored and accessed by third parties.

Requirement	The smart metering system shall support logging of the following diagnostic, fault and tamper information, including date stamping of the information: meter faults, supply faults, communications faults, cover removal, clock resets and faults, improper running of the registers, unauthorised logical access, energy flow exceeding agreed extreme levels, interruption to neutral supply of meter (electricity only), bridging of internal switches (electricity only), remote enablement, disablement events, etc.
ID	DI.1
Narrative	Initial minimum information set based on ERA and BG specifications as well as input from AMO.
Justification	High-level list B
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall support remote configuration of logs, alarms and thresholds.
ID	DI.2
Narrative	Suppliers may wish to configure the logs in different ways. This should be possible without a home visit.
Justification	High-level list B
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall support configuration of alarms associated with usage thresholds.
ID	DI.3
Narrative	To ensure, for example, measurements outside limits are registered
Justification	High-level list B
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall store its configuration data in non volatile memory.
ID	DI.4
Narrative	To ensure, for example, that necessary information/data/settings remains after loss of power.
Justification	High-level list B
Domestic/Non-domestic	D/ND

Requirement	The smart metering system components shall be identifiable within any diagnostic log information.
ID	DI.5
Narrative	To ensure clear and unambiguous recognition/understanding
Justification	High-level list B
Domestic/Non-domestic	D/ND

Requirement	The smart meter system shall communicate battery status for metrology related functionality.
ID	DI.6
Narrative	The Measuring Instruments Directive covering gas meters states warning has to be shown once 90% of lifetime reached (Annex MI-002, 5.2).
Justification	Regulatory
Domestic/Non-domestic	D/ND

Security and Privacy Requirements

1.40. The "Data Privacy and Security" supporting document summarises high-level requirement areas. More detailed security requirements for the smart metering system are detailed below.

Requirement	The smart metering system shall support strong mechanisms for authentication, authorisation and access control.
ID	SP.1
Narrative	This enables access rights to different aspects of the smart metering system.
Justification	Security and privacy
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall support secure data communication to ensure the confidentiality, integrity and availability of the data and commands.
ID	SP.2
Narrative	This requirement ensures the data privacy and security of personal information system functionality by protecting the confidentiality, integrity and availability of the communications.
Justification	Security and privacy
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall be protected from physical tampering or interference, e.g. security seals, tamper switches, etc.
ID	SP.3
Narrative	A current requirement for conventional meters.
Justification	Security and privacy
Domestic/Non-domestic	D/ND

Requirement	The smart metering system components shall be inaccessible to unauthorised parties.
ID	SP.4
Narrative	A current requirement for conventional meters.
Justification	Security and privacy
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall ensure that keys and certificates used for access control and secure communications are securely stored.
ID	SP.5
Narrative	To ensure the security of communications and access control the keys and certificates used by this functionality need to be protected to prevent unauthorised access and use.
Justification	Security and privacy
Domestic/Non-domestic	D/ND

Requirement	The smart metering system encryption keys and certificates shall be remotely manageable in a secure manner.
ID	SP.6
Narrative	It is necessary to be able to change the keys and certificates used in the system to ensure tight access control and secure communications. This needs to be done in a secure manner.
Justification	Security and privacy
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall be appropriately robust to prevent local or remote electronic attack or unauthorised use.
ID	SP.7
Narrative	System hardening methods such as removal of unused services and blowing of security (JTAG) fuses increases security by reducing the potential attack points on a meter.
Justification	Security and privacy
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall ensure that firmware upgrade is secure.
ID	SP.8
Narrative	Firmware needs to be updatable remotely to fix security vulnerabilities and provide functionality updates. This needs to be done securely to prevent unauthorised use.
Justification	Security and privacy
Domestic/Non-domestic	D/ND

Requirement	The communication interfaces of the smart meter shall be secure and robust.
ID	SP.9
Narrative	Many communication interfaces (wired, radio and optical) have been proven to be insecure and vulnerable to attack.
Justification	Security and privacy
Domestic/Non-domestic	D/ND

Requirement	The security smart metering system shall be demonstrated to be fit for purpose through rigorous independent testing.
ID	SP.10
Narrative	Many embedded devices undergo functionality testing - rigorous security testing is required to ensure that the smart metering system is secure and robust to attack.
Justification	Security and privacy
Domestic/Non-domestic	D/ND

Requirement	The smart metering system functionality that can affect the supply of energy (e.g. remote disconnect or demand side management) shall be appropriately protected from unauthorised use by access control measures.
ID	SP.11
Narrative	Control capability present in the meter needs to be appropriately protected to prevent wide scale remote misuse.
Justification	Security and privacy
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall ensure that only authorised devices may connect to the smart meter.
ID	SP.12
Narrative	Consumers may require devices to be connected to the smart meter for collection of their own energy consumption information. Controls are needed to ensure that only authorised devices can connect.
Justification	Security and privacy
Domestic/Non-domestic	D/ND

Requirement	The smart metering system communications shall be designed and implemented to restrict the numbers of smart meters that are visible to each other to prevent one meter being able to attack other meters.
ID	SP.13
Narrative	Network segmentation is needed to prevent meters being an attack point to other meters and to prevent possible worm infections.
Justification	Security and privacy
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall incorporate security logging for physical tampering and electronic security events.
ID	SP.14
Narrative	Logging of physical and electronic security events will be an important element in ensuring the security of the smart metering system and in detecting security incidents.
Justification	Security and privacy
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall follow the principle of least privilege.
ID	SP.15
Narrative	The principle of least privilege increases security by limiting the functionality available to a service if it is compromised.
Justification	Security and privacy
Domestic/Non-domestic	D/ND

Requirement	The smart metering system shall follow a secure development lifecycle for software.
ID	SP.16
Narrative	Following a secure development lifecycle will minimise the number of vulnerabilities present in software.
Justification	Security and privacy
Domestic/Non-domestic	D/ND

HAN Requirements

1.41. The HAN requirements describe the expected functionality of the links between the devices that are on the HAN. They also call for a HAN solution that has some degree of future proofing given the emerging requirements of other "smart" applications such as water metering.

Requirement	The HAN interface shall be based on open and non proprietary standards.
ID	HA.1
Narrative	An example would be by using a protocol based on an EN standard.
Justification	High-level list C
Domestic/Non-domestic	D/ND

Requirement	The HAN interface shall only support authorised devices (i.e. no unauthorised linking of devices).
ID	HA.2
Narrative	This can be achieved through local button presses on meter and devices or by phone call to supplier. Prevents unauthorised addition of device which could present a security/privacy threat.
Justification	High-level list C
Domestic/Non-domestic	D/ND

Requirement	The HAN interface shall support real-time two way communication from mains powered nodes (5s delay/update).
ID	HA.3
Narrative	This enables real time updates to IHDs.
Justification	high-level list C
Domestic/Non-domestic	D/ND

Requirement	The HAN interface shall support network coordinator functionality for smart meter system components.
ID	HA.4
Narrative	This allows the network to be configured as a star as well as mesh.
Justification	High-level list C
Domestic/Non-domestic	D/ND

Requirement	The HAN interface shall be independently certified and tested for interoperability.
ID	HA.5
Narrative	A reinforcement of the general requirement for technical interoperability.
Justification	High-level list C
Domestic/Non-domestic	D/ND

Requirement	The HAN interface shall support operation over the radio frequency physical layer.
ID	HA.6
Narrative	Minimum requirement as the gas meter cannot have wires running into it.
Justification	High-level list C
Domestic/Non-domestic	D/ND

Requirement	The HAN interface shall support appliance control events (minimum 100 events per 24 hour period, minimum response rate of 5s once signal sent from HAN interface).
ID	HA.7
Narrative	Estimate of likely demand for appliance control events. This includes Economy 7 type control events.
Justification	High-level list C
Domestic/Non-domestic	D/ND

Requirement	The HAN interface shall support the use of repeaters, boosters, etc. to extend range.
ID	HA.9
Narrative	All HAN solutions will have range issues in some instances and therefore the ability to extent range is essential.
Justification	High-level list C
Domestic/Non-domestic	D/ND

Requirement	The HAN interface shall support acknowledgement of signals.
ID	HA.10
Narrative	For occasions where delivery receipt is required, such as appliance control or remote top-up.
Justification	High-level list C
Domestic/Non-domestic	D/ND

Requirement	The HAN interface shall support 30 minute update (wake up) frequency from battery powered nodes.
ID	HA.11
Narrative	It is recognised that a 15 year battery life for a gas meter is not compatible with real-time communication, hence a relaxed requirement for battery powered nodes.
Justification	High-level list C
Domestic/Non-domestic	D/ND

Requirement	The HAN interface shall be remotely upgradeable.
ID	HA.12
Narrative	This recognises that HAN software changes over time and upgrades must not cause disruption for the consumer.
Justification	High-level list C
Domestic/Non-domestic	D/ND

Requirement	The HAN interface shall support gateway/bridging devices to access data made available on the HAN.
ID	HA.13
Narrative	An important category of device that enables a consumer to download data locally or get real-time information via the internet if they wish to.
Justification	High-level list C
Domestic/Non-domestic	D/ND

Requirement	The HAN shall support a defined application profile for devices that connect to the HAN.
ID	HA.14
Narrative	This helps with interoperability across different suppliers and manufacturers.
Justification	High-level list C
Domestic/Non-domestic	D/ND

Requirement	The HAN shall support alphanumeric messaging.
ID	HA.15
Narrative	For example, IHD messages, user interaction with touch screens, etc.
Justification	High-level list C
Domestic/Non-domestic	D/ND

Requirement	The HAN shall support the security and privacy requirements.
ID	HA.16
Narrative	As set out in the security and privacy section.
Justification	Security and privacy
Domestic/Non-domestic	D/ND

Requirement	The HAN shall be capable of supporting other utility meters where the data requirements do not exceed those of gas and electricity smart meters.
ID	HA.17
Narrative	For example microgeneration meters or water meters.
Justification	High-level list H
Domestic/Non-domestic	D/ND

Requirement	The HAN shall be capable of being physically switched on and off by authorised personnel.
ID	HA.18
Narrative	For instances where consumers have legitimate reasons for not having an operating HAN.
Justification	Safety
Domestic/Non-domestic	D/ND

Requirement	The HAN shall support addition of new devices classes.
ID	HA.19
Narrative	Allows a degree of future proofing.
Justification	High-level list C
Domestic/Non-domestic	D/ND

Requirement	The HAN shall be backwards compatible.
ID	HA.20
Narrative	HAN has to be supported for 15 years to avoid technical obsolescence issues.
Justification	High-level list A
Domestic/Non-domestic	D/ND

Requirement	The HAN shall be used by all smart metering system components in a consumer premise.
ID	HA.21
Narrative	Multiple HANs within a consumer premise are undesirable.
Justification	High-level list A
Domestic/Non-domestic	D/ND

Requirement	The HAN shall not interfere with existing accredited premise HANs.
ID	HA.22
Narrative	For example, a consumer's Wi-Fi network.
Justification	High-level list A
Domestic/Non-domestic	D/ND

WAN Requirements

1.42. The WAN requirements describe the expected functionality of the link between the premise and DCC. The key parameters of bandwidth, availability and latency (responsiveness) are subject to the level of traffic associated with DCC services. It has been recognised that as requirements emerge it may be necessary to upgrade the WAN without replacing the meter.

Requirement	The WAN interface shall be based on open and non proprietary standards.
ID	WA.1
Narrative	An example would be by using a protocol based on an EN standard. Reflects the HAN requirement. Suppliers must have the ability to select equipment from a number of suppliers.
Justification	High-level list A
Domestic/Non-domestic	D/ND

Requirement	The WAN interface shall support real-time interrogation of WAN enabled devices with response rate of 1 minute or better.
ID	WA.2
Narrative	No requirement for always on communications. It is recognised that the response rate is a function of other parameters; the figure presented is an average.
Justification	High-level list A
Domestic/Non-domestic	D/ND

Requirement	The WAN interface shall support acknowledge signals.
ID	WA.3
Narrative	To, for example, test the integrity of the WAN connection to the smart metering equipment within the premise.
Justification	High-level list A
Domestic/Non-domestic	D/ND

Requirement	The WAN interface shall be independently certified and tested for interoperability.
ID	WA.4
Narrative	A reinforcement of the general requirement for technical interoperability.
Justification	High-level list A
Domestic/Non-domestic	D/ND

Requirement	The WAN shall support the security and privacy requirements – set out in the earlier section of the Catalogue.
ID	WA.5
Narrative	As set out in the security and privacy section.
Justification	High-level list A
Domestic/Non-domestic	D/ND

Requirement	The WAN shall be capable of being physically switched on and off by authorised personnel.
ID	WA.6
Narrative	For example, for testing.
Justification	High-level list A
Domestic/Non-domestic	D/ND

Requirement	The WAN shall support simultaneous communication with a large number of meters within a short timescale.
ID	WA.7
Narrative	"Broadcast mode". For example, 100,000 meters in 1 hour, 1,000 meters in 15 minutes.
Justification	Smart grids
Domestic/Non-domestic	D/ND

IHD Requirements

1.43. The IHD requirements apply to any IHD that is provided to the consumer as the result of an obligation. They are necessarily high-level (to avoid restricting innovation) and cover the minimum information provision as well as power requirements.

Requirement	The IHD shall support mains power operation.
ID	IH.1
Narrative	Avoids issues with batteries.
Justification	high-level list C
Domestic/Non-domestic	D

Requirement	The IHD shall show the following information for gas and electricity: ▪ Indicative real-time usage in kW; ▪ Indicative real-time rate of consumption in pence per hour; ▪ Accurate cumulative consumption in kWh and £ for current day/week/month/billing period; ▪ 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; ▪ Accurate account balance information (amount in credit or debit) in real time for prepayment customers and on at least a monthly basis for credit customers; ▪ Current tariff (i.e. cost per unit in pence per kWh); ▪ Local time; ▪ Status of communication link All information will be displayed in digital numerical format as a minimum. In addition, information on real-time energy rate (kilowatt) and cost of current level of consumption (pence per hour) will, as a minimum, be displayed in a visual (non numerical) way which allows a consumer to easily distinguish between low and high current consumption. Minimum real time update for electricity is 5 seconds, for gas it is 15 minutes.
ID	IH.2
Narrative	The minimum data set based on consumer research and stakeholder input.
Justification	High-level list C
Domestic/Non-domestic	D

Requirement	The average IHD power consumption shall be less than 0.6W.
ID	IH.3
Narrative	As per the impact assessment.
Justification	High-level list C and impact assessment
Domestic/Non-domestic	D

Existing Metering System Variants

1.44. There are a number of existing variants in terms of meter design, such as polyphase supply and internal meter switches for specific circuits and devices in the home (e.g. Economy 7). Solutions for these variants must also meet the minimum functional requirements.

Smart Metering System Services

1.45. The majority of the smart meter benefits set out in the updated impact assessment require two way communication with the DataCommsCo (DCC). These benefits will be delivered through commands delivered to the smart metering system components in the consumer premise. Associated with these commands will be data flows between the premise and DCC. These commands and data constitute the smart meter system "services" available through DCC.

1.46. This Catalogue outlines the proposed services in terms of a description of the service, the benefit it enables, an example service level and expected demand (frequency) of the service. It does not explicitly cover the data and information flows that will occur either between the smart meter and the IHD or from the DCC to other market participants.

1.47. This Catalogue was developed from the benefits in the updated impact assessment along with a detailed review of stakeholder feedback and documentation. We welcome industry feedback on our proposals.

1.48. The services have been grouped into the following categories:

- General and Operational;
- Electricity and Gas;
- Gas Specific;
- Distributed Generation and Storage; and
- Smart Grids.

1.49. The services have been drafted for both domestic and non-domestic consumers. However, it is recognised that services associated with the IHD and gas valve will not apply to non-domestic consumers. It is possible that non-domestic customers will benefit from the greater functionality of the solution to be defined for domestic customers.

1.50. In order to size the WAN requirements, an estimate of the volume of traffic is required. To understand this volume of traffic, service level agreements and the potential frequency of these services will need to be defined and agreed. The Catalogue provides an initial indication of the potential service level agreements drawing on practice in other jurisdictions. The programme will develop detailed service levels as part of the technical specification. We welcome industry feedback on these initial proposals.

General and Operational Services

1.51. General and operational services are the services that are required to ensure that the gas and electricity smart meters operate reliably and accurately over the life of the assets. They include diagnosis of issues with reliability that may arise and the notification of any fault or the triggering of a tampering alarm. This section also considers the initial registration requirement and the ability to send a message to the end user customer.

1.52. The general and operational services detailed below are:

- Registration of Smart Meter
- Check Accuracy of Master Clock Data
- Tamper Alarm Triggered
- Meter Fault Alarm Triggered
- Firmware/Software Upgrade
- Diagnostics
- Test Meter Communication Line
- End of Calibration Life/Service Life Notification
- Message to Consumers to the IHD
- Clear all Existing Data from Meter
- Remote Configuration and Synchronisation of Meter Settings

Registration of Smart Meter

1.53. When a smart meter is installed, remote registration of the meter will be required.

Service	Registration of Smart Meter
Service to be Delivered	▪ Self-registration of smart metering system with the DCC after installation is complete.
Example Service Levels	On Demand: ▪ Registration acknowledgment shall be received from the DCC within 2 hours for 90% of meters. ▪ Over a 24 hour period, 0.01% of the anticipated meter population shall be able to self register with the DCC.
Frequency of Transaction	On Demand: Registration of a meter will be required only on installation.
Benefit Delivered	Customer switching and Avoided site visit (high-level list B).

Check Accuracy of Master Clock Data

1.54. For accurate billing the meter's Master Clock must meet the accuracy requirements and be able to be reset remotely if incorrect.

Service	Check Accuracy of Master Clock Data
Service to be Delivered	▪ Check of the smart metering system master clock. ▪ Remote update of clock.
Example Service Levels	On Demand: ▪ 90% of remote checks of the Master Clocks' time to be completed within 2 hours. ▪ 99.9% of remote checks of the Master Clocks' time to be completed within 8 hours.
Frequency of Transaction	On Demand: Each meter's clock will be checked for accuracy on an annual basis.
Benefit Delivered	Inbound enquiries and Customer services overhead (high-level list B).

Tamper Alarm Triggered

1.55. Any tampering with the smart metering system shall be recorded and can trigger an alarm to the DCC which then informs, for example, the Meter Asset Manager (gas) or Meter Operator (electricity). Types of tampering to be detected as set out in the functional requirements include any firmware manipulation, the presence of strong magnetic fields, unauthorised opening of the meter terminal cover or meter main cover, the use of reverse running (reverse flow) devices which cause the meter to run backwards etc.

Service	Tamper Alarm Triggered
Service to be Delivered	▪ Communication of a meter tamper alarm. ▪ Enablement, disablement of the tamper alarm.
Example Service Levels	On Demand: ▪ A meter tamper alarm shall be reported within 60 minutes of tamper detection. ▪ Capability for 0.5% of meters to submit a tamper alarm within a 24 hour period.
Frequency of Transaction	▪On Demand: A tamper alarm will only happen in the event that a meter has been tampered with. Likely to be single events per meter per year.
Benefit Delivered	▪ Reduced theft (high-level list B).

Meter Fault Alarm Triggered

1.56. The meter can detect and log malfunctions. If a malfunction is detected, the DCC will be notified through a message detailing the reasons for the alarm.

Service	Meter Fault Alarm Triggered
Service to be Delivered	▪ Communication of an alarm from the meter to the DCC to signify a malfunction of the meter. ▪ Remote enablement, disablement of the tamper alarm.
Example Service Levels	On Demand: ▪ A meter tamper alarm shall be reported within 60 minutes of tamper detection. ▪ Capability for 0.5% of meters to submit a tamper alarm within a 24 hour period.
Frequency of Transaction	On Demand: Meter fault alarms will only be triggered if there is a fault with the meter. Likely to be single events per meter per year.
Benefit Delivered	Inbound enquiries and avoided site visit (high-level list B).

Firmware/Software Upgrade

1.57. The transfer of data to update smart metering system firmware/software remotely.

Service	Firmware/Software Upgrade
Service to be Delivered	▪ Update of firmware/software for the meter, WAN Modem, IHD, etc. NB these updates can be of significant size (100's kbytes)
Example Service Levels	On Demand: ▪ A firmware or software upgrade to all meters shall be completed within 60 minutes. ▪ 99.9% of all meters shall be upgraded within 14 days of completing the update.
Frequency of Transaction	On Demand: Firmware and software upgrades will happen infrequently. There may be instances where it is necessary to update many meters in a short space of time. Likely to be single events per meter per year.
Benefit Delivered	Customer switching and avoided site visit (high-level list B).

Diagnostics

1.58. As set out in the functional requirements the smart metering system will have some form of configuration and log data associated with its components. This service enables this functionality to be accessed and changed remotely.

Service	**Diagnostics**
Service to be Delivered	▪ Remote access of meter configuration data. ▪ Remote access of meter event logs. ▪ Remote access of battery status. ▪ Remote access of the operational status of the HAN. ▪ Communication of a warning that the memory capacity of the meter is about to be exceeded. ▪Communication of a warning that battery capacity is low.
Example Service Levels	On Demand: ▪ 90% of on demand requests for diagnostic data to be received by the DCC within 30 minutes.
Frequency of Transaction	On Demand: Likely to be single number of events per meter per year.
Benefit Delivered	Inbound enquiries, Avoided site visits, Customer services (high-level list B).

Test Meter Communication Line

1.59. The status of the communications line between the DCC and the smart metering system can be tested in terms of its parameters such as latency, bandwidth etc.

Service	Test Meter Communication Line
Service to be Delivered	▪ Test the operational status of the communications link between the smart metering system and the DCC.
Example Service Levels	On Demand: An acknowledgement of a successful test and associated parameters shall be received within 1 minute.
Frequency of Transaction	On Demand: Testing of the communication line shall only be required on installation and in the event of a fault retrieving information from the meter. Likely to be single events per meter per year.
Benefit Delivered	Avoided site visits (high-level list B).

Service Life Notification

1.60. The smart metering system can give notification that it is due to end its calibration life or service life.

Service	Service Life Notification
Service to be Delivered	Smart metering infrastructure shall support the communication of a message to signify the meter is due to end its calibration life or service life.
Example Service Levels	On Demand: Messages signifying the end of calibration life or service life shall be received from 90% of meters within 12 hours.
Frequency of Transaction	On Demand: Less than single events per meter per year.
Benefit Delivered	Inbound enquiries, Avoided site visits, Customer services (high-level list B).

Message to Consumers through the IHD

1.61. Messages can be sent to the consumers through their IHD.

Service	Message to Consumers to the IHD
Service to be Delivered	Communication of a message from the DCC to the IHD.
Example Service Levels	On Demand: Messages to an IHD from the DCC shall be received within 1 hour.
Frequency of Transaction	On Demand: Variable, from single messages per meter per year to daily.
Benefit Delivered	Energy saving, Avoided cost of carbon, Inbound enquiries, Load shifting, Avoided site visit, Reduced customer service overheads (high-level list B)

Download/Clear all Existing Data from Meter

1.62. This service allows all data to be downloaded/purged from the meter remotely, e.g. to erase a previous customer's information.

Service	Download/Clear all Existing Data from Meter
Service to be Delivered	▪ Remote download/purge of data from a meter (within constraints of MID)
Example Service Levels	On Demand: Existing data shall be removed from 90% of smart meters within 1 hour.
Frequency of Transaction	On Demand: Data shall only be required to be downloaded/purged from a meter on an infrequent basis. Likely to be single events per year.
Benefit Delivered	Energy savings, Avoided site visit (high-level list B).

Remote Configuration of Settings

1.63. This service allows for settings within the smart metering system to be configured remotely.

Service	Remote Configuration of Settings
Service to be Delivered	Remote configuration and synchronisation of settings associated with the smart metering system.
Example Service Levels	On Demand: ▪ Requested configuration or reconfiguration of a setting shall be acknowledged from 90% of meters within 30 minutes. ▪ The total number of commands to alter settings in individual meters in any 30 minute period can be up to 0.05% of the installed, operational meter population.
Frequency of Transaction	On Demand: Likely to be single events per meter per year.
Benefit Delivered	Customer switching, Inbound enquiries, Avoided site visit (high-level list B).

Electricity and Gas Services

1.64. Activities relating to the electricity and gas smart meters are:

- Meter Read (Consumption Import & Export for electricity)
- Energisation Status
- Enablement/Disablement of Supply
- Switch between Credit and Prepayment
- Prepayment
- Credit Balance Update
- Electricity Tariff Update
- Supply Fault Alarm Triggered
- Consumer Meter Interaction
- Maximum Demand Read
- Notification of Failure to Obtain Reading

Meter Read (Consumption import & export for electricity)

1.65. The meter shall be able to transmit recorded meter reads on both a half hourly and aggregate level. Configurability of time based intervals shall be enabled.

Service	Meter Read (import & export)
Service to be Delivered	▪ Communication of meter reads on a half hourly granularity. ▪ Communication of meter reads on an aggregate level. ▪ Configurability of meter reads.
Example Service Levels	Scheduled: ▪ Meter read data from 99% of all meters shall be received within 24 hours. ▪ All meter reads shall be received within 24 hours. On Demand: ▪ 90% of ad-hoc read requests to be received by the DCC within 30 minutes. ▪ The total number of individual meters to be read in any 30 minute period can be up to 0.1% of the installed, operational smart meter population.
Frequency of Transaction	Scheduled: Meter reads may be required on either a daily, weekly, monthly or quarterly basis, or as configured. Each read shall contain half hourly values and the appropriate aggregate total. On Demand: Likely to be single events per meter per year
Benefit Delivered	Energy saving, Avoided site visit, Customer switching, Load switching (high-level list A, G).

Energisation Status

1.66. The ability to test remotely the presence of supply to the meter.

Service	Energisation Status
Service to be Delivered	Check supply status of the premise.
Example Service Levels	On Demand: ▪ Remote checking of supply to a meter shall obtain confirmation or otherwise of supply from 95% of meters within 5 minutes. ▪ In any 5 minute period up to 0.001% of meters shall be able to be individually checked.
Frequency of Transaction	On Demand: Likely to be single events per meter per year.
Benefit Delivered	Avoided site visit, Inbound enquiries (high-level list B).

Enablement/Disablement of Supply

1.67. The smart metering infrastructure shall enable the remote enablement and disablement of electrical supply. For safety reasons, customers shall be required to acknowledge resumption of supply before supply is enabled.

Service	Remote Enablement/Disablement of Supply
Service to be Delivered	▪ Remote enablement of supply. ▪ Remote disablement of supply.
Example Service Levels	On Demand: ▪ 90% of remote enablement/disablement requests to be received by within 10 minutes. ▪ The number of enablement/disablement requests shall be no greater than 0.01% of the installed and operation meters in any 10 minute period.
Frequency of Transaction	On Demand: Likely to be single events per meter per year.
Benefit Delivered	Avoided prepayment change of supplier premium, Debt handling, Avoided site visit, Smart grids (high-level list F).

Consumer Meter Interaction

1.68. Where supply is due to be reconnected within the premise the consumer will acknowledge through interacting with the smart metering system to re-enable supply into the premise.

Service	Consumer Meter Interaction
Service to be Delivered	▪ Communication of a message to notify the customer that their interaction is required to complete reconnection of supply. ▪ Communication of the consumer interaction to DCC.
Example Service Levels	On Demand: ▪ Messages shall be received by 95% of customers within 30 minutes. ▪ DCC shall receive messages from 95% of consumer premises within 30 minutes.
Frequency of Transaction	Consumer meter interaction will only be required on an infrequent basis when supply is re-enabled.
Benefit Delivered	Avoided prepayment change of supplier premium, Avoided site visit (high-level list B).

Switch between Credit and Prepayment

1.69. The smart metering system shall enable the remote switching of a consumer from a credit based payment method to prepayment and vice versa.

Service	Switch Between Credit and Prepayment
Service to be Delivered	▪ Remote switching of a customer from a credit based payment method to a prepayment method of payment. ▪ Remote switching of a customer from a prepayment method of payment to a credit based payment method.
Example Service Levels	On Demand: ▪ 95% of meters shall be able to remotely be switched from a credit based payment method to a prepayment method of payment (or vice versa) within 1 hour.
Frequency of Transaction	On Demand: Likely to be single events per meter per year.
Benefit Delivered	Avoided prepayment change of supplier premium (high-level list F).

Prepayment

1.70. This relates to services associated with prepayment such as remote top-up and prepayment configuration.

Service	Prepayment
Service to be Delivered	▪ Communication of updated prepayment balances. ▪ Configuration of emergency credit/debt recovery/disconnect period/alarms/etc.
Example Service Levels	On Demand: ▪ An updated balance shall be registered by the smart metering system within 20 minutes of the consumer purchasing top-up. ▪ 95% of meters shall be configured within 1 hour of configuration request
Frequency of Transaction	On Demand: Likely to be single events per meter per month.
Benefit Delivered	Avoided prepayment change of supplier premium (high-level list F).

Credit Balance Update

1.71. This service enables credit balances calculated on a central billing system to be sent to IHDs.

Service	Credit Balance Update
Service to be Delivered	Communication of a customer’s credit balance to the IHD.
Example Service Levels	On Demand: An updated credit balance shall be displayed on the IHD within 30 minutes of request
Frequency of Transaction	On Demand: Likely to be single events per meter per month.
Benefit Delivered	Energy saving (high-level list A).

Tariff Update

1.72. When the consumer tariff changes, it may be necessary to update aspects of the smart metering system.

Service	Tariff Update
Service to be Delivered	Communication of tariff information to the smart metering system, e.g. smart meter, IHD.
Example Service Levels	On Demand: An updated tariff shall be received by 95% of meters/IHDs within 2 hours.
Frequency of Transaction	On Demand: Likely to be single events per meter per month.
Benefit Delivered	Energy saving, Load shifting, TOU tariffs (high-level list A, D).

Supply Fault Alarm Triggered

1.73. On loss of supply DCC is notified.

Service	Supply Fault Alarm Triggered
Service to be Delivered	▪ Communication of an alarm signifying the loss of electrical supply in the meter. This includes the use of a "last gasp" message where possible. ▪ Communication of an alarm signifying other conditions such as: over and under voltage, and overload conditions, etc.
Example Service Levels	On Demand: ▪ Loss of supply shall be reported by DCC within 5 minutes for 99.5% of the meters detecting a loss of supply. ▪ Power restoration shall be reported by DCC within 60 minutes for 90% of the meters affected by loss of supply.
Frequency of Transaction	On Demand: Likely to be single events per meter per year.
Benefit Delivered	In bound enquiries, Avoided site visit, Smart grids.

Maximum Demand Read

1.74. For consumers whose maximum demand read is important for their billing requirements, a maximum demand read can be remotely read. This is likely to be of greater importance with the increased use of electric vehicles, load control, etc., and to support innovative tariffs.

Service	Maximum Demand Read
Service to be Delivered	Scheduled: ▪ Communication of a scheduled maximum demand read. On Demand: ▪ Communication of an on demand maximum demand read.
Example Service Levels	Scheduled: ▪ Maximum demand read data from 99% of all meters shall be received within 24 hours. On Demand: ▪ 90% of ad-hoc maximum demand read request to be received within 30 minutes.
Frequency of Transaction	Scheduled: daily, weekly, monthly. On Demand: Likely to be single events per meter per month
Benefit Delivered	Energy saving, Reduced losses (networks) (high-level list A, B).

Notification of Failure to Obtain Reading

1.75. A notification of failure to obtain a reading shall be delivered with an associated failure code to the DCC.

Service	Notification of Failure to Obtain Reading
Service to be Delivered	Communication of a message from the meter to the DCC signifying a meter reading has failed.
Example Service Levels	On Demand: ▪ A failure to obtain a reading notification shall be received by the DCC within 1 hour for 90% of meters that experience a fail in meter reading. ▪ An Acknowledgement of Meter Read Failure report shall be communicated to the meter within 10 minutes of receiving a reading failure notification.
Frequency of Transaction	On Demand: Likely to be single events per meter per year
Benefit Delivered	Inbound enquiries, Reduced losses (high-level list A).

Gas Specific Services

1.76. Activities relating specifically to the gas smart meter are:

Gas Calorific Value Update

1.77. The delivery of gas calorific value and other conversion factors to the smart metering system.

Service	Gas Calorific Update
Service to be Delivered	Communication of the calorific value to the smart metering system.
Example Service Levels	The calorific value of gas shall be transmitted to 95% of meters within 12 hours.
Frequency of Transaction	Calorific value of gas shall be required to be sent to a meter on a monthly basis.
Benefit Delivered	Energy savings, Avoided prepayment change of supplier premium (high-level list A, B).

Distributed Generation and Storage Specific Services

1.78. The activities related to distributed generation and storage are:

- Read Distributed Generation Data; and
- Feed-in Tariff Update.

Read Distributed Generation Data

1.79. There should be a record of meter reads on both a half hourly and aggregate level.

Service	Read Distributed Generation Data
Service to be Delivered	▪ Communication of distributed generation reads on a half hourly granularity. ▪ Communication of distributed generation reads on an aggregate level. ▪ Configurability of meter reads.
Example Service Levels	Scheduled: ▪ data from 99% of all meters shall be received within 24 hours. On Demand: ▪ 90% of on demand read requests to be received by the DCC within 30 minutes.
Frequency of Transaction	Scheduled: half hourly, daily, weekly, monthly or quarterly On Demand: Likely to be single events per meter per year.
Benefit Delivered	Microgeneration (high-level list G, H).

Feed in Tariff Update

1.80. There should be an update of feed in tariff information to smart metering system.

Service	Feed in Tariff Update
Service to be Delivered	Communication of tariff information to the meter and IHD.
Example Service Levels	On Demand: An updated Feed In Tariff shall be received by 95% of meters/IHDs within 2 hours.
Frequency of Transaction	Feed In Tariff updates will only be required on an infrequent basis.
Benefit Delivered	Microgeneration (high-level list G, H).

Smart Grids Specific Services

1.81. Smart grids specific services relate to services that will enable the network wide control and monitoring of load and power quality remotely. Smart grids related services that require information to be transmitted between the meter and the DCC are:

- Electricity Quality Read; and
- Load Management.

1.82. This is based on assumptions to date. The programme awaits additional justification with cost and benefits from ENA.

Electricity Quality Read

1.83. The measurements of the quality of electricity at the premise should be delivered remotely including measuring values such as peak/average voltage, frequency, peak/average power, etc.

Service	Electricity Quality Read
Service to be Delivered	Smart metering infrastructure shall support remote acquisition of electricity quality data.
Example Service Levels	On Demand: Electricity quality data shall be received from 99% of applicable meters within 1 minute. Scheduled: Electricity quality data shall be received from 99% of applicable meters within 60 minutes
Frequency of Transaction	On Demand: single events per year per meter Scheduled: daily aggregated download per meter.
Benefit Delivered	Reduced Losses (Networks), Smart Grids justification

Load management

1.89. Load management involves sending messages to control appliances and specified premise circuits (via auxiliary switches) remotely. This allows network operators to manage network load dynamically.

Service	Load Management
Service to be Delivered	▪ Smart metering infrastructure shall support the ability to send messages to appliances as well as auxiliary switches. ▪ Smart metering infrastructure shall support the ability to send messages to configure different modes of operation to allow for alternative load control, event and customer driven operation. ▪ Smart metering infrastructure shall support the ability to send messages to control supply capacity.
Example Service Levels	On Demand/Scheduled: ▪ Commands for load management shall be transmitted to 90% of meters within 5 minutes[15]. ▪ An acknowledgement that a command for load management has been successfully received by the smart metering system shall be received by the DCC from 90% of smart meters within 10 minutes. ▪ The total number of load control commands to individual meters in any 10 minute period can be up to 0.05% of the installed, operational smart meters.
Frequency of Transaction	On Demand: It is likely that load management will be required for meters within a stressed part of the network on an infrequent basis when load is peaking. Scheduled: Daily events per meter
Benefit Delivered	Energy saving, Avoided cost of carbon, Load shifting, TOU tariffs (high-level list B, E).

[15] NSMP Business Requirements Workstream

Appendix 3 – Smart Grids: Background Information

Introduction

1.1. This appendix provides information in a non-technical way as far as possible, on the basic ideas behind the smart grid and the reasons that are being put forward why current grids should be made smarter.

1.2. This appendix does not make proposals in respect of smart grids but provides a summary of proposals and discussions being take forward in other fora. This summary is provided as background information only and should not be used as an alternative to more detailed, smart grid specific publications.

1.3. For simplicity, the complete transmission and distribution system is referred to as the "grid" throughout this appendix unless a specific point is being made. The total supply chain, including the generators and the demand side is referred to as the "electricity system".

How is a Smart Grid defined?

1.4. Many definitions have been proposed. There are really two ways of defining a smart grid. One way is to describe what it is and the other is to describe what it does. From a regulatory perspective we are particularly interested in the latter approach. The ENSG Smart Grid Working Group provided a useful definition as follows:

- A smart grid, as part of an electricity power system, can intelligently integrate the actions of all users connected to it - generators, consumers and those that do both - in order to efficiently deliver sustainable, economic and secure electricity supplies. A smart grid employs communications, innovative products and services together with intelligent monitoring and control technologies to:
    - Facilitate connection and operation of generators of all sizes and technologies;
    - Enable the demand side to play a part in optimising the operation of the system;
    - Extend system balancing into distribution and the home;
    - Provide consumers with greater information and choice of supply;
    - Significantly reduce the environmental impact of the total electricity supply system; and
    - Deliver required levels of reliability, flexibility, quality and security of supply.

Controlling the electricity system

1.5. To understand why a smarter grid is needed it is useful to firstly understand a little about the way the electricity system is controlled.

1.6. The electricity system is quite unique. There is no other supply chain where production (i.e. converting gas, coal, wind to electricity), delivery (i.e. transmission and distribution) and consumption occur instantaneously and have to be kept in almost perfect balance on a continuous basis. To operate the electricity system safely and securely in this way requires very sophisticated, intelligent (i.e. smart) control systems.

1.7. The three primary quantities that have to be controlled are:

- Frequency – this is done by matching production and consumption on a second-by-second basis to ensure stability of the system and to make sure that everyone receives electricity at a constant frequency (within a defined tolerance).
- Voltage – this is done using many control devices, mainly generators and transformers (but increasingly other voltage compensation devices), across the electricity system to ensure that voltages remain stable and that customers receive their electricity within specified voltage limits.
- Current – every device and circuit in the grid has an upper limit to the current that it can pass without damage or failure. The grid therefore has to be designed so that these limits are respected at all times, even when faults occur. This is done both by providing redundant capacity in the grid together with control and protection actions.

How is this achieved now?

Frequency Control

1.8. The fundamental structure of the electricity system has been very stable for a number of decades now. Electricity production is dominated by very large power stations that are connected to the high voltage transmission system. The majority of these power stations are able to vary their output according to the needs of the total system and the system operator, National Grid Electricity Transmission, issues instructions continuously to make sure that the balance between production and consumption is maintained. Large power stations are required to be able to assist with frequency control no matter where they are located on the grid.

1.9. Because production is so controllable, demand has been able to act generally without constraint. In other words, the demand side can assume that electricity is always available. This situation is reinforced by the fact that the majority of consumers pay the same price for electricity no matter when they consume it.

Voltage Control

1.10. Voltage control is rather more complex than frequency control. In particular, voltage control has to be carried out locally rather than nationally. Different methods can therefore be used for different parts of the grid. At the transmission level, voltage control is very sophisticated. This is because power flows are over long distances and the actual power flows can vary quite significantly. The system operator is able to monitor the voltage across the transmission system on a continuous basis and can control it within set limits using generators, transformers and other devices.

1.11. In contrast, if the low voltage distribution grid that supplies houses and small businesses is considered a very different approach to voltage control is observed. At this end of the grid, there is no ability locally to control voltage in real time. Instead, the grid is designed in such a way that the voltage limits will be met for a range of operating conditions. It is possible to do this because the power flows through these circuits are generally very predictable and so the variation of voltage can be calculated and confirmed as acceptable at the design stage. At these low voltage levels there is no monitoring or control capability.

1.12. So, it would be reasonable to say that voltage control at the transmission level is already smart but at low voltage levels it is not.

Current Control

1.13. A similar situation applies for the control of current as for voltage. Again, this is a local issue so that measurement at many points on the electricity system is necessary. At the transmission level, the current in every circuit will be continually monitored and the system operator will be alerted, or automatic operations will occur, if the current approaches or exceeds set limits. Again, the system operator is able to control current levels, for example by instructing a power station to run purely because it is located at a point on the grid that will help reduce current flows in heavily loaded circuits. This is often referred to as constraint management. Also, the transmission system has redundant capacity designed in so that circuits are not overloaded when credible faults and maintenance outages occur.

1.14. Once again, there is a stark contrast at the low voltage distribution grid. Here, there may be no measurement reported of the current flowing through a circuit and the distribution network operator will only know if the current has exceeded a safe limit when a protection device operates, usually a large fuse, and supplies are lost to consumers. However, the relatively predictable nature of current flow at this level and the fact that it is usually in one direction, means that sufficient capacity can be provided to permit safe, reliable operation.

1.15. So, again, it is reasonable to say that the control of current at the transmission level is smart but at low voltage levels it is not always.

So why might a smarter grid be required?

1.16. The electricity system design and operating strategies described above have worked well for decades. Sophisticated control systems are installed where they are needed but simpler, cheaper systems are deployed where they are able to meet set performance requirements. Therefore there needs to be good reasons for making changes, particularly if this involves making the grid more complex.

Drivers for change

1.17. The main driver for change is the achievement of our 2020 and 2050 carbon reduction targets. The electricity supply sector will make a major contribution to achieving these targets and the engagement and support of all stakeholders will be essential. All the key components of the electricity system will have vital roles to play in achieving these targets but the most significant contribution to reducing greenhouse gas emissions from the electricity sector will be by replacing fossil-fired generation with low or zero carbon generation technologies. These generation technologies have a number of very different characteristics compared with the fossil-fired generators that they will replace:

- Renewable generators, especially wind, have uncontrolled fuel sources (weather) and have to be located where the renewable resource is available;
- Nuclear generators are best suited to base load generation as control of their output is less flexible than for fossil-fuelled power stations; and
- Distributed generators are smaller devices connected to distribution grids and have traditionally not been required to be as controllable.

1.18. The result of the widespread deployment of these technologies will be that power flows on the grid are likely to be much less predictable and the system operator will need to find new ways of balancing production and consumption to maintain a stable system.

Changes at transmission level

1.19. As explained above, system control at this level is already smart. The transmission system will continue to evolve but it is quite possible that its fundamental operation will not change dramatically. The future possible roles of the transmission system have been discussed in the Long-term Energy Networks Scenarios studies carried out by Ofgem and the potential near-term developments in the Energy Networks Strategy Group 2020 study. Greater interconnection with other countries could be helpful and so could demand side management.

Changes at distribution level

1.20. It is expected that the changes necessary in the distribution grid will be more substantial. A number of possible changes can be envisaged:

- Houses might increasingly install some form of generation.
- Space and water heating could be converted from gas to electricity.
- Hybrid and battery cars could replace petrol/diesel ones (their charge/discharge cycles could help balance the electricity system).

1.21. It was explained above that our current low voltage grids have almost no control capability and that this is acceptable because of the predictable nature of the demands they supply and that current flows in one direction. If the changes described above materialise, it is likely that more electricity will need to be delivered to each house and the pattern of consumption will change significantly. It is therefore possible that more intelligent network monitoring and control will be needed to enable the distribution network operator to operate its distribution system efficiently and economically.

1.22. It is also possible that with the roll out of smart meters and the introduction of home automation (for example controls that decide when domestic appliances run on the basis of the price of electricity) many consumers will be encouraged to actively manage their demand to help balance the electricity system and help manage grid constraints. This demand side management could add another element of unpredictability.

1.23. So, in summary, the main reasons a smarter grid is needed is to help the network companies efficiently accommodate low/zero carbon generation and a growing but less predictable demand for electricity.

What might the benefits be?

1.24. While there is a consensus about the challenges that network companies are likely to face, as described above, there remains uncertainty about the cost benefits that a smarter grid might deliver. There is a very wide range of potential applications but quite limited deployment experience to date.

1.25. The recent Electricity Networks Strategy Group studies demonstrated this uncertainty. They estimated that the present value of the benefits to 2020 could exceed £6bn for a given deployment strategy, showing an NPV of £1bn. However, in a more cautious scenario the NPV turned negative by £170m.

1.26. However, there is an expectation that smart solutions will offer cost effective ways to:

- Better facilitate the connection and operation of low and zero carbon generators;
- Facilitate the involvement of the demand side in the operation of the electricity system;
- Permit growth in electricity demand while minimising the provision of new network capacity; and
- Reduce the carbon impact of the grid itself, for example by minimising losses.

1.27. As deployment grows across the world in the next few years, better data will become available about potential smart grid applications that will allow more accurate assessment of the benefits of specific smart grid solutions.

Smart Grids and Smart Meters

1.28. We do not consider it appropriate to view smart grids and smart meters as entirely separate issues. Although they are not fundamentally dependent on each other, smart meters can facilitate many potential smart grid applications. It is logical therefore to consider the development of smart meters and smart grids together for two main reasons:

- The raw data (e.g. voltage and current) that a smart meter can collect is of great value to the network companies, helping them to better manage the grid; and
- Both smart grids and smart meters require a communications infrastructure.

1.29. Our proposals within the Functional Requirements Catalogue have therefore been developed giving consideration to current and likely future smart grid requirements.

Appendix 4 – Glossary

A

Access control

The method used to ensure that access to meter data is only available to properly authorised parties.

Auxiliary switches

Circuits within the home such as electric storage heating or immersion heaters found in some Economy 7 installations.

B

Balancing and Settlement Code (BSC)

The BSC contains the rules and governance arrangements for the electricity balancing and settlement in Great Britain. All licensed electricity suppliers must be party to it (see codes).

C

Catalogue

The functional requirements of the smart metering system are brought together in our proposed Smart Metering System Functional Requirements Catalogue (the "Catalogue"). This covers the smart metering system for both domestic and smaller non-domestic sectors.

Code Governance Review

Review of the governance of industry codes carried out by Ofgem. Final proposals and consultation on the proposed licence drafting to implement those proposals were published on 31 March 2010.

Codes

Industry codes establish detailed rules that govern market operation, the terms for connection and access to energy networks. The supply and network licences require the establishment of a number of industry codes that underpin the gas and electricity markets. The electricity codes are: Balancing and Settlement Code (BSC), Connection and Use of System Code (CUSC), Distribution Code, Grid Code, Master Registration Agreement (MRA), System Operator-Transmission Owner Code (STC), Distribution Connection and Use of System Agreement (DCUSA). The gas codes are the Uniform Network Code (UNC), Independent Gas Transporter (IGT) Network Codes, Supply Point Administration Agreement (SPAA).

Commercial interoperability

The terms on which a new supplier can use the meter and related equipment when a customer changes supplier.

Communications hub

The device that houses communications equipment which enables communication of data between meters and the central data and communications function.

Consumer

Person or organisation using electricity or gas at a meter point.

Consumer Advisory Group (CAG)

The Consumer Advisory Group consists of members from groups representing a broad range of domestic consumers. It was set up to help inform the programme and to promote understanding of key consumer issues, particularly more complex issues that cannot be fully explored through primary consumer research.

Credit mode

Smart meters will be capable of switching between prepayment and credit mode. When operating in credit mode, customers will be billed for their energy after using it.

Customer

Any person supplied or entitled to be supplied with electricity or gas by a supplier.

D

DataCommsCo (DCC)

New proposed entity which would be created and licensed to deliver central data and communications activities. DCC would be responsible for managing the procurement and contract management of data and communications services that will underpin the smart metering system.

Data processing

Involves the validation of meter reading data, and the transfer of the relevant information to interested parties.

Department of Energy and Climate Change (DECC)

The Department of Energy and Climate Change (DECC) was created in October 2008, to bring together: energy policy and climate change mitigation policy.

Demand-side management

Demand-side management (also known as load management) involves energy consumers managing demand in response to changes in the balance between supply and demand, usually in response to a price signal.

Distributed generation

Any generation which is connected directly into the local distribution network, as opposed to the transmissions network, as well as combined heat and power schemes of any scale. The electricity generated by such schemes is typically used in the local system rather than being transported for use across GB.

Dual fuel

A type of energy contract where a customer takes gas and electricity from the same supplier.

Dynamic teleswitching (DTS)

A particular type of electricity meter which has an integrated teleswitch, allowing the supplier (or distribution company) to switch the metered supply remotely. The Radio Teleswitching Access Provider controls the radio switches, and therefore heating load, following instructions from the supplier.

E

Electricity meter

A measuring instrument that records the quantity of electricity supplied.

ELEXON

ELEXON is the Balancing and Settlement Code Company (BSCCo) defined and created by the BSC. The BSC places obligations on ELEXON, who consequently manage the balancing and settlement arrangements, in conjunction with the BSC Panel. ELEXON therefore procures, manages and operates services and systems, which enable the balancing and imbalance settlement of the wholesale electricity market and retail competition in electricity supply.

Emergency credit

Credit applied by a supplier when a meter is out of credit to avoid interruptions during defined time periods such as overnight.

Energy suppliers

A company licensed by Ofgem to sell energy to, and to bill, customers in Great Britain.

F

Functional requirements

The minimum functions that must be supported by the different elements of the smart metering system to ensure the delivery of the benefits of smart metering. Describes what the smart metering system must do (not how it must do so).

G

Gas and Electricity Markets Authority (GEMA)

The Authority is Ofgem's governing body. It consists of non-executive and executive members and a non-executive chair. The Authority determines strategy, sets policy priorities and takes decisions on a range of matters, including price controls and enforcement. The Authority's principal objective is to protect the interests of existing and future consumers in relation to gas conveyed through pipes and electricity conveyed by distribution or transmission systems. The interests of such consumers are their interests taken as a whole, including their interests in the reduction of greenhouse gases and in the security of the supply of gas and electricity to them. The Authority's powers are provided for under the Gas Act 1986, the Electricity Act 1989, the Utilities Act 2000, the Competition Act 1998 and the Enterprise Act 2002.

Gas meter

A measuring instrument that records the volume of gas supplied.

Gas valve

A gas valve may be incorporated into a gas meter to regulate the flow of gas into the consumer premise. It is distinct from the isolation valve.

H

Heat pump

In GB heat pumps are usually used as central heating systems, drawing energy from the ground, water or outside air to heat a fluid and then pump it into a house. Heat pumps may also work in reverse to cool a house, drawing heat from the inside air and transferring it to the ground, water or the outside air.

Home Area Network (HAN)

The smart metering HAN will be used for communication between smart meters, IHDs and other devices in consumers'' premises.

I

In-home display (IHD)

An in-home display is an electronic device, linked to a smart meter, which provides information on a customer's energy consumption.

Interoperability

The ability of diverse systems, devices or organisations to work together (interoperate). See also commercial interoperability and technical interoperability.

K

kWh

Kilowatt-hour is a unit used to measure energy consumption in both electricity and gas. The kilowatt-hour is a unit of energy equal to 1000 watt hours or 3.6 megajoules. Energy in watt hours is the multiplication of power in watts, and time in hours. A 100W light bulb left on for one day will consume 2.4 kWh (0.1*24).

L

Licence

Transporting, shipping and supplying gas; and generating, transmitting, distributing and supplying electricity are all licensable activities. Ofgem grants licences that permit parties to carry out these activities in the GB market. The licenses require the establishment of a number of multilateral industry codes that underpin the gas and electricity markets. Licensees need to be signed up as parties to codes in order to operate in the gas and electricity markets (see codes).

Low Carbon Networks (LCN) Fund

As part of the new price control arrangements that run from 1 April 2010 to 31 March 2015, Ofgem has set up a Low Carbon Networks Fund. The Fund will allow up to £500 million of support to projects sponsored by the distribution network operators (DNOs) to try out new technology, operating and commercial arrangements. The objective of the projects is to help all DNOs understand what they need to do to provide security of supply at value for money as GB moves to a low-carbon economy. Projects receiving support from the Fund may involve the DNOs partnering with suppliers, generators, technology providers and other parties to explore how networks can facilitate the take up of low carbon and energy saving initiatives such as electric vehicles, heat pumps, micro and local generation and demand side management, as well as investigating the opportunities that smart meter roll out provide to network companies. As such the Fund should also provide valuable learning for the wider energy industry and other parties.

M

Measuring Instruments Directive (MID)

The Measuring Instruments Directive is a European Directive (2004/22/EC) that covers a number of different measuring instrument types, including active electrical energy meters and gas meters. The MID enables EU conformity assessment certificates to be issued, and the instrument can then be used in any EU Member State. The aim of the Directive is to create a single market in measuring instruments for the benefit of manufacturers and, ultimately, consumers across Europe.

Meter Asset Manager (MAM)

A person approved by the Authority as possessing sufficient expertise to provide gas meter-related services. A gas MAM essentially provides the services that would be provided by a Meter Asset Provider and Meter Operator in electricity.

Meter Operator (MOp)

In electricity a MOp is responsible for the installation, commissioning, testing, repair, maintenance, removal and replacement of electricity metering equipment as defined in Section 1B of standard condition 36B of the distribution licence.

Metering Services

The provision to a customer of a meter that meets the prescribed limits for accuracy (currently +2.5% and -3.5%). It includes meter provision and meter operation.

Microgeneration

Microgeneration is the on-site generation of lower carbon heat and power by individuals, small businesses and communities at a small scale.

N

Network operators

The companies that are licensed by Ofgem to maintain and manage the electricity and gas networks in GB.

O

Ofgem

The Office of the Gas and Electricity Markets (Ofgem) is responsible for protecting gas and electricity consumers in Great Britain. We do this by promoting competition, wherever appropriate, and regulating the monopoly companies that run the gas and electricity networks.

Ofgem E-Serve

Ofgem E-Serve is responsible for Ofgem's support and delivery functions. It focuses on administering environmental programmes and the delivery of sustainability projects such as the Smart Metering Implementation Programme.

Open standard

The European Union definition of an open standard (taken from "European Interoperability Framework for pan-European eGovernment Services") is:

- The standard is adopted and will be maintained by a not-for-profit organisation, and its ongoing development occurs on the basis of an open decision-making procedure available to all interested parties (consensus or majority decision etc.).
- The standard has been published and the standard specification document is available either freely or at a nominal charge. It must be permissible to all to copy, distribute and use it for no fee or at a nominal fee.
- The intellectual property - i.e. patents possibly present - of (parts of) the standard is made irrevocably available on a royalty-free basis.
- There are no constraints on the re-use of the standard.

P

Prepayment mode

Smart meters will be capable of switching between prepayment and credit mode. When operating in prepayment mode customers will have to pay for their energy before using it.

Privacy by design

A system that has been designed with privacy in mind from the outset.

Programme

The Smart Metering Implementation Programme.

S

Security by design

Security by design is defined as ensuring that the security of a system is designed from the ground up to be secure. It is an established concept where security risks and issues are identified early in the system's development lifecycle.

Smart appliances

An appliance that can alter the way in which it uses energy (consumption level or time of use) in response to changes in the balance between supply and demand, usually in response to a price signal.

Smart Energy Code

The proposed new industry Code that will cover both gas and electricity and will contain the detailed regulatory, commercial and technical arrangements applicable to smart metering during rollout and on an enduring basis.

Smart grids

Smart grids, as part of an electricity power system, can intelligently integrate the actions of all users connected to it - generators, consumers and those that do both - in order to efficiently deliver sustainable, economic and secure electricity supplies.

Smart meter

In addition to traditional metering functionality (measuring and registering the amount of energy which passes through it), smart meters are capable of two-way communication allowing them to transmit meter reads and receive data remotely.

T

Tamper alarm

A tamper alarm senses and reports any tampering with the metering system such as removal of the metering case or reversal of current.

Technical interoperability

The capability of systems or devices to provide and receive services and information between each other, and to use these services and information exchange to operate effectively together in predictable ways without significant user intervention. Within the context of the smart metering system, this means the seamless, end-to-end connectivity of hardware and software from customer premises equipment through to DCC, suppliers, network operators and other authorised parties.

Technical specifications

The technical specifications for the smart metering system will be an explicit set of solutions and guidelines as to how the smart metering system will fulfil the functional requirements

Trickle disconnection

Restriction of the flow of energy to a home, allowing the consumer to use limited levels of electricity to cover basic needs such as lighting and the fridge/freezer. It is used by suppliers as an alternative to full disconnection in cases of non payment by electricity or gas customers.

U

Uniform Network Code (UNC)

The Uniform Network Code is the hub around which the competitive gas industry revolves, comprising a legal and contractual framework to supply and transport gas. It has a common set of rules for all industry players, which ensure that competition can be facilitated on level terms. It governs processes, such as the balancing of the gas system, network planning, and the allocation of network capacity. See also codes.

W

Wide area network (WAN)

The smart metering WAN will be used for two-way communication between smart meters and DCC (via the WAN communications module in the customer’s premises).

Appendix 5 – The Authority's Powers and Duties

1.1. Ofgem is the Office of Gas and Electricity Markets which supports the Gas and Electricity Markets Authority ("the Authority"), the regulator of the gas and electricity industries in Great Britain. This Appendix summarises the primary powers and duties of the Authority. It is not comprehensive and is not a substitute to reference to the relevant legal instruments (including, but not limited to, those referred to below).

1.2. The Authority's powers and duties are largely provided for in statute, principally the Gas Act 1986, the Electricity Act 1989, the Utilities Act 2000, the Competition Act 1998, the Enterprise Act 2002 and the Energy Act 2004, as well as arising from directly effective European Community legislation. References to the Gas Act and the Electricity Act in this Appendix are to Part 1 of each of those Acts.[16]

1.3. Duties and functions relating to gas are set out in the Gas Act and those relating to electricity are set out in the Electricity Act. This Appendix must be read accordingly[17].

1.4. The Authority's principal objective when carrying out certain of its functions under each of the Gas Act and the Electricity Act is to protect the interests of existing and future consumers, wherever appropriate by promoting effective competition between persons engaged in, or in commercial activities connected with, the shipping, transportation or supply of gas conveyed through pipes, and the generation, transmission, distribution or supply of electricity or the provision or use of electricity interconnectors.

1.5. The Authority must when carrying out those functions have regard to:

- the need to secure that, so far as it is economical to meet them, all reasonable demands in Great Britain for gas conveyed through pipes are met;
- the need to secure that all reasonable demands for electricity are met;
- the need to secure that licence holders are able to finance the activities which are the subject of obligations on them[18];
- the need to contribute to the achievement of sustainable development; and
- the interests of individuals who are disabled or chronically sick, of pensionable age, with low incomes, or residing in rural areas.[19]

1.6. Subject to the above, the Authority is required to carry out the functions referred to in the manner which it considers is best calculated to:

[16] Entitled "Gas Supply" and "Electricity Supply" respectively.
[17] However, in exercising a function under the Electricity Act the Authority may have regard to the interests of consumers in relation to gas conveyed through pipes and vice versa in the case of it exercising a function under the Gas Act.
[18] Under the Gas Act and the Utilities Act, in the case of Gas Act functions, or the Electricity Act, the Utilities Act and certain parts of the Energy Act in the case of Electricity Act functions.
[19] The Authority may have regard to other descriptions of consumers.

- promote efficiency and economy on the part of those licensed[20] under the relevant Act and the efficient use of gas conveyed through pipes and electricity conveyed by distribution systems or transmission systems;
- protect the public from dangers arising from the conveyance of gas through pipes or the use of gas conveyed through pipes and from the generation, transmission, distribution or supply of electricity; and
- secure a diverse and viable long-term energy supply.

1.7. In carrying out the functions referred to, the Authority must also have regard, to:

- the effect on the environment of activities connected with the conveyance of gas through pipes or with the generation, transmission, distribution or supply of electricity;
- the principles under which regulatory activities should be transparent, accountable, proportionate, consistent and targeted only at cases in which action is needed and any other principles that appear to it to represent the best regulatory practice; and
- certain statutory guidance on social and environmental matters issued by the Secretary of State.

1.8. The Authority has powers under the Competition Act to investigate suspected anti-competitive activity and take action for breaches of the prohibitions in the legislation in respect of the gas and electricity sectors in Great Britain and is a designated National Competition Authority under the EC Modernisation Regulation[21] and therefore part of the European Competition Network. The Authority also has concurrent powers with the Office of Fair Trading in respect of market investigation references to the Competition Commission.

[20] Or persons authorised by exemptions to carry on any activity.
[21] Council Regulation (EC) 1/2003