ENA Smart Metering System Requirements Update

For: Energy Networks Association

April 2010

Engage Consulting Limited

Document Ref: ENACR006-002-1.1

Restriction: ENA Authorised Parties only

Executive Summary

Background

ENA commissioned Engage Consulting Limited (Engage) to undertake a comprehensive analysis of Networks' requirements for a smart metering system for electricity and gas. This was commissioned to ensure that the ENA would be in a position to provide more detail regarding their specific requirements to the Ofgem's Phase 1 Scoping Study on the smart metering implementation programme. The overall project has four workstreams:

- **Workstream 1 – ENA Smart Metering System Requirements**
- **Workstream 2 - Development of Appropriate Use Cases**
- **Workstream 3 – Performance Standards & Communication Requirements**
- **Workstream 4 - Privacy & Security Considerations**

This report summarises the output of Workstream 1 and it is closely linked to the output of Workstream 2 covering Use Cases (Reference 5).

Review of Original Requirements List

This original ENA requirements list was constructed through work undertaken by the Energy Networks Futures Group (ENFG) smart metering working group. This level of detail was viewed as appropriate to support the response to the original DECC consultation process, but it was recognised that the list of requirements needed to be developed further to ensure the implications of specific network related needs were fully understood by all key stakeholders.

Updated ENA Requirements Lists

Based on material obtained from the ENA, the output of the Workshop and a review process, the original ENA requirements where reshaped and expanded upon to focus on key Networks' business processes that a smart metering system would support.

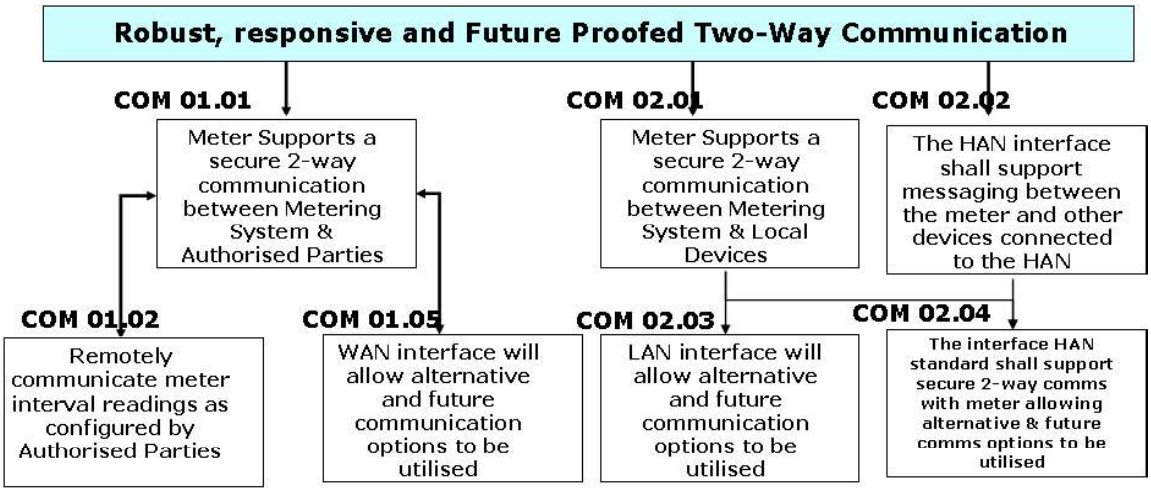
1. Communications Requirements (Electricity and Gas)

These requirements focus on the communication interfaces of both electricity and gas smart meters. Where the requirement only relates to a particular type of meter this is explicitly highlighted in the report.

Figure E.1 below illustrates the specific communication requirements that are covered in detail in the report.

These requirements expand on the need to provide a robust, responsive and future proofed two-way communication service from the smart metering system to Network Operators through a wide area network and into the home through a local / home area network.

Figure E.1 – Communication Requirements



Electricity Only
COM 01.03 - Send imported and exported energy data as captured by meter system on demand
COM 01.04 – Send cumulative import / export energy data within time schedules as configured by Authorised Parties

2. Electricity Network Requirements

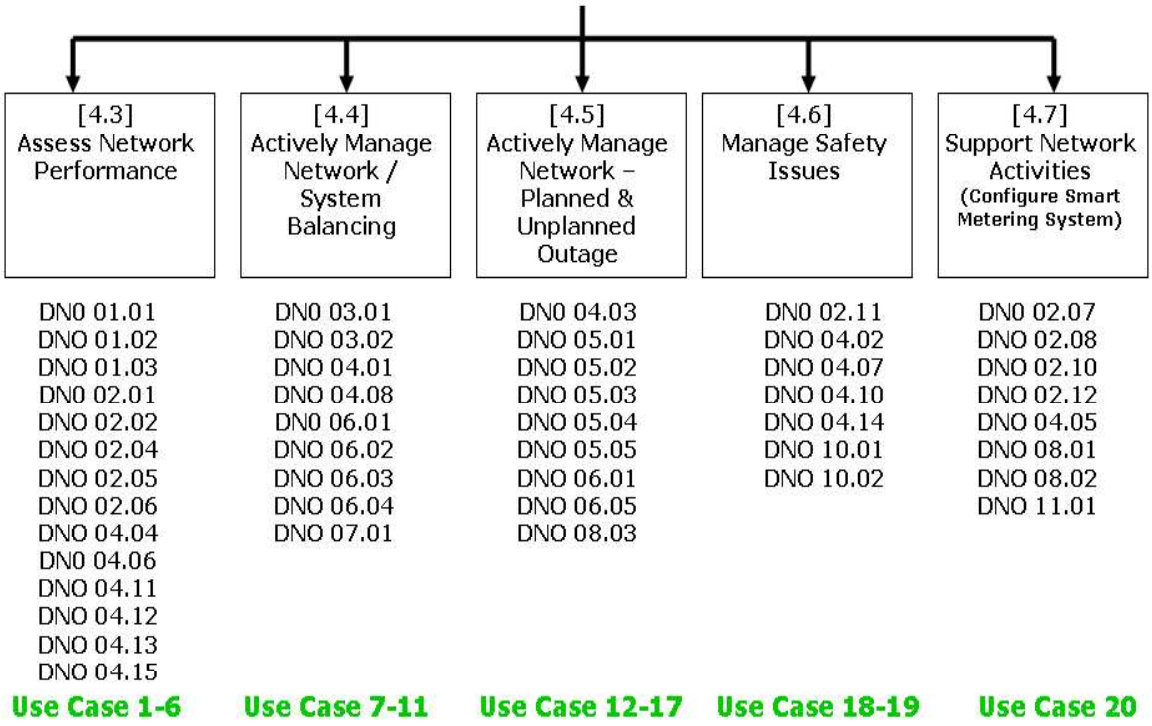
Figure E.2 below highlights the five key areas that were considered as critical for DNOs to be able to maximise the benefit of smart metering in the short-medium term for planning purposes and in the longer term to provide the capability that will support a smart electricity grid.

- **Assess Network Performance:** This covers the activity of capturing all the relevant data that is needed by a DNO to improve their planning processes. This is linked to assessing the impact of new demand / generation on the network, understanding the underlying latent demand from embedded generation when recovering from loss of supply and identifying voltage quality issues.
- **Actively Manage Network / System Balancing:** This covers the need to capture data on a more frequent basis than for planning purposes when new technologies are deployed on the networks and using that data to actively manage and control voltage, power flow and generally balance the system. The actions undertaken by the DNO to manage the network extend from changes to existing DNO assets (out of scope of this work), to using the smart metering system to send signals to customers via tariffs and/or taking control of equipment in the customers' premises, where permission has been given.
- **Actively Manage Network – Planned & Unplanned Outages:** This covers using the smart metering system to inform the customer of planned outages, to identifying where premises are off supply (checking energisation status and/or outage alarms), to verifying restoration of supply and undertaking regulatory reporting linked to this.
- **Manage Safety Issues:** This covers the key safety areas associated with electric smart metering systems. This includes detecting such things as: the terminal cover has been removed; the contact/switch has been bridged; interruption to the neutral

supply of the meter; detection of crossed polarity at the meter; the presence of a magnetic field stronger than 200 mT; the detection of excessive heat.

- **Support Network Activities:** This covers all aspects related to being able to configure the smart metering system to capture the required data and provide potential alarms and reports.

Figure E.2 – Overview of Key Network Electricity Activities



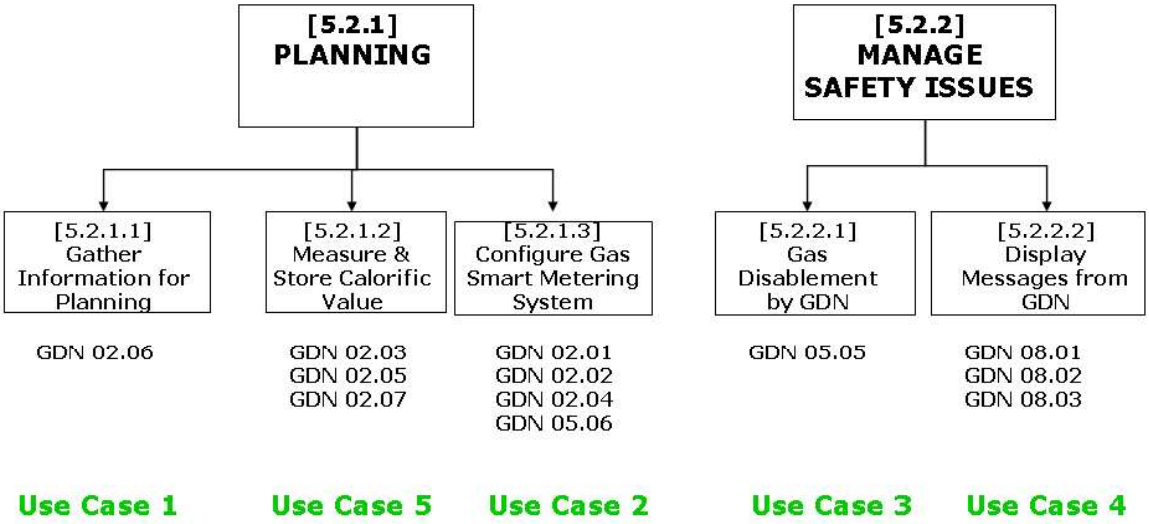
3. Gas Network Requirements

The review process for Gas Network Operators resulted in the original requirements submitted to the DECC Consultation process being reduced to the key areas highlighted in Figure E.3 below.

The key areas of focus for the Gas requirements are as follows:

- **Planning:** Smart meters could be configured to provide detail on a selection of all gas smart meters which would replace the small sample of data loggers currently employed. This will provide more accurate and representative data to support the network planning and demand modelling process for gas networks;
- **Manage Safety Issues**: GDNs view deployment of a gas valve more related to revenue protection than safety, since they are required to isolate the supply when problems occur (at emergency cut-off valve – ECV). The one identified situation where a gas valve could be useful with regard to safety to GDNs was in cases of network failure (assume small incidents of circa 250 properties or less) where use of the valve would prevent the need to purge the system to re-establish supply. The ability to display messages from GDN to consumers was also viewed as extremely beneficial.

Figure E.3 – Key Gas Requirements



Planning v Active Management of Networks

Although there will be a commonality of requirements between Network Businesses and Suppliers, it is critical that all stakeholders fully understand and appreciate the impact that certain network requirements will have now and as the need to operate a Smart Grid begins to become a reality.

The need for active management of Electricity Networks will be driven by the timing of adoption of new carbon neutral technologies such as micro-generation, Electric Vehicles, electric heat pumps etc. This is when a Smart Electric Grid will be needed.

This means that in the early stages of the GB smart metering roll-out, the need for network specific data will be primarily to assist in the infrastructure planning process of Network Businesses. This planning process, by its very nature, requires access to historic rather than real-time data, and this means that the emphasis will be on ensuring that the smart metering system has a storage buffer sufficient to ensure that data can be systematically downloaded to the Networks' systems where it can be archived for longer periods (for example to provide a complete 12 month profile). However, as the take-up of new technologies expands, this will put major strains on the network businesses (especially the DNOs) and they will need to move to a much more 'active' management of their networks. This will require much more immediate access to key data for example real time voltage measurements as an input to more localised automatic voltage control systems.

This key change in processes will bring with it major implications for the communication network that will support these processes. The question of volume of data, response time and required bandwidths etc., need to be considered and planned for. This will require the procurement of a communication provision that will readily allow this upgrade and transition when required, or the consideration of how these potentially different communication requirements could be provided separately.

Document Control

Authorities

Version	Issue Date	Author	Comments
0.1	16th Feb 2010	Tom Hainey	Initial draft to confirm structure
0.2 – 0.6	17-24th Feb 2010	Tom Hainey / Viktorija Namavira	Various additions to Report
0.8	25th Feb 2010	Tom Hainey	Review & Update following Use Case Workshop
0.9	18th March 2010	John Cunningham	Review of technical content.
1.0	01st April 2010	Tom Hainey	Update to align with Use Case conclusions
1.1	07th April 2010	James Boraston	Incorporate ENA comments
Version	**Issue Date**	**Reviewer**	**Comments**
1.0	06th April 2010	Dave Openshaw & Ralph Reekie	ENA review
Version	**Issue Date**	**Authorisation**	**Comments**

Related Documents

Reference 1	ENA Smart Metering Project Initiation Document (ENACR004-001-1.0)
Reference 2	ENA Networks Association Response to the Consultation on Smart Metering for Electricity and Gas (May 2009) (Ref 2)
Reference 3	DECC – "Towards a smarter future: Government response to the Consultation on Electricity and Gas Metering".
Reference 4	ERA – "Operational Framework B – Meter System Requirements v2"
Reference 5	Final Use Case Document - ENACR007-002-1.0
Reference 6	'ENA v DECC Consultation Metering System Requirements Gap Analysis v1'
Reference 7	'ENA v M/441 Metering System Requirements Gap Analysis v1';
Reference 8	'ENA v ERA Metering System Requirements Gap Analysis v1'

Change History

Version	Change Reference	Description
1.0	N/A	Initial version
1.1	DTO	Reviewed and amended final version

Distribution

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Table of Contents

1 Introduction

Since their production of an initial set of ENA Requirements for Smart Metering which formed part of their response to the DECC consultation on smart metering, the ENA and its member companies have recognised the importance of further developing their original functional specification in order to fully support the objectives of the ENSG Smart Grid Vision and Route-map, and in recognition of the importance that DECC has placed on the development of Smart Grids. In order to achieve this objective, ENA has commissioned Engage Consulting Limited (Engage) to undertake a project (PID – Reference 1) to address 4 key areas of work as follows:

- **Workstream 1 – ENA Smart Metering System Requirements:** Update and enhance key network requirements needed to support current network businesses and the future needs of Smart Grids;
- **Workstream 2 - Development of Appropriate Use Cases:** To fully articulate the key aspects of the ENA requirements it is intended that specific Use Cases will be developed for critical areas related to energy network businesses and smart grids.
- **Workstream 3 – Performance Standards & Communication Requirements:** This workstream will develop appropriate scenarios for each Use Case and undertake a data traffic analysis to assess the impact this will have on the smart metering communications infrastructure.
- **Workstream 4 - Privacy & Security Considerations -** This activity will provide an overview of the scope, principles and concepts that need to be considered when developing a secure smart metering system solution to take account of the Energy Networks additional requirements.

This report summarises the output of Workstream 1 (which has been informed by Workstream 2) which has resulted in an updated set of ENA Smart Metering Requirements (Reference 2) superseding those originally provided to DECC in response to their consultation process (Reference 3). This ENA Smart Metering Requirements Update is expected to make an important contribution to the Ofgem E-Serve Smart Meter Phase 1 Scoping Study.

1.1 Background

The Government's response to the DECC smart metering consultation process (Reference 3) included a number of statements emphasising the importance of developing a smart grid in Great Britain and of ensuring that Network businesses were able to contribute by specifying the functional requirements of a smart metering system that would be required to support that objective.

It is therefore imperative that the correct level of factual and detailed information is fed into Ofgem E-Serve's Phase 1 work. This will ensure that in developing the smart meter functionality and communications infrastructure requirements, full account can be taken of the short, medium and long term needs of network operators such that the key functionalities can be incorporated in an appropriate manner and within the relevant timescales.

It is assumed that all of the network-specific requirements will be subject to a Cost Benefit Analysis (CBA) to ensure that they demonstrate a net positive impact on the value of smart metering for Great Britain.

1.2 Purpose

The purpose of this Updated Requirements Report is to:

- Summarise the outcome of the development of ENA requirements for electricity and gas networks and the future needs of smart grids into a structured set of Smart Metering System Requirements (ENACR006-002-1.1);
- This report has made use of the outcome of the Gap Analyses listed below; the detailed analyses are available as separate documents.
    - DECC Consultation Response functionality list, delivering a product of the 'ENA v DECC Consultation Metering System Requirements Gap Analysis v1' (Reference 6);
    - Mandate 441 (EU Smart Metering standards initiative) detail delivering a product of the 'ENA v M/441 Metering System Requirements Gap Analysis v1' (Reference 7); *and*
    - Energy Retail Association (ERA) stated requirements delivering a product of the 'ENA v ERA Metering System Requirements Gap Analysis v1' (Reference 8).

1.3 Scope

This project is focused on ensuring that the requirements of energy networks - in respect of the short, medium and longer term functionality required of smart metering, and associated communication infrastructure and supporting I.T. - are clearly defined and aligned with work being undertaken by the DECC/Ofgem E-Serve Smart Metering Implementation Project. This report provides clear and precise articulation of these key requirements. The ENA will need to ensure that these key requirements are fully understood and consequently factored into the scoping work currently being undertaken by Ofgem E-Serve and DECC.

1.4 Copyright and Disclaimer

2 Original Requirements List

Reference 2 provides full details of the electricity and gas requirements submitted as part of the DECC consultation process. These were viewed by the ENA as an initial view of their high level requirements. This project was instigated by the ENA to enhance the detail, clarity, and level of these requirements in order to provide an appropriate level of insight for ENA members, Ofgem E-serve, DECC, and any other interested stakeholders.

This original requirements list was constructed through work undertaken by the Energy Networks Futures Group (ENFG) smart metering working group. This level of detail was viewed as appropriate to support the response to the original DECC consultation process. The ENA recognised that in order to help articulate the detail of their requirements it would be necessary to commission additional work to further develop these requirements and feed them to key stakeholders in the development of a GB Smart Metering strategy.

The original requirements submitted to the DECC consultation process are summarised and restated below for reference.

2.1 Electricity Requirements

The original requirements were summarised as follows:

Table 1 – ENA Original Electricity Requirements List

Requirement Reference	Requirement Description
DNO 01	The meter will have 4-quadrant registering capability.
DNO 02	The meter will have the capability to support Feed-in Tariffs insofar as these might depend on measurement of output from demand side energy sources – including micro-generation, mobile battery storage (e.g. BEV / PHEV vehicles), and ultimately fuel cells.
DNO 03	The metering system will provide demand (import/export) and demand-side generation profile data.
DNO 04	The metering system will be equipped with sufficient multiple configurable data channels or other means to support two-way communications of periodic (e.g. hourly or half-hourly) data, and also defined ancillary functions.
DNO 05	The meter will be able to interface with a range of communications systems.
DNO 5a	The smart metering system will permit mapping of smart metering information to the electricity network.
DNO 06	The meter will support power outage detection by remote interrogation of meter energisation status.
DNO 07	The metering system will provide time-stamped power outage / restoration information.

DNO 08	The meter will have the capability if specified as an option (and assisted as necessary by an external auxiliary supply) to transmit a power outage signal.
DNO 09	The metering system will provide voltage profile data.
DNO 10	The meter will have the capability of detecting a potentially dangerous over or under voltage condition and will be capable of configuration to either (or both) transmit an alarm or (and) initiate disconnection through the meter's integral automatic cut-off switch (if fitted – see Ref. DNO 14).
DNO 11	The meter will provide basic (voltage sag / swell) power quality monitoring functionality.
DNO 12	The meter will support multi-rate (TOD / CPP) tariff structures.
DNO 13	The meter will be capable of initiating consumer appliance load switching.
DNO 14	As an optional requirement (if specified) the meter will include a configurable (and remotely controllable) cut-off switch designed to operate automatically if the customer's load exceeds a predefined limit and duration.
DNO 15	The meter will incorporate measures to guard against tampering and unauthorised access to the meter terminals.
DNO 16	The meter will have the functionality to respond to daily synchronisation signals to ensure continued accurate time-stamping of information.

2.2 Gas Requirements

The original requirements were summarised as follows:

Table 2 – ENA Original Gas Requirements List

Requirement Reference	Requirement Description
GDN 01	Meter to incorporate a valve. A number of ENA members do not see the benefit to GDNs of the gas valve, but they have looked at ways of maximising the benefits from a valve if it is to be installed.
GDN 02	Positive response from Meter where a valve closure has been requested that the valve has operated successfully.
GDN 03	Maximum time from instruction to operate valve to its operation.
GDN 04	Consumption detection alarm following valve actuation
GDN 05	Consumption to be stored for [half] hourly periods.
GDN 06	Ability to store CV. A Supplier issue but needs specifying.
GDN 07	Low Pressure Alarm and isolation. Distribution Networks could not justify the inclusion of a pressure sensor, however if it is required for Supplier needs (pressure and temperature compensation) GDNs would utilise it.
GDN 08	High Pressure Alarm and isolation. Distribution Networks could not justify the inclusion of a pressure sensor, however if it is required for Supplier

	needs (pressure and temperature compensation) GDNs would utilise it.
GDN 09	Tamper alarm
GDN 10	Minimum battery life

3 Communication Requirements

Based on material obtained from the ENA, the output of a Workshop and a review process, the original ENA requirements where reshaped and expanded upon to focus on key Networks' business processes that a smart metering system would support. The communication requirements are based on providing a robust and responsive two-way communication that will be common for both Electricity and Gas meters.

3.1 Communication related Original Requirement

In the original ENA requirements provided to DECC, the following reference to communication functionality was provided through the table of electricity requirements:

- DNO 04 – The metering system will be equipped with sufficient multiple configurable data channels or other means to support two-way communications of periodic (e.g. hourly or half-hourly) data, and also defined ancillary functions.
- DNO 05 - The meter will be able to interface with a range of communications systems.

These two original requirements are focused on:

- Highlighting that DNOs must have access to a robust and effective two-way communications system allowing them to access relevant information, held either on the smart meter system or centrally, and download information and messages to the smart meter / customer;
- DNOs require that the smart meter must be able to interface with a range of communication technologies; either simply to gain required coverage, to allow the introduction of a new communication technology, or to provide an appropriately responsive (low latency) communication route for key real time activities (full smart grid operation).

The key points made during the review process were as follows:

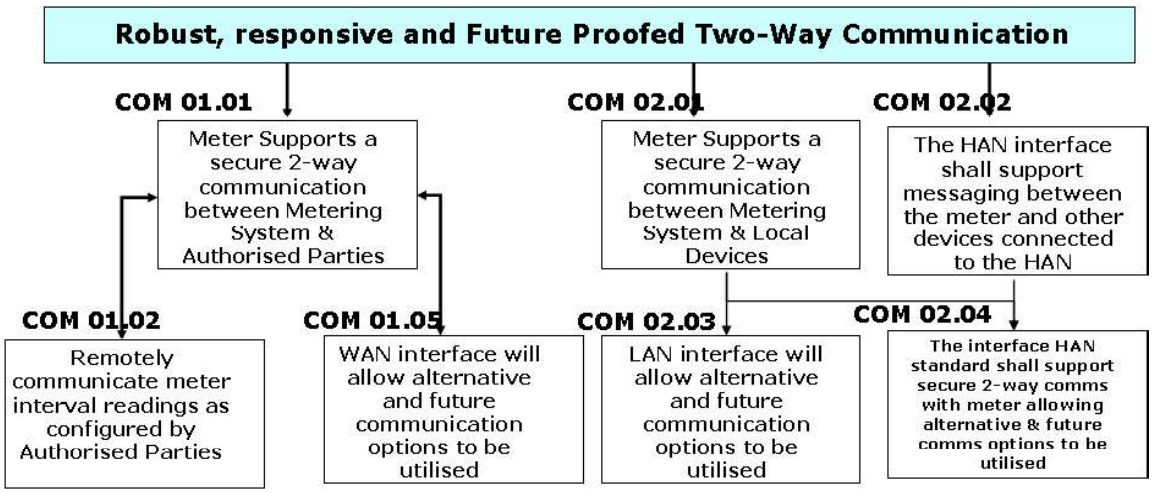
- Requirement (B.COM.012) highlighted by ERA (Reference 4) on behalf of Suppliers, may be sufficient initially to support the two-way communication needs of Network Operators associated with obtaining planning data. The concern is that as the need for access to this data becomes more real time in nature, then if the communication infrastructure is sized only for this initial phase of network requirements, then it may not have adequate bandwidth and speed to support those DNOs' requirements linked to actively managing the network and balancing the system (full smart grid operation);
- The requirement to provide a flexible communications infrastructure which can evolve as needed is linked to both communications within the home to the smart meter (HAN), from local devices to the smart meter (LAN) and from the smart meter to the appropriately authorised parties (e.g. DNOs/GDNs through the WAN).

3.2 Detail of Communications Requirements (Electricity and Gas)

This section will discuss the communication interfaces of both electricity and gas smart meters. Where the requirement only relates to a particular type of meter this is explicitly highlighted.

The figure below illustrates the specific requirements that are discussed in the sections that follow.

Figure 3.1 – Communication Requirements



Electricity Only
COM 01.03 - Send imported and exported energy data as captured by meter system on demand
COM 01.04 – Send cumulative import / export energy data within time schedules as configured by Authorised Parties

3.2.1 Remote Acquisition (Wide Area Network – WAN)

COM 01.01 is the basic capability for a smart meter to be able to provide two-way communicate between meter and authorised parties e.g. DNO, GDN etc.

Ref	Previously: DNO 04, DNO 02, DNO 13 , Now: COM 01.01
Title	The meter will support a secure 2 way communication between the metering system and the Authorised Party (as B.COM.012 for ERA).
Description	This is the requirement for Wide Area Network Communication, allowing smart meters to be electronically accessed by a remote party.
Rationale	Two way communications will allow DNOs and GDN's to receive configured data or data on demand directly from meters when needed thus allowing for network optimisation, load forecasting and balancing planning. It will also help to notify distributors of any events that have occurred that they need to respond to e.g. alarms etc.
Criterion	The metering system will have an available meter interface to ensure automatic communication between the meter and the Authorised Parties.
Version	3
Date	Feb-10
Origin	DNORSM

COM 01.05 emphasises the need to 'future-proof' this wide area network communication infrastructure.

Ref	Previously: DNO 05, Now: COM 01.05
Title	The meter WAN interface will allow alternative and future communications options to be utilised.
Description	The meter interface should be able to use a range of communications systems and be flexible enough to deal with any new communication technology that may be developed in the future.
Rationale	This will allow the use of various existing communication types (e.g. mesh radio, GPRS, PLC, etc.) and future communication enhancements to maximise the coverage and performance of the WAN connection.
Criterion	The meter WAN interface will be based on an open standard.
Version	3
Date	Feb-10
Origin	DNORSM

Standard transfer of interval data from smart metering system to Authorised Parties via WAN (Electricity or Gas).

Ref	Previously: DNO 01; Now: COM 01.02
Title	The metering system will be able to remotely communicate meter interval readings as configured by Authorised Parties (as B.COM.005 for ERA)
Description	The Authorised Parties will be able to receive configured meter interval readings using their chosen interval (e.g. 30 minutes, etc.)
Rationale	Allows DNOs to receive meter readings as scheduled remotely. Supports energy demand, export profiling, load profiling and voltage profiling. See Use Cases: **Electricity** '01_Monitor Power Flows and Voltage levels to Identify Thermal Capacity and Statutory Voltage Headroom' '06_Identify Voltage Quality Issues' '07_Collect Data for Active Management and System Balancing' **Gas** '01_ Gather information for planning'
Criterion	For example, the metering system will provide information for each interval read, such as: - Meter id - Timestamp - Interval value
Version	3
Date	Feb-10
Origin	DNORSM

Electricity specific WAN communication requirements are as follows:

Ref	Previously: DNO 01, Now: COM 01.03
Title	The electricity metering system will be able to send imported and exported energy data as captured by meter system on demand (as B.COM.006 from ERA)
Description	It will be possible for DNO's to receive configurable data from the meter on demand
Rationale	Allows DNOs to receive data on demand. See Use Case – 05_Determine Latent Demand due to embedded generation
Criterion	Typically the Authorised parties will be able to receive information on demand, such as: 1. Active energy (kWh) and power (kW) (average half hour) import or export 2. Reactive energy (kVAh) and reactive demand (kVAr) (average half hour) import or export 3. kVA maximum (average half hour) import and export for polyphase meters supporting MD tariffs 4. Metering system status 5. Metering system diagnostics 6. Average Voltage over specified period 7. Power quality (e.g. voltage sags and swells)
Version	3
Date	Feb-10
Origin	DNORSM

Ref	Previously: DNO 01, Now: COM 01.04
Title	The electricity metering system will be able to send cumulative imported and exported energy data within time schedules as configured by Authorised Parties (as B.COM.005 for ERA)
Description	DNO's will be able to configure receiving data as configured and at any chosen time schedule.
Rationale	Allows DNOs to receive cumulative energy import and export data thus allowing profiling and demand side management based on the data received. Supports energy demand, export profiling, load profiling and voltage profiling. See Use Cases: '01_Monitor Power Flows and Voltage to Identify Thermal Capacity and Statutory Voltage Headroom'
Criterion	Typically the Authorised parties will be able to receive information on demand, such as: 1. Active energy and power (kWh/kW) import and export 2. Reactive energy and power (kVArh/kVAr) import and export 3. kVA maximum (average half hour) import and export for polyphase meters 4. Metering system status 5. Metering system diagnostics 6. Voltage 7. Power quality
Version	3
Date	Feb-10
Origin	DNORSM

3.2.2 Local and Home Area Acquisition

As for the WAN it is a requirement that there is a two-way communication link between the smart metering system and appropriately enabled local devices.

Note that for certain communications solutions the LAN might also act as the 'last mile' element of the overall WAN solution and in that context would need to also comply with the requirements under 3.2.1 above for WAN.

Ref	Previously: DNO 02, DNO 04, DNO 13, Now: COM 02.01
Title	The meter will support a secure 2 way communication between Metering System and Local Devices (as B.COM.013 for ERA)
Description	This is a requirement for Local Area Communications (LAN) and Home Area Network (HAN) Communication, allowing smart metering systems to be electronically accessed by devices (including other smart metering systems) within the premises.
Rationale	This is the requirement for Local Communications, allowing smart metering systems to be electronically accessed by devices (including other smart metering systems) within premises. This would facilitate distributed generation, feed in tariffs, EVs, and load management. See Use Cases – '08_Active Management of Network Voltage' '09_Perform Active Management of Network Power Flow' '10_Perform System Balancing'
Criterion	The metering system will have an available meter interface to ensure automatic communication between the meter and the local devices.
Version	3
Date	Feb-10
Origin	DNORSM

The Home Area Network is capable of supporting message exchanges between appropriately enabled devices in the home and the smart metering system.

Ref	Previously: DNO 02, DNO 04; DNO 13, Now: COM 02.02
Title	The HAN interface shall support messaging between the meter and other devices connected to the HAN.
Description	The metering system will be able to give commands to and to receive data from the devices connected to the home area network such as smart appliance devices – air conditioning, refrigerators, TVs, etc.
Rationale	This is a key enabler of providing authorised party with demand management capability
Criterion	The HAN interface shall support display of all relevant data from other devices to the smart metering system and appropriate messaging associated with actions instigated. See Use Cases – '08_Active Management of Network Voltage' '09_Perform Active Management of Network Power Flow' '10_Perform System Balancing'
Version	3
Date	Feb-10
Origin	DNORSM

As for the WAN this requirement seeks to ensure that the Local Area Network communication infrastructure is 'future-proofed'.

Ref	Previously: DNO 05, Now: COM 02.03
Title	The LAN interface will allow alternative and future communications options to be utilised.
Description	The meter interface should allow using a range of communications systems, both current and as communication technology evolves in this area.
Rationale	This will allow the use of various current and future developments of communication technology in this area.
Criterion	The meter LAN interface will be based on an open standard.
Version	3
Date	Feb-10
Origin	DNORSM

As for the WAN this requirement seeks to ensure that the Home Area Network communication infrastructure is 'future-proofed'.

Ref	Previously: DNO 02; DNO 05; DNO 13, Now: COM 02.04
Title	The HAN interface standard shall support secure two-way communications with the meter allowing alternative and future communications options to be utilised.
Description	This will allow the use of various current and future developments of communication technology in this area.
Rationale	Two way HAN communication will allow DNOs and GDNs to carry out load management functions and balance grid. DNOs and GDNs will be able to switch off home appliances when grid load becomes too high or facilitate demand side management.
Criterion	The meter HAN interface will be based on an open standard.
Version	3
Date	Feb-10
Origin	DNORSM

4 Electricity Requirements Review

4.1 Original Electricity Requirements – Key Points from review

This section expands on the key points raised during the review related to the original requirements submitted to the DECC consultation process.

4.1.1 DNO 01 – DNO 03

These three original requirements either:

- indicated a specific need (DNO 01 – need 4 quadrant meter to measure real and reactive power and import and export); or
- addressed certain aspects linked to how Network businesses envisage a smart metering system would help their infrastructure planning processes now, and eventually support greater active management of the network as required by the anticipated increased uptake in Distributed Generation (DG), Electric Vehicles (EVs) and electric heat pumps (Smart Grid operation).

The key points made were as follows:

- DNOs need to be able to monitor real and reactive power flows, and the import and export occurring at each supply point. This will provide an important insight into the demand (import or export) at each point on the network, the power factor, and the available capacity headroom at each point on the network. It will also help inform the level of latent demand present, and the potential cold load pick-up which DNOs will need to ensure can be managed;
- Having access to this data in profiled form will provide DNOs with an in-depth knowledge of how their network is equipped to deal with growth in generation and demand, and allow them to either plan network reinforcement requirements in sufficient time, and/or implement other measures to avoid the immediate need for network reinforcement;
- This information will be required initially for planning purposes (collected on a regular basis from the smart meter - for example at 3 month intervals), but as the take-up of DG, EVs and heat pumps increases, some of this information will be required in operational. When this change will need to occur depends on the speed and scale of uptake of the above new forms of electrical generation and demand at particular points on the network.

4.1.2 DNO 05a (Mapping of Smart metering information to the electricity network)

Knowing the connectivity between each customer (meter point) and the DNO's LV network is a requirement for the operation of any smart grid capability. This mapping of information can be achieved either:

- At the installation of the smart meter when the location details are provided to all authorised parties; or

- By information that is held on the smart meter.

DNOs will need to hold and maintain this information within their internal systems (for example GIS / DMS). A beneficial enhancement would be to also determine phase connectivity which would help to identify phase imbalances and also help in the isolation of LV faults. Incorporation of PLC in the communications solution would greatly facilitate determination of phase connectivity.

4.1.3 DNO 06 – DNO 08 (Outage Related)

DNO 06 and DNO 08 address two approaches to identifying where unplanned outages have occurred. The ability to interrogate the energisation status of the meter population (poll individual meters) covered in DNO 06 assumes that either the DNO suspects an outage may have occurred in a part of their network and undertakes this approach to confirm that suspicion; or that the DNO is aware of an outage problem and uses this approach to ascertain the extent of that outage. DNO 08 assumes that each smart meter would have the functionality to transmit details regarding an outage as it occurred. If this proved to be an expensive option (for example due to the need to include a battery to provide 'last gasp' signalling capability) then restricting meters with this functionality to vulnerable customers might be an appropriate way to proceed. Nevertheless, having the capability described in DNO 08 would allow DNOs to increase the speed of their response once outages had occurred, and might better fulfil customers' reasonable expectations as what a smart metering system should be capable of.

DNO 07 is focused on the smart meter having the capability to capture time-stamped information, recording when outages and restorations occurred. This data could be downloaded by DNOs at appropriate intervals and would provide accurate detail for Regulatory reporting of quality of supply performance, and for identification of Guaranteed Standard failures.

4.1.4 DNO 09 (Provide voltage profile data)

Having access to voltage profile data would allow DNOs to optimise voltage levels and make full use of the statutory voltage bandwidth before resorting to potentially expensive reinforcement measures. Optimising voltage levels would also help to minimise losses. Voltage profile data might initially be required only in planning timescales and downloaded periodically (e.g. at 3 month intervals). However, as increased levels of generation and new types of demand such as heat pumps and EVs begin to make an impact, the need to monitor voltage will become more of a real time operational need; for example as an input to more localised AVC systems.

4.1.5 DNO 10 (Detect potentially dangerous over or under voltage conditions – transmit alarm and/or disconnect)

Whereas momentary voltage variations outside statutory limits may not be significant, extreme voltage variations (for example associated with an open-circuit neutral or malfunctioning AVC system) could lead to significant damage to appliances and even present a potential fire hazard. Incorporating an alert function and/or an automatic disconnection capability would greatly reduce this risk.

4.1.6 DNO 11 (provide basic voltage sag/swell power quality functionality)

Localised voltage quality issues can arise from a number of causes, including intermittent faults, disturbing loads (such as welders and direct-on-line starting motors) or the frequent switching of relatively heavy loads (such as electric showers on weak networks). This commonly manifests itself in terms of flickering lights. In future, an increased penetration of heat pumps or air cooling systems might give rise to increased levels of voltage disturbance and hence customer annoyance. Currently, customers have to inform their DNO about such problems and determining the root cause is often less than straightforward. The ability to access voltage quality information from smart meters would enable not only the scale and frequency of the disturbance to be measured (which might suggest the type of device responsible) but also the extent of the problem across that part of the network, thereby helping to pin down the location of the root cause.

It is understood that only a simple enhancement to the functionality contained within the smart meter software would be necessary to enable voltage quality to be monitored. This 'fault finding' functionality might be called into use only over a small sample of the total meter population at any given time, but having this capability in all meters would allow for overall monitoring of voltage quality to detect any general deterioration due, for example, to an increased prevalence of heat pump motors with high starting currents.

4.1.7 DNO 12 (support multi-rate tariff structures)

This requirement addresses the need for DNOs to have the capability to influence demand through price signals as part of an overall demand management strategy.

As the mix of generation moves to a higher percentage of renewables, in particular intermittent generation such as wind and solar, the ability to manipulate load according to the availability of generation output will become an increasingly important function of Smart Grid capability.

Moreover, as network utilisation levels increase due to EVs and heat pumps, the ability to manipulate these new demands so as to avoid, so far as possible, peak demand periods, and hence the need for network reinforcement, will be essential in maintaining affordable use of system charges.

The ability of DNOs to influence demand via use of system charge variations relies on the Supplier in question passing these charges through to customers. While there can be no guarantee that the Supplier will do so in all cases it is encouraging that Suppliers (via ERA) have also highlighted this as a requirement.

4.1.8 DNO 13 (capability to initiate consumer appliance load switching)

This is linked to the outcome which DNO 12 is addressing. However this differentiates from DNO 12 in that instead of relying on a price message/incentive for the customer to reduce or time-shift demand, it effects a real-time change in demand through direct control.

The existing requirement under ERA (B.COM.013) was viewed as potentially meeting the DNO need, so long as it was recognised that locational use of system charges (determined by available network capacity headroom) and not only time

of day energy prices (determined by the market) would need to be reflected in the use of this functionality. This would need to be emphasised as part of the industry's input to the current Ofgem E-Serve Phase 1 work programme.

DNOs viewed the smart meter and its associated comms module as a hub through which to send price or direct control signals to a range of future domestic devices, including microgeneration, EV charging systems, electric heating, and 'wet' appliances such as washing machines, dishwashers and tumble dryers. DNOs recognised the need to stagger any control commands to ensure that the process does not cause unnecessary voltage fluctuations.

4.1.9 DNO 14 (remotely configurable cut-off switch to operate if customer's load exceeds a predefined limit or duration)

This was viewed by DNOs as essentially the same requirement as the ERA has in their requirement B.ELE.022. DNOs would need to understand the threshold settings for this cut-off switch to ensure that it aligned with their requirements.

4.1.10 DNO 15 (incorporate measures to guard against tampering)

This was viewed as complementary to the ERA requirement B.COM.003 (no more susceptible to fraud than non-smart meters) which has already been raised. The ENA requirement is however more specific in stipulating detection of the removal of terminal covers and the fact that the meter should be resilient to external magnetic fields.

4.1.11 DNO 16 (daily synchronisation)

This requirement is met through the ERA requirement B.COM.054 that requires conformation to IEC 62055-31 Annex D for accuracy. This standard requires that the accuracy of the clock should be +/- 0.5 seconds per day.

4.1.12 New Requirement raised (support temperature sensing)

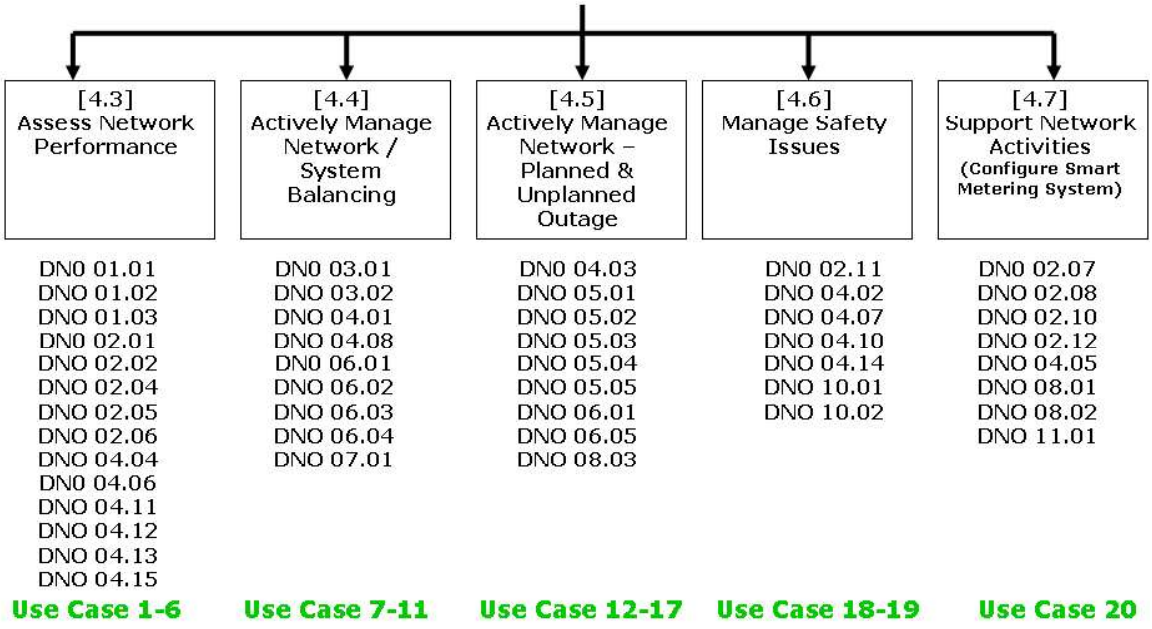
This requirement was raised in recognition of a future less frequent inspection regime than is presently achieved through meter reading operatives meeting the requirements under MOCOPA (Meter Operation Code of Practice Agreement). If these opportunistic inspections are no longer undertaken once smart metering systems are deployed, then this might lead to the possibility of dangerous conditions such as heat build up in the connector block going unnoticed.

It was also recognised that if this functionality was viewed as necessary, an alternative to incorporating the functionality within the meter could be to incorporate a sensor device within the connector block. Either way, a cost-benefit analysis would be required to justify the mitigation of what is historically a very low probability (but potentially high impact) event.

4.2 Overview of Key ENA Electricity Activities

The diagram below highlights the five key areas that were considered as critical for DNOs to be able to maximise the benefit of smart metering in the short-to-medium term for planning purposes, and in the longer term to provide the capability that will support a smart electricity grid.

Figure 4.1 – Overview of Key Network Electricity Activities



Each of the five key areas highlighted in Figure 4.1 are linked to a set of Use Cases which highlight the key aspects of the specific business process being undertaken, in simple language. The table below summarises the Use Cases referred to in Figure 4.1.

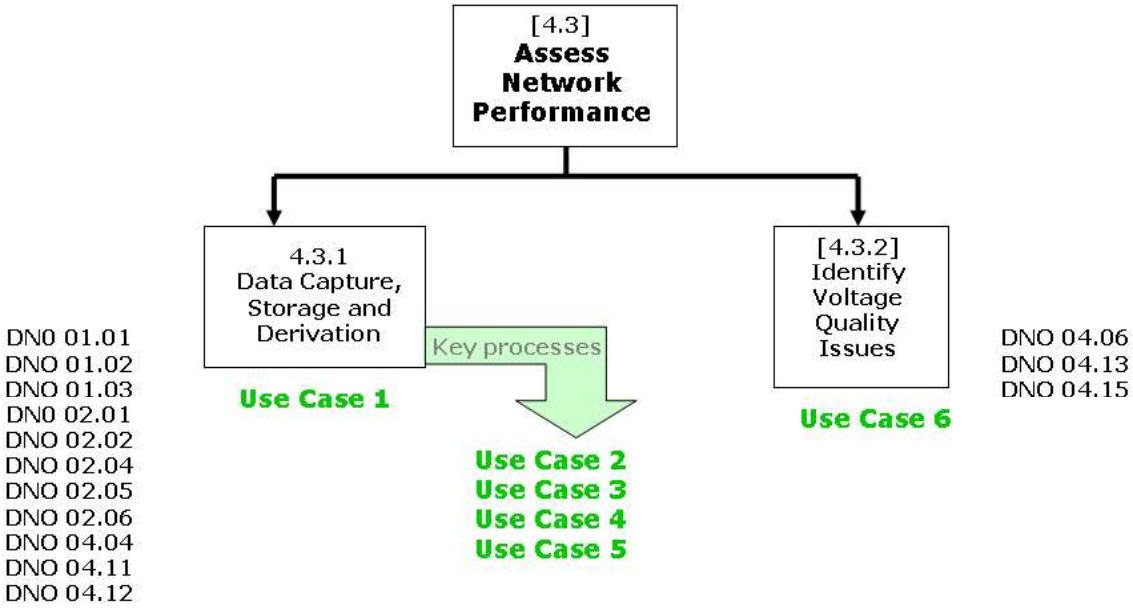
Table 4.1 – Electricity Use Case Summary

Key Activities for Network Businesses	Use Case Detail Level
Assess Network Performance	01_Monitor Power Flows and Voltage Levels to Identify Thermal Capacity and Statutory Voltage Headroom
	02_Determine network impact of proposed new demand / generation connections
	03_Determine network impact of proposed increases in demand / generation at existing connection points
	04_Monitor demand and generation profiles for network load forecasting
	05_Determine Latent Demand due to Embedded Generation
	06_Identify Voltage Quality Issues
Actively Manage Network / System Balancing	07_Collect data for active network management
	08_Active Management of Network Voltage
	09_Perform Active Management of Network Power Flow
	10_Perform System Balancing
	11_Check effectiveness of active network management / system balancing measures
Actively Manage Network – Planned & Unplanned Outages	12_Notify consumer of planned outage
	13_Query Meter Energisation Status to determine Outage Source and Location
	14_Send Alarm to DNO during Network Outage
	15_Verify restoration of supplies after outage
	16_Regulatory Reporting of Outages
	17_Restore and maintain supply during outages
Manage Safety Issues	18_Manage meter safety alarm
	19_Manage extreme voltage at meter
Support Network Activities	20_Configure smart metering system

4.3 Assess Network Performance

Figure 4.2 illustrates the key areas of focus for the DNO activity of 'Assess Network Performance', which is focused on gathering appropriate information to aid in their planning process.

Figure 4.2 – Assess Network Performance – Planning activities



Distribution Network Operators have a requirement to use data from Smart Metering Systems to aid in their Planning processes:

1. Proactively monitoring their networks to monitor power flows and voltage levels to identify thermal capacity and statutory voltage headroom (Use Case 1). This requires:
    - The location of the Smart Metering Systems mapped to the DNO's networks;
    - Real and reactive / import and export power or power flow data and generation export data (in terms of half-hourly averaged values); and
    - Voltage data (in terms of half-hourly averaged values).
2. Determining the potential network impact of requests for new connections (Use Case 2). This requires:
    - DNOs to be able to determine whether the existing distribution network has sufficient capacity headroom to accommodate the additional load / generation, whether infrastructure reinforcement is required, or whether advanced forms of active network management will be sufficiently effective to deal with the extra load / generation;
    - Measurements of exported and imported electricity from smart metering in the same area of the network as the proposed new connection (two to three years' worth of half-hourly real and

reactive power flow and voltage data is suggested as suitable to give a confident assessment).

3. Determining the potential impact on their network of increased levels of demand or generation at existing connection points (Use Case 3). This requires:
    - DNOs to use Smart Metering System data to create load profiles that can then be used to model the impact of increased levels of demand or generation at existing connections.
4. Forecasting the effect of new technologies (e.g. electric vehicles, heat pumps, compact fluorescent lights and domestic air cooling units) on the network in order to take timely action to maintain system integrity. These technologies will affect total energy distributed, power factor, voltage levels, peak demands, and the overall shape of the daily and seasonal cyclic demand profile (Use Case 4). This requires:
    - DNOs to use smart metering data to assess the accuracy of the generic profiles used to model the effects of new connections and changes in the type and quantity generation and demand on the networks, and update their profiles accordingly.
5. DNO obtaining a true view of the potential peak demand on their network with increased micro-generation and distributed generation (Use Case 5). When a distribution circuit is re-energised after a prolonged outage the initial demand can be greater than that observed immediately prior to the outage. This effect is known as 'cold load pickup' and arises from appliances with cyclic patterns of electricity usage such as refrigeration and heating plant simultaneously drawing demand as soon as supplies are restored. This issue is exacerbated where there is generation connected to the network. This generation will normally cease when the outage occurs. The DNO will therefore need to be aware of the gross network demand that will be presented when power is restored in order to ensure that the network has sufficient capacity to meet this demand until such time that generation is able to recommence. The demand effectively 'hidden' by the presence of distributed generation is termed 'latent demand'. This requires:
    - DNOs to use the Smart Metering System data to obtain a better estimate of both the potential 'cold load pickup' and especially the 'latent demand' due to any generation present. To do this they will need to determine the latent demand at each connected Smart Metering System that has micro-generation installed, as well as the normal connected demand. This can be calculated by obtaining, from the Smart Metering System, the half hourly average real and reactive power flow from each individual premise, and the half hourly generation output from the generation meter if fitted (i.e. the Feed-in Tariff or 'FIT' meter).

6. Identifying Voltage Quality issues (Use Case 6). This requires:
    - Monitoring of voltage quality on the LV network due to the anticipated increases in LV connected non-linear loads (such as heat pump motor soft-start mechanisms, CFLs, and DC/AC converters associated with PV micro-generation (and in future 'vehicle-to-grid' (V2G) operation) and potentially disturbing loads such as heat pump direct-on-line starting currents.
    - Smart meters to provide the facility to record voltage fluctuations and date / time stamp such events such that Distribution Network Operators will be able to identify any parts of their networks where poor voltage quality is a recurring issue. Threshold limits for recording of events will be specified.

This section is focused on highlighting the key requirements that support a DNO's ability to undertake this assessment of their network performance, which greatly enhances their planning capability.

4.3.1 Data Capture, Storage & Derivation

This section underpins all the activities that are part of the overall network planning process. Specific data about the location of the smart meters and historic data related to real/reactive and import/ export demand and generation and voltage profiles need to be captured. This data provides a basis against which to assess the impact of increased demand / generation at existing locations, proposed new locations and how this information relates to the derivation of profiles for load forecasting and assessment of latent demand.

4.3.1.1 Mapping of Smart Meters onto DNO's LV Network

A number of the activities that support this planning related requirement rely on being able to identify exactly where, in electrical connectivity terms, the relevant meters are on the DNO's LV network so that it can selectively capture specific data from these meters to use in their planning process. DNO 01.01 and DNO 01.02 are linked to data necessary to locate the meter and do not directly assume that any functionality exists in the meter to maintain the position of specific meters on the DNO LV Network.

Ref	Previously: DNO 05a – Now: DNO 01.01
Title	The meter shall provide functionality to set location information in the meter after the meter is physically installed or changed but before the meter is deployed.
Description	Upon installation the installer of the meter will be able to input information into the meter on location of the meter physically as well as its location on the network.
Rationale	This will allow the mapping of smart metering system thus providing information to networks on meter mapping and their load profiles to individual LV cables and HV/LV substations. It will also make it possible to find where metering equipment is installed for equipment maintenance. See Use Cases – '01_Monitor power and voltage levels to Identify Thermal Capacity and Statutory Voltage Headroom' '02_Determine potential network impact of proposed new demand / generation connections' '03_Determine potential network impact of proposed increase in demand / generation at existing connection points' '04_Monitor demand and generation profiles for network load forecasting' '05_Determine Latent Demand due to Embedded Generation' '06_Identify Voltage Quality Issues'
Criterion	Typically each smart meter will contain information such as: - postcode and house number (note: the latter may change from a plot no. to a postal address following commissioning of the meter) - geographical coordinates depicted as an OS reference with sufficient resolution to define the premises) - MPAN - Communication address - Currently present smart customer devices that will communicate with the meter (device id)
Version	3
Date	Feb-10
Origin	DNORSM

Ref	Now: DNO 01.02
Title	Upon installation the meter will automatically self register and issue a signal to the grid.
Description	The meter will be able to issue self registration information to the grid in order to fully register on the grid.
Rationale	Requirement to provide relevant smart metering detail to appropriate authorised parties. See Use Cases – '01_Monitor power and voltage levels to Identify Thermal Capacity and Statutory Voltage Headroom' '02_Determine potential network impact of proposed new demand / generation connections' '03_Determine potential network impact of proposed increase in demand / generation at existing connection points' '04_Monitor demand and generation profiles for network load forecasting' '05_Determine Latent Demand due to Embedded Generation' '06_Identify Voltage Quality Issues'
Criterion	Typically the meter will register the information such as: - New meter ID - New meter read - Communication address - Meter log information - Related metering system equipment ID (comms box, LV feeder) - Address of the premises - Corresponding Metering system equipment location expressed as an OS reference with sufficient resolution to define the premises
Version	3
Date	Feb-10
Origin	DNORSM

Requirements DNO 01.01 and DNO 01.02 above assume that the smart metering location and detail is used within the DNOs systems to map the electrical connectivity of the meter onto a network map / model (e.g. a GIS system). However, if appropriate and able to pass a cost benefit justification, it would be desirable for the detail of where this specific meter is on the DNO network to be configurable to automatically update the system to adapt to network system reconfigurations.

Ref	Now: DNO 01.03
Title	Metering system will be configurable to automatically update the system to adapt to grid network system changes
Description	The meter will update configurations following network reconfiguration.
Rationale	For meter and grid maintenance purposes. See Use Cases – '01_Monitor power and voltage levels to Identify Thermal Capacity and Statutory Voltage Headroom' '02_Determine potential network impact of proposed new demand / generation connections' '03_Determine potential network impact of proposed increase in demand / generation at existing connection points' '04_Monitor demand and generation profiles for network load forecasting' '05_Determine Latent Demand due to Embedded Generation' '06_Identify Voltage Quality Issues'
Criterion	The metering system will be able to be updated in situ.
Version	3
Date	Feb-10
Origin	DNORSM

When the location of the meter in a DNO's network is known, then information can be captured against which planning activities can be undertaken. This data forms the basis of the following actions:

- Determine Network impact of proposed new demand / generation connections;
- Determine Network impact of proposed increases in demand / generation at existing Connection points; and
- Monitor demand and generation profiles for network load forecasting

4.3.1.2 Ability to measure key data e.g. real/reactive, import/export energy and voltage

Requirement DN 02.01 and DNO 02.02 are focused on the DNO's need to measure import, export, real and reactive power.

Ref	Previously: DNO 01; DNO 03 – Now: DNO 02.01
Title	The metering system will be capable of measuring imported and exported active energy (as B.ELE.012 for ERA)
Description	The metering system will have the capability to support the measurement of imported and exported energy.
Rationale	This will support distributed and micro-generation and will allow the measurement of energy exported to the grid to be measured which is a requirement of feed-in tariffs (FIT). It will also allow the assessment of import / export at each supply point and will facilitate system management and load flow monitoring. Supports energy demand, export profiling, load profiling and voltage profiling. See Use Cases – '01_Monitor power and voltage levels to Identify Thermal Capacity and Statutory Voltage Headroom' '02_Determine potential network impact of proposed new demand / generation connections' '03_Determine potential network impact of proposed increase in demand / generation at existing connection points' '04_Monitor demand and generation profiles for network load forecasting' '05_Determine Latent Demand due to Embedded Generation' '06_Identify Voltage Quality Issues'
Criterion	The meter will have available meter readings for exported and imported active power and energy; i.e. 1. kW import 2. KW export 3. kWh import 4. kWh export
Version	3
Date	Feb-10
Origin	DNORSM

Ref	Previously: DNO 01; DNO 03 – Now: DNO 02.02
Title	The metering system will be capable of measuring imported and exported reactive energy.
Description	The meter will have the capability to support the measurement of imported and exported reactive energy.
Rationale	This helps to establish the reactive demand placed on an electrical system caused by certain home appliances such as devices with induction motors (typically 'wet' appliances and refrigerators) and ultimately supports grid optimisation by providing a measure of the reactive flows and prevailing power factor. It will also allow the assessment of import / export at each supply point and will facilitate system management and load flow monitoring. Supports energy demand, export profiling, load profiling and voltage profiling. See Use Cases – '01_Monitor power and voltage levels to Identify Thermal Capacity and Statutory Voltage Headroom' '02_Determine potential network impact of proposed new demand / generation connections' '03_Determine potential network impact of proposed increase in demand / generation at existing connection points' '04_Monitor demand and generation profiles for network load forecasting' '05_Determine Latent Demand due to Embedded Generation' '06_Identify Voltage Quality Issues'
Criterion	Typically the meter will have available meter readings for reactive energy for import and export (as well as active energy details from DNO 02.01) such as: 1. kVAr import 2. kVAr export 3. kVArh import 4. kVArh export
Version	3
Date	Feb-10
Origin	DNORSM

Requirement DNO 04.04 is linked to the ability of an authorised party to configure and capture specific voltage data that is required to support this overall planning activity.

Ref	Previously: DNO 09 – Now: DNO 04.04
Title	The meter will be configurable to record half-hourly average RMS voltages.
Description	The meter will be able to provide the average voltage determined for the configurable periods e.g. 30 minutes.
Rationale	To support DNOs' statutory obligation to maintain voltage levels at customers' terminals within prescribed limits. See Use Cases – '01_Monitor power and voltage levels to Identify Thermal Capacity and Statutory Voltage Headroom' '02_Determine potential network impact of proposed new demand / generation connections' '03_Determine potential network impact of proposed increase in demand / generation at existing connection points' '04_Monitor demand and generation profiles for network load forecasting' '06_Identify Voltage Quality Issues'
Criterion	The configured average half hourly voltage figure will contain the following information: - Meter id - Time stamp for end of the period during which the average voltage was determined - Average (half hour) RMS voltage (for each phase of a polyphase meter)
Version	3
Date	Feb-10
Origin	DNORSM

4.3.1.3 Ability of smart metering system to store captured data in the meter until transferred to appropriate authorised parties

The requirements that follow are related to the ability of the smart metering system to store the data for prescribed periods of time before transferring this data to an authorised party. The smart meter needs to be able to store configurable data that is measured at the meter.

Ref	Previously: DNO 01 – Now: DNO 02.06
Title	The metering system will record and store energy consumed and exported to the grid using configurable time periods for at least 3 months (similar to B.COM.004 for ERA)
Description	It will be possible to configure the metering system to store the data for at least 3 months to ensure that the Authorised Party would have enough time to access the data.
Rationale	Allows DNOs to receive cumulative (profile) data for certain time periods (monthly, weekly, daily) and extract the stored data when needed. See Use Cases – '02_Determine potential network impact of proposed new demand / generation connections' '03_Determine potential network impact of proposed increase in demand / generation at existing connection points' '04_Monitor demand and generation profiles for network load forecasting' '05_Determine Latent Demand due to Embedded Generation'
Criterion	Typically the Authorised parties will be able to configure the recording of the energy measurements according to their requirements, such as: 1. Active energy and power import and export (kWh/kW) 2. Reactive energy and power import and export (kVArh/kVAr) 3. Power factor 4. kVA maximum (average half hour) for import and export for polyphase meters
Version	3
Date	Feb-10
Origin	DNORSM

Ref	Previously: DNO 09 – Now: DNO 04.11
Title	The meter will store voltage profile data for 3 months
Description	The meter will be capable of storing voltage profile data for at least 3 months.
Rationale	This will make sure that DNO's will be able to capture this data. See Use Cases – '01_Monitor power and voltage levels to Identify Thermal Capacity and Statutory Voltage Headroom' '02_Determine potential network impact of proposed new demand / generation connections' '03_Determine potential network impact of proposed increase in demand / generation at existing connection points' '04_Monitor demand and generation profiles for network load forecasting' '05_Determine Latent Demand due to Embedded Generation' '06_Identify Voltage Quality Issues'
Criterion	The configured average half hourly voltage figure will contain the following: - Meter id - Time stamp for end of the period during which the average voltage was determined - Maximum (half hour avg.) RMS voltage recorded - Minimum (half hour avg.) RMS voltage recorded - Average (half hour avg.) RMS voltage for each half-hour period
Version	3
Date	Feb-10
Origin	DNORSM

Ref	Previously: DNO 10 – Now: DNO 04.12
Title	The meter will continuously store a specified minimum number of Under and Over voltage events
Description	Authorised Parties will be able to specify how many Under or Over voltage events would be stored in the meter and the thresholds for determining Under or Over voltage events in terms of magnitude and duration.
Rationale	This will allow DNOs to store specific information related to under and over voltage events to use in their planning of their infrastructure and in the active management of their network. See Use Cases – '06_Identify Voltage Quality Issues'
Criterion	Typically the meter will store the information for the number of configured Under and Over voltage events and will provide the information such as: - Meter id - Timestamp of event - Voltage level (RMS) - Duration of the under or over voltage
Version	3
Date	Feb-10
Origin	DNORSM

4.3.1.4 Calculate Values using data captured

This section reflects the calculations that need to be done by the smart metering system using the stored data, prior to use.

Ref	Previously: DNO 01 – Now: DNO 02.04
Title	The metering system will be capable of calculating and reporting power factors.
Description	The metering system will report individual power factors as part of electricity readings.
Rationale	Power factor helps to indicate how efficient the electricity usage is. The higher the power factor the more efficient is electricity usage. This will help networks to optimise electricity redistribution. See Use Cases – '01_Monitor power and voltage levels to Identify Thermal Capacity and Statutory Voltage Headroom' '02_Determine potential network impact of proposed new demand / generation connections' '03_Determine potential network impact of proposed increase in demand / generation at existing connection points' '04_Monitor demand and generation profiles for network load forecasting' '05_Determine Latent Demand due to Embedded Generation'
Criterion	The metering system will be able to submit power factor on demand or as configured.
Version	3
Date	Feb-10
Origin	DNORSM

Ref	Previously: DNO 01; DNO 03 – Now: DNO 02.05
Title	The metering system will be capable of deriving and recording maximum (average half hour) kVA for import and export for polyphase meters.
Description	The metering system will derive maximum import and export kVA using average half hourly based readings for polyphase meters.
Rationale	This satisfies the requirement within existing MD tariffs to record maximum demand in kVA. See Use Cases – '01_Monitor power and voltage levels to Identify Thermal Capacity and Statutory Voltage Headroom' '02_Determine potential network impact of proposed new demand / generation connections' '03_Determine potential network impact of proposed increase in demand / generation at existing connection points' '04_Monitor demand and generation profiles for network load forecasting' '05_Determine Latent Demand due to Embedded Generation'
Criterion	- Meter id -Timestamp - kVA maximum (average half hour) for import and export
Version	3
Date	Feb-10
Origin	DNORSM

4.3.2 Identify Voltage Quality Issues (Voltage Sag / Swell - UC 06 Identify Voltage Quality Issues)

This requirement seeks to provide capability to measure voltage sag and swell affects.

Ref	Previously: DNO 11 – Now: DNO 04.06
Title	The meter will provide power quality information as configured and on demand
Description	The meter will provide basic (voltage sag / swell / flicker) power quality monitoring functionality.
Rationale	The DNO wishes to know when specific power quality issues have been breached. See Use Case: '06_Identify Voltage Quality Issues'
Criterion	Typically this would capture information such as: - Meter id - Number of power swells (configurable for the duration and threshold) - Number of power dips (configurable for the duration and threshold) - All events to be time stamped
Version	3
Date	Feb-10
Origin	DNORSM

Ref	Previously: DNO 11 – Now: DNO 04.13
Title	The meter will store a configurable minimum number of power quality event recordings.
Description	The meter will be able to be configured to store a number of power quality information event recordings (voltage sags, swells, flicker).
Rationale	This will allow DNOs to store specific information related to power quality to use in the planning of their infrastructure or in the active management of the network. See Use Cases – '06_Identify Voltage Quality Issues'
Criterion	The meter will be able to provide information on a minimum number of power quality events (to be determined) over a period of 3 months
Version	3
Date	Feb-10
Origin	DNORSM

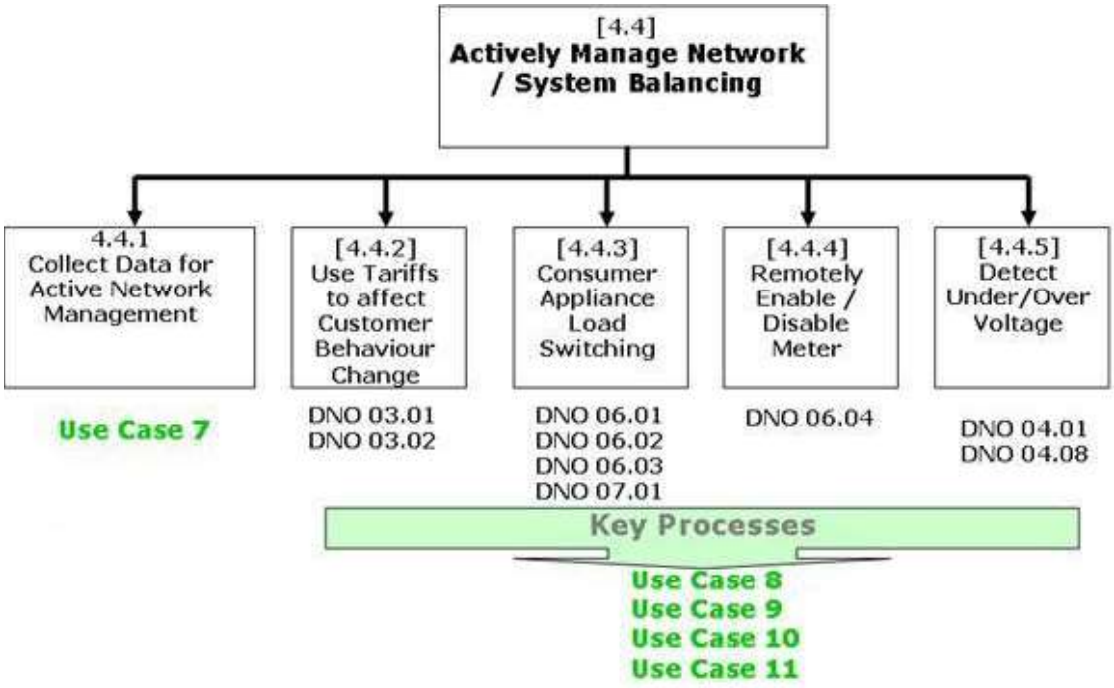
Ref	Previously: DNO 11 – Now: DNO 04.15
Title	The meter shall record power quality events.
Description	The metering system will be able to be configured to record power quality events.
Rationale	The DNO wishes to know when specific power quality events have occurred. See Use Case – '06_Identify Voltage Quality Issues'
Criterion	The meter would typically store appropriate power quality events as configured by the DNO, such as: - Meter id - Number of power swells (configurable for the duration and threshold) - Number of power dips (configurable for the duration and threshold) - Under/Over-voltage events - All events to be time stamped
Version	3
Date	Feb-10
Origin	DNORSM

4.4 Actively Manage Network / System Balance

Diagram 4.3 illustrates the key areas of focus for the DNO activity of 'Actively Manage Network / System Balancing' which is focused on gathering appropriate information to actively manage a much more diverse network with a proliferation of new technology in place.

Many of the requirements discussed in Section 4.3 are applicable in this much more active management of the Network. For planning purposes DNOs needed to collect a block of data as the basis for undertaking planning activities. This activity assumes that we are in a world where there has been a proliferation of new technologies (e.g. EV, heat pumps etc.) and the network operator now has to manage the network in a much more active and 'real-time' mode.

Figure 4.3 – Actively Manage Network / System Balancing



Distribution Network Operators have a requirement to use data from Smart Metering Systems to aid in their active management of the network and in supporting system balancing activity both at Transmission and Distribution levels of the network:

1. Distribution Network Operators will use Smart Metering System information to monitor real and reactive power flow and voltages within their network, to identify or predict where actions are required to keep the network operating within the prescribed limits to deliver electricity safely, reliably and efficiently (Use Case 7). This requires:
    - Rectifying actions which could be implemented by the Distribution Network Operator or NETSO;
    - Using the same monitoring systems to check that the rectifying actions have been successful;

- The Network Operator receives the data and loads it into its system along with data from sensors within networks and other information to identify whether actions are needed or actions that have been carried out have been successful.

2. Active management of Network Voltage (Use Case 08), Perform Active Management of Network Power Flow (Use Case 09) and Perform System Balancing (Use Case 10) reflect the need to ensure that the DNO will be able to manage the network such that power flows, voltages and frequency are maintained within prescribed operating limits at all times. Distribution networks are managed by Distribution Network Operators. While they are currently not managed as proactively, in real time, as transmission networks there is an expectation that this will change in the near future. The application of this control will require:

   - Actions may be taken directly on assets owned and operated by the Distribution Network Operator e.g. operation of:
     - primary or grid transformer tap changing equipment;
     - distribution transformer tap changing equipment;
     - HV or LV voltage regulators;
     - Capacitors / DStatcoms.
   - Alternatively, or in addition, actions may be requested on equipment within the consumer's premises e.g. initiating control actions to:
     - change the load on the network by decreasing or increasing demand;
     - change the operation of in-premise generation.
   - These actions are expected to be used in various combinations to resolve the observed voltage / power flow / forecast energy imbalance issues on distribution networks. It should be noted that although actions on DNO equipment are outside the Smart Metering System Scope, there may be a need for communications from the Smart Meter System to the DNO equipment to initiate action and confirm its effectiveness.
   - Actions within Customers premises: On the demand side, actions will normally be with the agreement of Consumers. There are two key approaches:
     - i) Increase or decrease network power flows by changing consumer demand (See Use Case 8-10 for details of these actions). The mechanisms for changing customer demand in 'operational planning timescales' may range from "softer" controls intended to gain a behavioural response such as by Time of Use Tariffs, Critical Peak Pricing (CPP) or dynamic Tariffs, or through direct control of appliances but allowing Consumer override, to "firm control" such as direct control of use without Consumer override.

- ii) Increase or decrease network power flows by changing generation / storage (See Use Case 8-10 for details of these actions). In addition to demand response mechanisms, there may be corresponding mechanisms to incentivise or curtail export power from micro-generation or returned from storage. Again, this may be influenced by pricing measures at different granularity or by direct control allowing or prohibiting input under particular conditions. Again these actions would be carried out within contracts with Consumers.

3. Check effectiveness of network management / system balancing measures (Use Case 11). There are a range of measures that may be taken to manage power flow, maintain voltages or undertake system balancing. Although some measures may actually control power used or generated to a known amount, many measures are dependent on local conditions, external forces and particularly on consumer response to a signal. In all of these cases it is necessary to check the effectiveness of the mechanism.

4.4.1 Collect Data for Active Management and System Balancing

The key data requirements for collecting this data for active management and system balancing are exactly similar to the data requirements discussed in Section 4.3 under the 'Assessment of Network Performance'. This data will be collected on an ongoing basis from all of the smart metering systems.

The ability of the DNO to actively manage network voltage, power flows and perform system balancing is related to an ability of the DNO to increase / decrease demand and/or distributed generation via one of more of the following:

- Price signals:
  - Time of Use Tariffing (via Use of System charging)
  - Real Time pricing / dynamic pricing (via Use of System charging);
- Direct control via threshold setting or direct control of appliances
  - Power Capping via the application of maximum power thresholds;
  - DNOs taking direct control of consumers' appliances of micro-generation.

4.4.2 Use Tariffs to affect Consumer Behaviour

The requirements stated in this section reflect the use of tariffs to effect a change in consumers' behaviour through a price signal that will allow the DNO to control voltage / power flow and system balancing.

Ref	Previously: DNO 12 – Now: DNO 03.01
Title	The metering system will operate as a multi-rate meter and will support Time of Use, Time of Day, Critical Peak Pricing and Dynamic Pricing (similar B.COM.007)
Description	The meter will be able to support a variety of tariffs including: Time of Use, Time of Day and Critical Peak Pricing tariffs, and Dynamic Pricing
Rationale	This will allow the use of various rates and load profiling by registering, recording and time stamping the data thus facilitating network balancing and constraint management. This will also facilitate demand side management and would allow DNOs to offer ancillary services to NETSO. Use Cases – '08_Active Management of Network Voltage '09_Perform Active Management of Network Power Flows' '10_Perform System Balancing' '11_Check effectiveness of network management / system balancing measures'
Criterion	Typically this option would include different rates/registers such as: - Time based registers including: - time of Day (at least 8 separate daily (day/night) periods) - day of week - critical Peak Pricing - real time pricing - consumption based registers – Block Registers
Version	3
Date	Feb-10
Origin	DNORSM

Ref	Previously: DNO 12 – Now: DNO 03.02
Title	The metering system will support configurable combination of register types (as B.COM.011 for ERA)
Description	The meter will support a range of consumption registration at a certain tariff.
Rationale	This will allow the use of various rates and load profiling by registering, recording and time stamping the data thus facilitating the network balance and manage constraints. This will also facilitate demand side management and would allow DNOs to offer ancillary services to GB System operator. Use Cases – '08_Active Management of Network Voltage '09_Perform Active Management of Network Power Flows' '10_Perform System Balancing' '11_Check effectiveness of network management / system balancing measures'
Criterion	As required by the authorised party.
Version	3
Date	Feb-10
Origin	DNORSM

4.4.3 Consumer Appliance Load Switching

This section relates to the requirements linked to the ability of a DNO to undertake load switching of appliances owned by the householder, which have in some way been contracted to provide a service.

	Previously: DNO 13 – Now: DNO 06.01
Title	The metering system will be able to support remote load management via communication with relevant load management devices and generation.
Description	The Authorised Parties will be able to remotely control certain appliances or in-premise circuits in order to limit or enable demand, or change the operation of in-premise generation via direct access to the communication devices.
Rationale	Allows Authorised Parties to constrain the demand on the network by control of smart consumer appliances (e.g. wet 'appliances', EV charging systems, air coolers) and in-premise generation (e.g. photovoltaic or micro-CHP) in order to support statutory requirements for voltage and frequency levels and optimise grid operation. Use Cases – '08_Active Management of Network Voltage '09_Perform Active Management of Network Power Flows' '10_Perform System Balancing' '11_Check effectiveness of network management / system balancing measures'
Criterion	DNOs will be able to schedule, manage and switch load in real time. For scheduled actions, the meter will display the proposed action and scheduled time. The meter will relay commands to the Energy Management System or dedicated circuits or appliances. For voluntary load management actions the customer will accept or reject the scheduled action.
Version	3
Date	Feb-10
Origin	DNORSM

Ref	Previously: DNO 13 – Now: DNO 06.02
Title	The metering system will support basic load control functions
Description	The Authorised Party will be able to directly access smart appliances via the smart metering system to carry out basic functions.
Rationale	Allows Authorised Parties to control consumer appliances to effect load control. This is used in cases of network constraints and/or when providing network balancing services. Use Cases – '08_Active Management of Network Voltage '09_Perform Active Management of Network Power Flows' '10_Perform System Balancing' '11_Check effectiveness of network management / system balancing measures'
Criterion	The meter shall allow appropriate load control functions as deemed necessary by the DNO. All actions will be recorded with appropriate time stamp.
Version	3
Date	Feb-10
Origin	DNORSM

Ref	Previously: DNO 13 – Now: DNO 06.03
Title	The meter will support an Emergency Override Command
Description	The Authorised Party will be able to override other activities in an emergency override command.
Rationale	To help in dealings with emergencies. Use Cases – '08_Active Management of Network Voltage '09_Perform Active Management of Network Power Flows' '10_Perform System Balancing' '11_Check effectiveness of network management / system balancing measures'
Criterion	Typically the Emergency Override Command would specify such things as: • Start Time for the override in Hours and Minutes. The Start Time shall also allow: commence immediately. • Duration of the Override After emergency override completion the meter will return to previous settings.
Version	3
Date	Feb-10
Origin	DNORSM

This requirement provides detail of fact that smart metering system needs to have a communication link to any distributed and micro-generation to allow it to affect any control actions.

Ref	Previously: DNO 13 – Now: DNO 07.01
Title	The metering system will be able to support distributed and micro-generation via communication with generation meters.
Description	The Authorised Parties will be able to receive data from the generation meter via the communication network.
Rationale	Allows DNOs to manage micro and distributed generation. Use Cases – '08_Active Management of Network Voltage '09_Perform Active Management of Network Power Flows' '10_Perform System Balancing' '11_Check effectiveness of network management / system balancing measures'
Criterion	DNOs will be able to receive customer generation data via communication network of the smart metering system.
Version	3
Date	Feb-10
Origin	DNORSM

4.4.4 Remotely enable / disable meter

This requirement deals with the ability to remotely enable or disable supply to the customer.

Ref	Previously: DNO 14 – Now: DNO 06.04
Title	The meter shall be configurable to enable and disable Meter Load limit Exceeded Switching (as B.ELE.005; B.ELE.022 for ERA)
Description	It will be possible to configure the system to disable automatically when a customer's load exceeds a predefined limit and duration.
Rationale	Can be used as a safety or simple load limiting feature. The threshold may be set to a level where the switch would not operate for normal short-term peaks of demand. Use Cases – '08_Active Management of Network Voltage '09_Perform Active Management of Network Power Flows' '10_Perform System Balancing' '11_Check effectiveness of network management / system balancing measures'
Criterion	To be defined.
Version	3
Date	Feb-10
Origin	DNORSM

4.4.5 Detect under / Over Voltage Levels

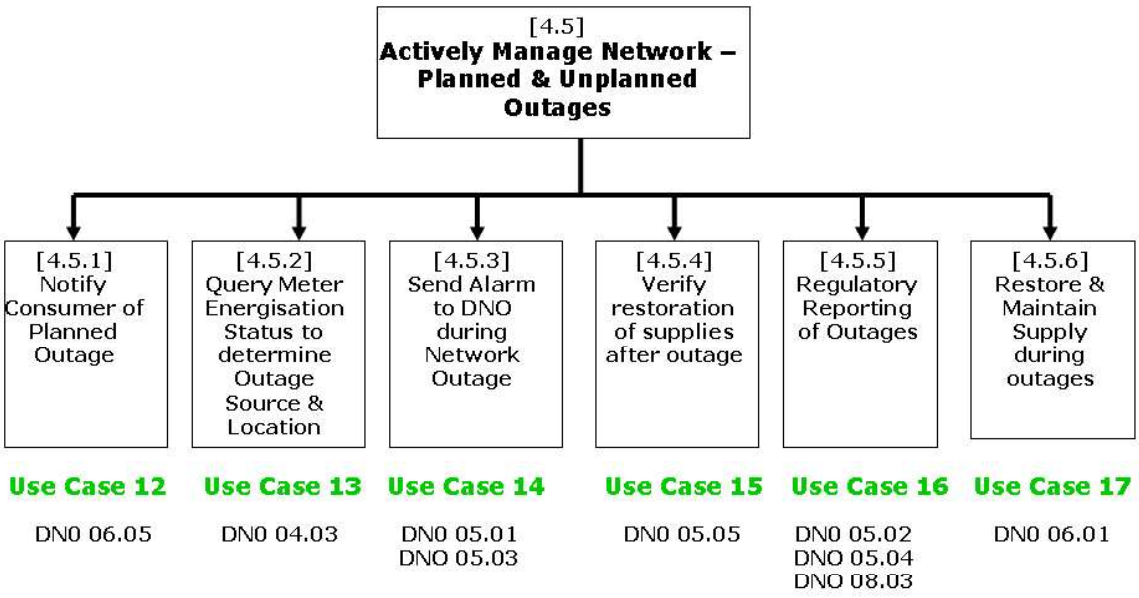
This requirement deals with the ability of the smart metering system to detect under and over voltage.

Ref	Previously: DNO 10 – Now: DNO 04.01
Title	The meter shall detect under voltage and over voltage levels.
Description	The meter will have the capability of detecting an Over or Under voltage condition. The over and under voltage levels will be configurable by the Authorised Party.
Rationale	To avoid equipment damage and reduce risk of fire hazard. Use Cases – '08_Active Management of Network Voltage '10_Perform System Balancing' '11_Check effectiveness of network management / system balancing measures'
Criterion	To be defined in detail later making use of Statutory limits and agreed incremental steps. Statutory limit is -6% and +10% for under and over voltage.
Version	3
Date	Feb-10
Origin	DNORSM

Ref	Previously: DNO 10 – Now: DNO 04.08
Title	The meter will issue an alarm when Over or Under voltage is detected
Description	The meter will automatically issue an alarm to Authorised Parties when Voltage levels are higher or lower than a configured threshold of voltage
Rationale	Allows DNO to configure specific voltages levels and be informed via an alarm that their limits have been breached. Use Cases – '08_Active Management of Network Voltage
Criterion	Typically the meter would provide information such as: - Meter id - Alert type - Level of voltage - Threshold set up - Timestamp - etc
Version	3
Date	Feb-10
Origin	DNORSM

4.5 Actively Manage Network – Planned and Unplanned Outage

This section will focus on the key requirements that support a DNOs ability to deal with planned and unplanned outages.



4.5.1 Notify Consumer of Planned Outage

This requirement expands on what needs to be done to notify a consumer of a planned outage.

Ref	Now: DNO 06.05
Title	The metering system shall be able to receive and display to customer scheduled outage information sent by network operators (similar to B.COM.044 from ERA – ideally this should be able to be configured for different languages)
Description	The customer will be able to receive messages from DNO's regarding planned outages or other planned construction/maintenance work that might cause inconvenience to the customer.
Rationale	To keep the customer informed and of network maintenance and other activities requiring a planned outage. See Use Case: '12_Notify customer of planed outage'.
Criterion	The customer could receive a message such as: 'due to essential network maintenance the power supply to your household will be interrupted between the hours of "hh/mm" and "hh/mm" on the following date: "dd/mm/yyyy"'.
Version	3
Date	Feb-10
Origin	DNORSM

4.5.2 Query Meter Energisation Status to determine Outage Source & Location

When the DNO suspects that there is a problem in a part of their network they can undertake 'polling' of a selection of their smart metering systems within this area to identify if the meter is energised or not. The assumption is that if not energised, then that specific smart metering system is not currently receiving power from the network.

Ref	Previously: DNO 06 – Now: DNO 04.03
Title	The metering system shall support remote meter energisation status check.
Description	It will be possible to check meter energisation status remotely by Authorised Parties.
Rationale	Allows monitoring of quality of supply to the meter. See Use Case – '13_Query Meter Energisation Status to determine Outage Source and Location'
Criterion	To be defined in detail later. Typically the smart metering infrastructure could be able to remotely determine such information as – Energisation status (energised / de-energised) – The status of a Supply Switch ('on' or 'off' or 'null') – Timestamp of loss of supply
Version	3
Date	Feb-10
Origin	DNORSM

4.5.3 Send Alarm to DNO during Network Outage

These requirements reflect the need for the smart metering system to be able to detect that there has been a loss of supply and to be able to issue a notification (Alarm) to this effect.

Ref	Previously: DNO 08 – Now: DNO 05.01
Title	The metering system shall detect loss of supply to meters.
Description	The metering system will be able to detect a loss of supply to the meter and will issue notification when this is detected.
Rationale	To manage outages and network failures. See Use Case – '14_Send Alarm to DNO during Network Outage'
Criterion	Meter will be able to identify when an outage occurs at the premises and collect appropriate time-stamped data related to the loss of supply.
Version	3
Date	Feb-10
Origin	DNORSM

This requirement indicates that once the smart metering system has detected a supply outage it will be able to gather appropriate information related to this loss of supply and issue an alarm to the appropriate authorised party (including DNO) that this has occurred to allow the DNO to respond to this and seek to correct it. This information may need to be controlled to avoid overloading DNO internal systems.

Ref	Previously: DNO 08 – Now: DNO 05.03
Title	The meter will issue an alarm when loss of supply is identified.
Description	The meter will automatically issue an alarm to the authorised party upon identification of loss of supply to the meter after a time delay of between 3 and 5 minutes, unless the supply is restored within that period in which case the alert will not be sent.
Rationale	To allow facilitation of outage management on the network. See Use Case – '14_Send Alarm to DNO during Network Outage'
Criterion	To be defined in detail later. Typically this will capture detail related to - meter id - meter location - timestamp detailing the time of the loss of supply
Version	3
Date	Feb-10
Origin	DNORSM

4.5.4 Verify Restoration of Supplies after Outage

As well as the ability to provide an alarm or allow the authorised party to check the energisation status of the meter, it is a requirement that detail regarding all supply outages is collected and reported on a regular basis to all the relevant authorised parties.

Ref	Previously: DNO 07 – Now: DNO 05.05
Title	Metering system shall be able to issue a notification when the meter loss of supply has been restored.
Description	The meter will issue confirmation to the Authorised Party when it detects the supply has been restored.
Rationale	To allow facilitation of outage management on the network. See Use Cases: '15_Verify Restoration of supplies after Outage'
Criterion	Typically this would result in a diagnostic report being produced automatically. DNO's will also be authorised to remotely request a meter diagnostic/error report. The outage restoration information could typically include information such as: - meter id - meter location - meter energisation status - outage duration - timestamp of restoration of supply
Version	3
Date	Feb-10
Origin	DNORSM

4.5.5 Regulatory Reporting of Outages

The smart meter must be able to store the configurable data that has been defined by the authorised parties and hold that information within the smart meter memory for the configured period. This information must then be made available to the authorised party for use in regulatory reporting.

Ref	Previously: DNO 07 – Now: DNO 05.02
Title	The metering system will store loss of supply information for a configured period
Description	The Authorised Party will be able to configure the meter to store meter loss of supply detection information for a configured period.
Rationale	To allow facilitation of outage management on the network. See Use Case: '16_Regulatory Reporting of Outages'
Criterion	The data must be held within the meter system for at least 3 months allowing sufficient time for periodic transfer of the data into a DNO data archiving system. The meter will typically record the following information (To be confirmed): - meter id - outage duration - timestamp of loss of supply - timestamp of restoration of supply
Version	3
Date	Feb-10
Origin	DNORSM

A specific illustration of this is related to the configurable event of an outage that exceeds 18 hours, as part of the Guaranteed Standard of Service (GSS).

Ref	Previously: DNO 07 – Now: DNO 08.03
Title	The metering system will store occurrences of 'over 18 hour loss of supply' GSS failures for 3 months
Description	The metering system will keep the details of 'over 18 hour loss of supply' GSS failures for at least 3 months to ensure the Authorised Parties have sufficient time to access the data.
Rationale	Authorised Parties need to be able to capture detail to verify claims for payments and for regulatory reporting purposes. See Use Case: '16_Regulatory Reporting of Outages'
Criterion	Typically the metering system will store the following information for a minimum of 3 months: - meter id - number of 'over 18 hour loss of supply' GSS failures - corresponding timestamp and duration of each failure
Version	3
Date	Feb-10
Origin	DNORSM

Once the relevant outage data that needs to be captured is configured in the meter and this data is captured and stored, it needs to be communicated as a report to the relevant authorised parties. Part of this reporting process will be to notify authorised parties that the supply has been restored.

Ref	Previously: DNO 07 – Now: DNO 05.04
Title	The metering system shall be able to communicate the meter loss of supply duration information.
Description	The Authorised Party will be able to communicate a report on losses of supply based on the configuration set.
Rationale	To allow facilitation of outage management on the network. See Use Case: '16_Regulatory Reporting of Outages'
Criterion	The metering system will record the following information: - meter id - outage duration - timestamp of loss of supply - timestamp of restoration of supply
Version	3
Date	Feb-10
Origin	DNORSM

4.5.6 Restore & Maintain Supply during Outages

This requirement has already been mentioned in Section 4.4 – Actively manage Network / System Balancing. In this instance the specific aspect of the requirement being considered is the ability to control these devices to provide an efficient restoration of supply. The objective would be to limit the load that could be drawn by customers so as to be able to restore supplies to customers affected by a fault i.e. equitably sharing the capacity of the depleted network. An example of this in the context of a radial LV system would be restoring supplies to a substation affected by an HV fault via an alternative LV source that might not have the capacity to meet the total additional demand presented by that substation. Limiting the demand on both the alternative LV source and the affected substation could permit all supplies to be restored.

	Previously: DNO 13 – Now: DNO 06.01
Title	The metering system will be able to support remote load management via communication with relevant load management devices and generation.
Description	The Authorised Parties will be able to remotely control certain appliances or in-premises circuits in order to limit or enable demand, or change the operation of in-premises generation via direct access to the communication devices.
Rationale	Allows Authorised Parties to constrain the demand on the network by control of smart consumer appliances (e.g. wet 'appliances', EV charging systems, air coolers) and in-premises generation (e.g. photovoltaic or micro-CHP) in order to support statutory requirements for voltage and frequency levels and optimise grid operation. Use Cases – '08_Active Management of Network Voltage '09_Perform Active Management of Network Power Flows' '10_Perform System Balancing' '11_Check effectiveness of network management / system balancing measures' '17_Restore and maintain supply during outages'
Criterion	DNOs will be able to schedule, manage and switch load in real time. For scheduled actions, the meter will display the proposed action and scheduled time. The meter will relay commands to the Energy Management System or dedicated circuits or appliances. For voluntary load management actions the customer will accept or reject the scheduled action.
Version	3
Date	Feb-10
Origin	DNORSM

4.6 Manage Safety Issues

This section will focus on the key requirements that support a DNOs ability to maintain a safe and secure electricity network.

Figure 4.5 – Safety related requirements

4.6.1 Manage Meter Safety Alarm

4.6.1.1 Temperature Sensor

This requirement applies to the metering system if a temperature sensor is incorporated within the meter (an alternative might be to include the sensor within a connector block – see DNO 02.10 under 4.7.1 below).

Ref	Previously: DNO 17 – Now: DNO 02.11
Title	Where meter has an in-built temperature sensor it will enable the detection of an overheating condition.
Description	The meter will be able to support temperature sensing to detect an overheating condition and militate against risks arising from reduced inspections of the service termination. See Use Case – '18_Manage meter safety alarm'
Rationale	This functionality may be able to militate against a less frequent inspection regime due to the discontinuation of manual meter reading coupled with the possibility of increased loading on the service equipment due to new types of load – for example Electric Vehicle charging equipment.
Criterion	The meter interface will allow inclusion of temperature sensor when this is specified. It will be possible to configure the sensor to record temperatures above a specified threshold.
Version	3
Date	Feb-10
Origin	DNORSM

4.6.1.2 Detect Reverse Polarity

This requirement arises due to the danger to life created by a reverse polarity condition and the increased probability of such a condition arising as a consequence of the smart meter roll out programme. Justification will be subject to a cost vs. benefit analysis.

Ref	Now: DNO 04.02
Title	The metering system will be configurable to detect reverse polarity at the meter position.
Description	The meter will have the capability to support detection of reverse polarity at the meter position.
Rationale	To reduce the possibility of this dangerous condition remaining undetected. See Use Case – '18_Manage meter safety alarm'
Criterion	The meter will be configured to detect reverse polarity; the metering system will produce a notification to the Authorised Party that this has been detected, with associated timestamp.
Version	3
Date	Feb-10
Origin	DNORSM

Ref	Now: DNO 04.10
Title	The meter will issue an alarm when it detects Reverse Polarity
Description	The meter will have the capability to configure an alarm to the Authorised Parties when reverse polarity is detected.
Rationale	To reduce safety issues. See Use Case – '18_Manage meter safety alarm'
Criterion	Typically the meter will issue an alarm containing the information such as: - meter id - alert type i.e. Reverse Polarity detected - timestamp
Version	3
Date	Feb-10
Origin	DNORSM

4.6.1.3 Meter will incorporate measures against tampering

This requirement is needed to ensure that the smart meter will incorporate measures against tampering. It is assumed that these requirements will be similar to those required by a Supplier, but they are restated for completeness.

Physical Tampering

This requirement covers physical tampering with the smart meter and the associated ERA requirements are shown for reference. Under a reduced inspection regime (discontinuation of manual meter reading) the possibility of detecting physical tampering is reduced.

Ref	Previously: DNO 15, Now: 10.01
Title	The meter will detect physical tamper attempts (as per B.COM.003 from ERA)
Description	The metering system shall be no more susceptible to fraud than modern 'non-smart' meters.
Rationale	Fraud prevention (and detection) is a fundamental requirement, and the introduction of smart metering cannot be a retrograde step. See Use Case – '18_Manage meter safety alarm'
Criterion	Typically the meter would register information for physical intervention such as: - equipment identifier for the meter that detected the physical intervention; - time stamp the moment of the intervention. - alert type The meter would be expected to detect the following tamper attempts: - terminal cover removal - meter cover removal - attempted unauthorised electronic access - contactor/switch bridged (may require contactor/switch to be rated for fault breaking) - current exceeds configurable level within configurable time period (to detect possible faults)
Version	3
Date	Feb-10
Origin	DNORSM

Tampering using a Magnetic Field

It is not clear if this requirement linked to tampering is covered by ERA.

Ref	Previously: DNO 15, Now: 10.02
Title	The metering system shall be immune to magnetic fields from normal magnets.
Description	The metering system will be able to resist magnetic fields from magnets. Where the magnetic field exceeds 200 mT the metering system will produce an alarm.
Rationale	The meters shall not be susceptible to magnetic fields up to 200 mT; stronger magnets cause a tamper alert. See Use Case – '18_Manage meter safety alarm'
Criterion	Meters shall not be susceptible to magnetic fields up to 200 mT; stronger magnets cause a tamper alert.
Version	3
Date	Feb-10
Origin	DNORSM

4.6.2 Manage Extreme Voltage at Meter

The smart metering system will have configurable parameters linked to extreme under and over voltage levels to be recorded. Statutory limits are +10% and -6% on 400/230V; however, the purpose of this requirement is to detect extreme voltages that might arise as a consequence of an open-circuit LV neutral conductor or a failure of AVC equipment.

Ref	Previously: DNO 10 – Now: DNO 04.07
Title	The meter shall provide configurable parameters to support extreme under or over-voltage detection.
Description	The meter will detect a voltage excursion beyond a specified threshold of magnitude and time and issue an alarm to the Authorised Party.
Rationale	See Use Case: '19_Manage Extreme Voltage at meter'.
Criterion	– specified voltage threshold and specified duration exceeded – set threshold for the extreme under and over voltage magnitude – set threshold for the duration of the extreme under and over duration – level of voltage detected – alarm dispatched – meter id
Version	3
Date	Feb-10
Origin	DNORSM

Ref	Previously: DNO 10 – Now: DNO 04.14
Title	The meter shall be configurable to automatically disable supply at the meter on detection of extreme under or over voltage.
Description	When the meter detects a potentially dangerous over or under voltage condition the meter will initiate supply disablement.
Rationale	See Use Case – '19_Manage Extreme Voltage at meter'
Criterion	On detection of the over or under voltage level as programmed by the DNO the meter will automatically initiate supply disablement and will issue a notification to the DNO of the actions undertaken. Typically this will be: - level of voltage detected - set threshold for the extreme under and over voltage magnitude - set threshold for the duration of the extreme under and over duration - initiation of supply disablement - confirmation the supply has been disabled - event time-stamped - meter id
Version	3
Date	Feb-10
Origin	DNORSM

4.7 Support Network Activities - Configure Smart metering System

This section deals with the requirement that Network Operators can configure the smart metering system for all the key functionalities that are important to support their overall management of the network; for example:

- Initiating functionality to gather network planning data;

- Introduction of new use-of-system tariff structures, such as time of use and critical peak use of system charges (which should be reflected in the Suppliers tariff prices);
- Amendments to parameters for alarms and corrective actions, such as trigger levels for high/low voltage alarms and automatic load disconnection;
- Synchronisation of the meter's internal clock to ensure accurate time stamping of information, such as load profile data and outage duration.

4.7.1 Ability to configure the Smart Meter to support Planning & Active Management of Network

The requirements that follow are linked to the ability to configure the smart meter to support activities linked to Planning Network Reinforcement and/or the ability to actively manage the network

Ref	Previously: DNO 01, DNO 03 – Now: DNO 02.07
Title	The metering system will support meter reading schedules configurable by Authorised Parties (as B.COM.005 from ERA)
Description	The configurable option will allow parties to analyse the network load and capacity in order to carry out future network optimisation and forward planning.
Rationale	Allows for DNOs to adopt different approaches to how the meter collects and transmits meter reading information and load profiles as per DNO requirements. See Use Case – '20_Configure Smart Metering System'
Criterion	Typically the Authorised parties will be able to configure the relevant energy measurements according to their requirements; for instance: 1. Cumulative active energy and demand import and export (kWh/kW) 2. Cumulative reactive energy and demand import and export (kVArh/kVAr) 3. Active energy (kWh) and power (kW) (average half hour) import or export 4. Reactive energy (kVAh) and reactive demand (kVAr) (average half hour) import or export 5. KVA maximum (average half hour) import and export for polyphase meters supporting MD tariffs 6. Power factor 7. Metering system diagnostics 8. Etc.
Version	3
Date	Feb-10
Origin	DNORSM

Ref	Previously: DNO 01 – Now: DNO 02.08
Title	The metering system will provide configurable on-demand information (as B.COM.006 from ERA)
Description	The metering system will be able to communicate certain readings and energy data on demand by Authorised Parties.
Rationale	Allows Authorised Parties to request ad hoc read information from the meter. See Use Case – '20_Configure Smart Metering System'
Criterion	Typically the Authorised parties will be able to receive the following on demand readings, as configured: 1. Cumulative active energy and demand import and export (kWh/kW) 2. Cumulative reactive energy and demand import and export (kVArh/kVAr) 3. Active energy (kWh) and power (kW) (average half hour) import or export 4. Reactive energy (kVAh) and reactive demand (kVAr) (average half hour) import or export 5. KVA maximum (average half hour) import and export for polyphase meters supporting MD tariffs 6. Power factor 7. Metering system diagnostics 8. Meter energisation status (energised / de-energised) 9. Etc.
Version	3
Date	Feb-10
Origin	DNORSM

This requirement is an alternative to DNO 02.11 under 4.6.1.1 above and addresses DNOs' concerns that the discontinuation of mandatory visual inspections (MOCOPA) once smart meters are deployed could lead to a risk that faulty termination equipment might go undetected. While it is assumed that physical damage would be reported by a responsible customer, a heat build up due to a poor connection at the service termination, connector block or meter might go unnoticed. Such conditions have been known to lead to fires.

The internal temperature of a meter at full load is 140 degrees centigrade. The issue is whether the meter could differentiate between a normal internal operating temperature and an external temperature rise at a connector block.

This alternative to DNO 02.11 recognises that the requirement for heat detection could be delivered through the deployment of a separate device (for example within the connector block) which would communicate through the smart metering system as an alternative to being incorporated within the smart meter.

Ref	Previously: DNO 17 – Now: DNO 02.10
Title	The metering system will support temperature sensing incorporated within an external device – for example a device incorporated within the connector block.
Description	The metering system will be able to support temperature sensing incorporated within an external device by communicating a signal received from the device.
Rationale	This functionality may be able to militate against a less frequent inspection regime due to the discontinuation of manual meter reading coupled with the possibility of increased loading on the service equipment due to new types of load – for example Electric Vehicle charging equipment See Use Case – '18_Manage meter safety alarm' '20_Configure Smart Metering System'
Criterion	The meter interface will support an external temperature sensor when this is specified. It will be possible to configure the sensor to record temperatures above a specified threshold
Version	3
Date	Feb-10
Origin	DNORSM

This requirement is linked to the meter being able to issue a notification to the Authorised Party of a specific configurable event occurring.

Ref	Previously: DNO 01 – Now: DNO 02.12
Title	The metering system will be configurable to notify the Authorised Party of any meter event.
Description	The metering system will produce a notification to the relevant Authorised Party about certain metering events.
Rationale	Allows DNOs to be notified of the metering system event See Use Case – '20_Configure Smart Metering System'
Criterion	The Authorised parties will typically be able to receive information on metering system events such as: 1. Supply enable/disable 2. Error occurrence in the metering system 3. Loss of Supply detection 4. Meter Register change 5. Under or Over voltage 6. All time-stamped as necessary
Version	3
Date	Feb-10
Origin	DNORSM

Ref	Previously: DNO 09 – Now: DNO 04.05
Title	The metering system will be configurable to provide the average, max and min voltage on-demand.
Description	The metering system will be able to provide the average, maximum or minimum voltage data on request by the Authorised Party.
Rationale	For the maintenance of the network, planning activities, voltage optimisation to minimise losses and system monitoring. See Use Case – '08_Active Management of Network Voltage' '20_Configure Smart Metering System'
Criterion	To be defined in detail later. Typically the average half hourly voltage could typically contain the following: - Meter id - Time stamp for end of the period during which the average voltage was determined - Actual voltage specified in V - Average V - Max V - Min V - Time period of the readings used
Version	3
Date	Feb-10
Origin	DNORSM

4.7.2 Daily Synchronisation

This requirement deals with the ability to remotely synchronise the time in the metering system to a defined time, to allow synchronisation. This is linked to being able to pick-up meter related data that is accurately time-stamped.

Ref	Previously: DNO 16, Now: DNO 11.01
Title	The meter will be capable of accurate remote synchronisation (as B.COM.052;B.COM.054 from ERA
Description	The meter will have the functionality to respond to daily synchronisation signals to ensure continued accurate time-stamping of information.
Rationale	To maintain ongoing accuracy of the time and date where required. See Use Case – '20_Configure Smart Metering System'
Criterion	The accuracy requirement is not anticipated to be in excess of that required by Suppliers.
Version	3
Date	Feb-10
Origin	DNORSM

4.7.3 Configurable Outage Details to be captured

It is a requirement that the capture of outage related data should be configurable and what is shown below relates to a specific example of such a configurable case. It illustrates the need to capture all outages that require over 18 hours to fully restore it. This has to be reported as part of the Guaranteed Standard of Service (GSS).

Ref	Previously: DNO 07 – Now: DNO 08.01
Title	The meter shall be configurable to identify GSS (>18 hour) failures
Description	The meter will detect supply interruption related Guaranteed Standard of Service failures as defined by DNO's.
Rationale	To allow the authorised party to configure the information that will be captured, within the allowed parameters such as duration (trigger for GSS) See Use Cases - '16_Regulatory Reporting of Outages' '20_Configure Smart Metering System'
Criterion	DNO's must provide GSS configuration information for smart meters to be entered upon installation or remotely configured into the metering system. The meter will be able to record the entered GSS threshold information and will issue a notification when this occurs.
Version	3
Date	Feb-10
Origin	DNORSM

Ref	Previously: DNO 07 – Now: DNO 08.02
Title	The metering system will be configurable to detect GSS (>18 hour) failures the metering system will record the event
Description	In the event if a GSS (>18 hour) failure the metering system will record the event. Authorised parties will be able to interrogate the metering system to identify GSS (>18 hour) failures
Rationale	Authorised party needs to know when a configurable failure has occurred. See Use Cases - '16_Regulatory Reporting of Outages' '20_Configure Smart Metering System'
Criterion	When the entered threshold is exceeded the meter will produce the following information to the Authorised Parties: - Meter id - Type of GSS failure - Timestamp and duration of the failure
Version	3
Date	Feb-10
Origin	DNORSM

5 Gas Requirements Review

5.1 Original Requirements Review

Based on answers to questions posed related to gas requirements, the Requirements Workshop, various gap analysis evaluations and subsequent discussions around Gas Use Cases it was agreed that the following original requirements provided in response to DECC's consultation process (Reference 2) either were not required, or were considered as covered by Suppliers needs and not directly related to GDNs needs. These are as follows:

5.1.1 GDN 01 (Gas Valve) and GDN 02 - 04 (Gas Valve related requirements)

GDNs outlined that the key point with regard to a valve and a gas smart meter is linked to the definition of "isolation" for gas and whether it is permanent or temporary. If gas leaks then it is still a requirement that gas is switched off at the Emergency Cut-off Valve (ECV)[1].

The following issues were highlighted:

- Valve is in the meter, so it cannot be relied on and is not covered by rules that network businesses need to follow.
- Valve would be more useful if GDN's could identify where the meter is on their network;
- Valve could be used for load shedding, but when GDNs carry out load sheds the domestic load shed is the last one and creates a serious problem as, once the gas supply can be reinstated, every premises is visited by an accredited Competent Person (Registered with Gas Safe) to ensure that the installation, connected pipework and appliances are safe and meet current industry standards;
- Situation where valve might be useful was in cases of network failure (assume small incidents of circa 250 properties or less) where isolation would prevent the need to purge the system to re-establish supply. If the area with supply issue was identified quickly and this data could be used via a system (quickly) to enact relevant valve closure and get confirmation that it had worked correctly, then it might be useful to GDNs. This is the requirement that the GDNs have considered under Use Case 03 (Gas Disablement by GDN). All other aspects related to a gas valve are assumed to be there for Revenue purposes and are assumed to be a Retailer requirement and not a Network requirement.
- The point was made that a gas valve may add complications, including a false sense of security (a specific issue where the valve is "sold" to the end use as a "safety device") and potential for non-function (after extended periods of non-operation).

GDNs mentioned the potential comparison of time of deploying the valve versus the time to deploy a 'man in a van'. Depending on whether the incident is

[1] IGEM/G/1 "Defining the end of the Network, a meter installation and installation pipe work"

controlled or uncontrolled, different time might be needed for operation of the valve:

- 97% of Uncontrolled incidents must be dealt with within 1 hour;
- 97% of controlled incidents must be dealt with within 2 hours.
- These are assessed on a case by case basis analysis e.g. we can smell gas.
- The point was made that a problem cannot be addressed by closing a valve comprising part of a meter installation (as the Emergency Control Valve is part of the GDN system and the responsibility for isolation lies with the GDN).

In essence, these requirements would ensure a form of control to reduce a potential gas escape that may put the public at risk.

5.1.2 GDN 07 - 08 (Low and High Pressure Alarm and isolation)

This was viewed as ECV side of regulator issue and it was decided to drop these as requirements.

5.1.3 GDN 09 (Tamper Alarm)

The GDNs accepted that the functionality contained in ERA requirements (B.COM.030-035) would be sufficient for their purposes.

Theft of Gas is a Supplier issue and not a GDN concern.

5.1.4 GDN 10 (Minimum Battery life)

The stated 10 years was based on the current pre-payment meter battery requirements. GDNs would be happy with a longer life.

GDNs are happy that ERA requirement B.GAS.010 (The metering system will include a battery capable with providing functionality throughout the asset life of the meter) will meet their requirements.

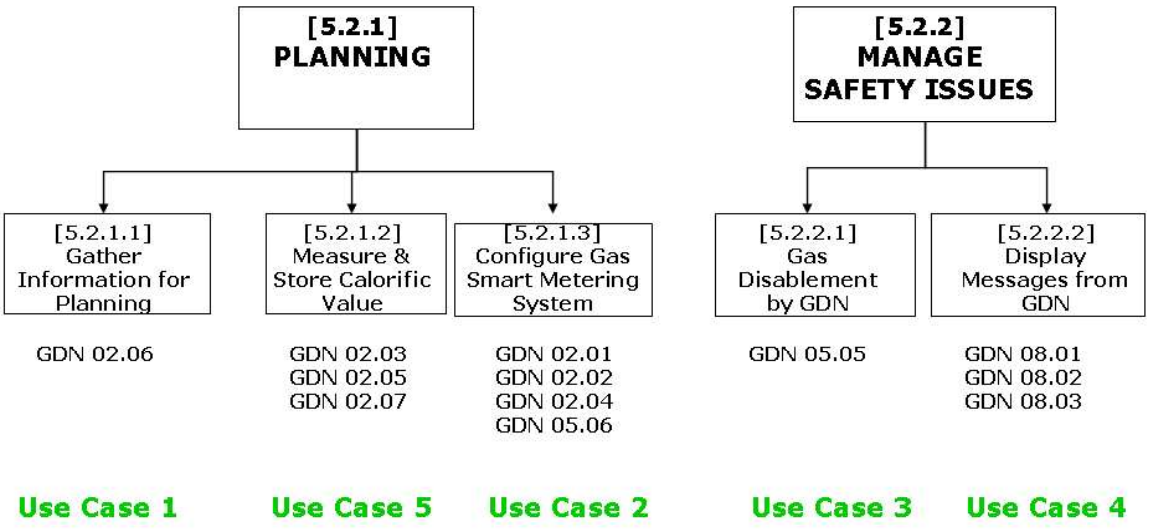
5.2 Updated Gas Requirements

Prior to the development of the Use Cases a number of updated requirements were identified and documented. As part of the review process a number of these were considered to be already covered by the requirements of Retailers and these were not core to specific Gas Network Operators' requirements. These requirements and any other requirements that were identified as not required as core for GDN's are provided in Appendix C for completeness.

The communication requirements for GDNs have already been covered in Section 3. This section will focus on the following:

- Section 5.2.1: Planning
- Section 5.2.2: Safety

Figure 5.1 – Key Gas Requirements



The table below summarises the Use Cases referred to in Diagram 5.1.

Table 5.1 – Gas Use Cases

Key activities for Network Businesses	Use Case Detail level
Planning	01_Gather Information for planning
	05_Measure & Store Calorific Value
	02_Configure Gas Smart Metering System
Manage Safety Issues	03_Gas Disablement by GDN
	04_Display Messages from GDN

5.2.1 Planning

Gas Distribution Network Operators currently use populations of data loggers attached to specific samples of meters to gather data used for a number of purposes including planning of the network infrastructure and for the development of data for estimation and demand modelling.

Smart meters could be configured to provide similar data measurements to Gas Distribution Network Operators. This would allow the Gas Distribution Network Operators to avoid deploying specialised equipment for this purpose and the flexibility would allow for larger or more targeted samples – leading to more accurate or representative data and hence better output from models.

The demand data recorded, the interval of the data, and delivery of data would be configured remotely by the Gas Distribution Network Operators. The data may be required over a yearly, monthly or daily frequency dependent on the specific network requirement or the optimum method of providing the data. For example they may only want data from specific Smart Metering Systems during

defined winter and summer months, or during specific times of the day, such as morning and evening peaks, or minimum consumption over night. Once the period of interest comes to an end, then these specific meters could be configured to cease collecting this data.

The data can be used for planning network infrastructure such as assessing capacity for new connections or whether a local network can cope with the input of gas (such as biogas, coal-bed methane and Liquid Natural Gas) during periods of low demand. This will inform investment decisions and allow more efficient use of the network, including the potential to avoid networks being over engineered for capacity.

5.2.1.1 Gather Information for Planning

These requirements relate to the ability of the gas smart meter to be able to record and store gas related data to a predefined configuration.

Ref	Now: GDN 02.06
Title	The metering system will store recorded gas consumption using configurable time periods for at least 3 months (similar to B.COM.004 for ERA)
Description	Gas meter should be able to store meter gas reads using time intervals as configured by the Authorised Party.
Rationale	This will ensure that GDN's have sufficient time to access the necessary data. See Use Case; '01_Gather information for planning'
Criterion	To be defined in detail later. Typically a Gas meter could record information such as: - Equipment id - Timestamp - Meter state - Counter value - Unit of measurement - Indication if the meter reading was corrected for temperature (yes/no) - Etc.
Version	3
Date	Feb-10
Origin	ENA

5.2.1.2 Measure & Store Calorific Value

Currently the CV is relatively stable and assumed CV value could be applied to convert volumes of gas consumed into appropriate energy. As the mix of gas introduced into the gas network becomes increasingly variable e.g. bio-gas, it is more likely that the CV will vary geographically and over time. To allow the Gas Smart Metering system to deal with this variability, there are two possible approaches that can be taken. One assumes (GDN 02.03) that CVs are measured elsewhere in the system by the GDN and these values are uploaded into the Gas Smart Metering System to be applied in the energy calculations.

Ref	Previously: GDN 06 - Now: GDN 02.03
Title	Gas meter will be configurable to receive confirmed calorific and correction values sent by the Authorised Party.
Description	Gas meter will be configurable to receive confirmed calorific and correction values sent by the Authorised Party with date and time stamp for start of its applicability.
Rationale	To provide accurate billing information on the meter display. See Use Case; '05_Measure & Store Calorific Value"
Criterion	Typically the GDN would send the following Calorific value information to the meter every day: -Confirmed calorific values according to geographic regions -Date for start of its applicability -Timestamp for start of its applicability
Version	2
Date	Feb-10
Origin	ENA

If the approach of uploading CV values to the meter is to be used in converting consumption to energy, then it will be necessary to have the CV stored from installation of the meter and it should apply from this point in time as configured.

Ref	Previously: GDN 06 - Now: GDN 02.05
Title	CV data will be used by meter from its start date and time as configured.
Description	CV will be sent to meter location with specified date and time stamp of its applicability, the meter will understand this and will apply accordingly.
Rationale	To provide accurate billing information on the meter display. See Use Case; '05_Measure & Store Calorific Value'.
Criterion	Meter will correct kWh consumption according to CV data sent using date and time specified for the applicability of the CV.
Version	3
Date	Feb-10
Origin	ENA

An alternative to GDN 02.03 would be if the Gas Smart Metering System had the functionality built into the meter to allow it to measure the CV at the meter and on a continuous basis derive and apply the appropriate CV. To ensure consistency with the information displayed to the customer, it is likely this information would be sent to the Supplier together with consumption data. The cost of this additional functionality would need to be assessed against the potential benefits it would provide over the simpler GDN 02.03 requirement implementation of this.

	GDN 02.07
Title	Gas meter will be capable of supporting the measurement and storage of calorific values within the metering system.
Description	Smart Gas metering system will be able to measure the CV within the meter where required without the need for GDNs to send the latest CV to the meter.
Rationale	To provide accurate billing information on the meter display. The solution whereby CV was measured at each smart meter would fulfill the need to measure CVs. The largest benefit is that CV "shrinkage" would be minimised, reducing the costs applicable to Suppliers and that billing would be equitable for all domestic consumers. See Use Case '05_Measure and store Calorific Value'.
Criterion	Gas meter will be able to measure the CV to the accuracy required by the Gas Calculation of Thermal Energy Regulations.
Version	3
Date	Mar-10
Origin	ENA

5.2.1.3 Configure Gas Smart Metering System

To provide flexibility the smart meter must be configurable to capture data at the granularity and frequency that is required (within the memory constraints that exist in the smart meter).

Ref	Previously: GDN 05, Now: GDN 02.01
Title	Gas meter shall be able to record meter reads through configurable time intervals (as B.COM.004 for ERA).
Description	Gas meter should be able to record meter gas reads using time intervals as configured by the Authorised Party
Rationale	This will provide valuable information to network operators when analysing peak flow days. See Use Case: '02_Configure Gas Smart Metering System'
Criterion	Typically the gas meter would record information such as: - Equipment id - Timestamp - Meter state - Counter value - Unit of measurement - Indication if the meter reading was corrected for temperature (yes/no) - Etc.
Version	3
Date	Feb-10
Origin	ENA

Ref	Previously: GDN 05, Now: GDN 02.02
Title	Gas meter shall be configurable to upload gas data reads to central storage facility at defined times.
Description	It will be possible to determine when the gas meter reads are transferred to the central storage facility, for example, on a monthly basis at off peak hours.
Rationale	This will provide valuable information to network operators when analysing peak flow days. See Use Case; '02_Configure Gas Smart Metering System'
Criterion	Gas meter shall be able to upload the configurable gas information at off-peak times.
Version	2
Date	Feb-10
Origin	ENA

This requirement highlights the need to be able to configure when a gas valve will be open and closed remotely.

Ref	Previously: GDN 01 Now: GDN 05.06
Title	Meter valve will be configurable to close and enable controlled opening of gas flow remotely (as B.GAS.004 from ERA).
Description	Meter to incorporate a valve that can be configured to enable and disable gas flow remotely.
Rationale	This could be used to manage local system emergency maintenance. See Use Case; '02_Configure Gas Smart Metering System'
Criterion	The switching equipment must have two positions (open/closed) The valve must reliably isolate the gas supply. This must be achieved even after several years of non-use.
Version	2
Date	Feb-10
Origin	ENA

In the option where the CV is uploaded into the Gas Smart Metering System, then to provide flexibility the smart metering system must be configurable to capture data at the granularity that is required (within the memory constraints that exist in the smart meter) and calculate specified parameters from this data.

Ref	Previously: GDN 06 - Now: GDN 02.04
Title	Gas meter will use calorific values to convert gas volumes into energy values in kW and kWh (as B.GAS.014 for ERA).
Description	Gas metering system will be able to use calorific values to modify energy values and store the values as corrected.
Rationale	To provide accurate billing information on the meter display. See Use Case; '02_Configure Gas Smart Metering System'.
Criterion	The gas meter will be able to receive updated correction and calorific values from the relevant parties.
Version	3
Date	Feb-10
Origin	ENA

5.2.2 Safety

Both of these requirements are related to specific aspects of Gas Safety.

5.2.2.1 Gas Disablement by GDN

A number of the requirements related to gas valve operation are not considered to be necessary for GDNs.

The one identified situation where a gas valve might be useful to GDNs was in cases of network failure (assume small incidents of circa 250 properties or less) where isolation would prevent the need to purge the system to re-establish supply. Section 4.1.1 has already expanded on issues around why a Gas Valve would not be a key requirement for GDNs related to isolation. A number of requirements linked to Gas Valves not considered as relevant to GDNs are provided in Appendix C for completeness.

Many of those requirements provided in Appendix C support the use of a gas valve as a Revenue Protection approach which is required by Suppliers.

The requirement below highlights what the GDN would require a gas valve to do, if the valve was present.

Ref	Previously GDN 02 – Now: GDN 05.05
Title	The metering system will acknowledge positive valve closure/opening.
Description	Positive response from Meter where a valve closure has been requested that the valve has operated successfully.
Rationale	Allows a GDN to receive confirmation that a new operation mode has been successfully implemented by the metering system or identify any failures. See Use Case – '03_Gas Disablement by GDN'
Criterion	This will be defined in detail later. Typically the meter automatically acknowledges the operation mode and could send information such as: - The equipment id - Timestamp - Valve position (open/closed/released – ready to be turned) - Reason (on demand, threshold, etc.) In case of an error the meter will produce the following error alarm: - The equipment id - Error type - Timestamp - Valve position
Version	2
Date	Feb-10
Origin	ENA

5.2.2.2 Display Messages from GDN

These are examples of messages that GDN may wish to display to the Consumer via the Smart Metering System display of the In-Home Display.

Ref	Now: GDN 08.03
Title	The metering system shall be able to receive and display to customers scheduled gas disconnection information sent by network operators (similar to B.COM.044 fro ERA)
Description	The customer will be able to receive messages from GDN's on planned gas disablement.
Rationale	To keep the customer informed.
Criterion	The customer will receive a message similar to following: 'due to network balancing purposes the power supply to your household will be interrupted for 'hh or mm or dd" on the following date: "dd/mm/yyyy" Use Case: 04 Display Messages from GDN.
Version	3
Date	Feb-10
Origin	DNORSM

These requirements are linked to the need to be able to display gas valve related information on the smart meter.

Ref	Previously GDN 01, Now: GDN 08.01
Title	Where meter has a valve, the meter shall provide a visual display of the time remaining before the Valve Switch will automatically switch to the on (closed) or off (open) position.
Description	The metering system will provide time remaining until the valve position change.
Rationale	To keep the customer informed.
Criterion	The metering system display will provide time (hh/mm) left until the valve change position. Use Case: 04 Display Messages from GDN.
Version	3
Date	Feb-10
Origin	DNORSM

Ref	Previously: GDN 01, Now: GDN 08.02
Title	Where meter has a valve, the meter will display status of the valve switch.
Description	It will be possible to see on the display whether the valve is open or closed.
Rationale	To keep the customer informed.
Criterion	Typically this could be i.ON ii.NULL iii.OFF Use Case: 04_Display Messages from GDN.
Version	3
Date	Feb-10
Origin	DNORSM

6 Smart Metering System Requirements Timelines

6.1 Introduction

All of the requirements now specified are considered as being required as part of the smart metering system from day 1. This reflects the need to collect data initially to use in infrastructure planning processes, but that once the emergence of new technology takes hold (e.g. EVs, heat pumps etc.) then this same data will be needed in much more immediate timescales for electricity networks.

In the tables below, the requirements that are viewed as needing some feedback from meter manufacturers and a cost benefit analysis undertaken are highlighted in yellow.

6.2 Electricity Requirements

Key Activities for Network Businesses	Updated Ref	Description	1st generation of smart meters	
			All meters	Specific areas
Assess Network Performance	DNO 01.01	The meter shall provide functionality to set location information in the meter after the meter is physically installed or changed but before the meter is deployed.	✓	
	DNO 01.02	Upon installation the meter will automatically self register and issue a signal to the grid.	✓	
	DNO 01.03	Meter will be configurable to automatically update the system to adopt to grid network system changes	✓	
	DNO 02.01	The metering system will be capable of measuring imported and exported active energy (as B.ELE.012)	✓	
	DNO 02.02	The metering system will be capable of measuring imported and exported reactive energy.	✓	
	DNO 02.04	The metering system will be capable of calculating and reporting power factor.	✓	
	DNO 02.05	The metering system will be capable of deriving maximum (average half hour) kVA for import and export for polyphase meters.	✓	
	DNO 02.06	The metering system will record and store energy consumed and sold to the grid using configurable time periods for at least 3 months (similar to B.COM.004 for ERA)	✓	
	DNO 04.04	The meter will be configurable to provide the average, max and min voltage during scheduled periods.	✓	
	DNO 04.06	The meter will provide power quality readings as configured and on demand	✓	
	DNO 04.11	The meter will store voltage profile data for 3 months	✓	
	DNO 04.12	The meter will continuously store a specified minimum number of Under and Over voltage events	✓	
	DNO 04.13	The meter will store a configurable minimum number of power quality readings.	✓	
	DNO 04.15	The meter shall record Quality of Supply events.	✓	
Actively Manage Network / System Balancing	DNO 03.01	The metering system will operate as a multi-rate meter and will support Time of Use, Time of Day and Critical Peak Pricing (similar B.COM.007)	✓	
	DNO 03.02	The metering system will support configurable combination of register types (as B.COM.011)	✓	
	DNO 04.01	The meter shall detect under voltage and over voltage levels.	✓	
	DNO 04.08	Meter will issue an alarm when Over or Under voltage is detected	✓	
	DNO 06.01	The metering system will be able to support remote load management via communication with relevant load management devices and generation meters.	✓	

Key Activities for Network Businesses	Updated Ref	Description	1st generation of smart meters	
			All meters	Specific areas
	DNO 06.02	The metering system will support basic load control functions	✓	
	DNO 06.03	The meter will support an Emergency Override Command	✓	
	DNO 06.04	The meter shall be configurable to enable and disable Meter Load limit Exceeded Switching. (as *B.ELE.005; B.ELE.022 for ERA)*	✓	
	DNO 07.01	The metering system will be able to support distributed and micro-generation via communication with generation meters.	✓	
Actively Manage Network – Planned & Unplanned Outages	DENO 04.03	The metering system shall support Remote meter energisation status check.	✓	
	DNO 05.01	The metering system shall detect loss of supply to meters.	✓	
	DNO 05.02	Meter will store loss of supply information for at least 3 months.	✓	
	DNO 05.03	The meter will issue an alarm when loss of supply is identified.	✓	
	DNO 05.04	Meter shall be able to communicate the meter loss of supply information.	✓	
	DNO 05.05	Meter shall be able to issue a notification when the meter loss of supply has been restored.	✓	
	DNO 06.01	The metering system will be able to support remote load management via communication with relevant load management devices and generation meters.	✓	
	DNO 06.05	The metering system shall be able to receive and display to customer scheduled outage information sent by network operators (similar to B.COM.044)	✓	
	DNO 08.03	Meter will store occurrences of GSS failures for 3 months	✓	
Manage Safety Issues	DNO 02.11	Where meter has an in-built temperature sensor it will enable connector temperature reading on demand.	✓	
	DNO 04.02	The meter would be configurable to detect reverse polarity at a customer's connection.	✓	
	DNO 04.07	The meter shall provide configurable parameters to support Under and Over-voltage recording.	✓	
	DNO 04.10	The meter will issue an alarm when it detects Reverse Polarity.	✓	
	DNO 04.14	The meter shall be configurable to automatically disable supply on Meter Under or Over Voltage.	✓	
	DNO 10.01	The meter will detect physical tamper attempts *(as per B.COM.003; B.ELE.007 for ERA)*	✓	
	DNO 10.02	The meters shall not be susceptible to magnetic fields up to 200 mT; stronger magnets cause a tamper alert as per 50470.	✓	
Support Network Activities	DNO 02.07	The metering system will support meter reading schedules configurable by Authorised Parties (as B.COM.005)	✓	
	DNO 02.08	The metering system will provide configurable on-demand information (as B.COM.006 for ERA)	✓	
	DNO 02.10	The metering system will support configurable measurement of temperature of the connector block.	✓	
	DNO 02.12	The metering system will be configurable to notify the Authorised Party of any meter event.	✓	
	DNO 04.05	The meter will be configurable to provide the average, max and min voltage on-demand.	✓	
	DNO 08.01	Meter shall be configurable to identify GSS failures (e.g. >18 hour restorations).	✓	
	DNO 08.02	Meter will issue notification to the Authorised Party when GSS failures occur	✓	
	DNO 11.01	The meter will be capable of accurate remote synchronisation (as B.COM.052;B.COM.054)	✓	

6.3 Gas Requirements

Key Activities for Gas Network Business	Updated Ref	Description	1st generation of smart meters	
			All meters	Specific areas
Planning	GDN 02.01	Gas meter shall be able to record meter reads through configurable time intervals. (B.COM.004)	✓	
	GDN 02.02	Gas meter shall be configurable to upload gas data reads to central storage facility at certain times.	✓	
	GDN 02.03	Gas meter will be configurable to receive confirmed calorific and correction values sent by the Authorised Party.	✓	
	GDN 02.04	Gas meter will use calorific and correction values to calculate energy values in kW and kWh. (as B.GAS.014)	✓	
	GDN 02.05	CV data will be used by meter from its start date and time as configured.	✓	
	GDN 02.06	The metering system will store energy consumed and sold to the grid using configurable time periods for at least 3 months (similar to B.COM.004)	✓	
	GDN 02.07	Gas meter will be capable to support measurement of calorific values within the metering system.	✓	
	GDN 05.06	Meter valve will be configurable to open and close gas flow remotely. (as B.GAS.004)	✓	
Manage Safety Issues	GDN 05.05	The metering system will acknowledge positive valve closure/opening.	✓	
	GDN 08.01	Where meter has a valve, the meter shall provide a visual display of the time remaining before the Valve Switch will automatically switch to the on (closed) position.	✓	
	GDN 08.02	Where meter has a valve, the meter will display status of the valve switch.	✓	
	GDN 08.03	The metering system shall be able to receive and display to customers scheduled gas disconnection information sent by network operators (similar to B.COM.044)	✓	

7 Other Implications for Networks of Smart Metering linked changes

This Section highlights some additional points that need to be noted with regard to the introduction of smart metering / smart grids to Network businesses.

7.1 Impact on DNO Systems & Processes

It is likely that some of the key decisions taken by Ofgem with regard to how smart meters will be deployed in GB, and the associated changes in how the market may deal with data, are likely to have an impact on Network business internal systems. Such changes have not been factored into the recent price review process, which means that there will be only limited, if any funds available to undertake these internal system updates over the DPCR5 period unless a re-opener is agreed – for example to allow logging up of such costs.

Suppliers also have to make major changes to their processes and systems, but they have been planning for these changes for some time and are not restricted by being a regulated business.

"Thickness" of functions (e.g. in terms of amount of data held centrally or comms managed centrally)

If a thick data model is linked to the Central Communication provision (i.e. many functions) then the impact on network back-office processes could be significant. In simple terms, to interface to the CCP, many systems and processes may require considerable change or replacement at significant cost and time.

For example if a central registration service were to be implemented the network business current registration service (SMRS) would 'wither on the vine' as customers are migrated to smart metering. For some network businesses this would have a knock on effect to their Asset and Fault Management systems which use SMRS data for Address and site information. In a worse case situation if the primary numbering system (MPAN) were to be replaced by a central reference then many other systems could be impacted. This issue would not be unique to networks, but would impact the whole of the industry.

In addition to the registration and address management processes of network businesses other areas which could be impacted include, but is not limited to:

- Use of meter reading information
- DUoS billing
- Network processes – New Connections, Disconnections, De-energisations etc.
- Data Transfer Service
- Existing Governance/License obligations
- Data access and quality
- Reporting obligations

St Clements Services acts as the agent of the Distribution Network Operators (DNOs) in providing the existing technical solution, Metering Point Registration

System (MPRS), for metering point registration to satisfy the Licence DSOs Metering Point Administration Service (MPAS) requirements. This solution has provided a robust and reliable back-bone to the needs for meter registration under the existing trading arrangements.

The MPAS service providers have a number of concerns with any proposal to centralise the entirety of the registration function. These can be summarised as follows:

- **Development Cost.** Replacing the existing distributed system with a new all encompassing central system will be costly – the industry value of any such change needs to be established.
- **Data Quality.** The loss of co-location between a metering point registration service and the local LDSO will inevitably lead to much poorer data quality.
- **Settlements.** The registration process and MPRS are a key input into the settlements process. This occurs through the supplier agent and Supplier Volume Allocation Agent (SVAA) which ultimately facilitates the use of system billing process. It is vital that DSOs have the same view of metering points on their network for billing purposes as the SVAA uses for its settlements calculations. Providing registration control to a central third party would jeopardise the accuracy of settlements and thus use of system billing which could ultimately see customers unnecessarily impacted.
- **Implementation timescales and priorities.** The MPAS services and associated systems are a fundamental building block of the existing trading arrangements which have delivered a robust and confident environment in which suppliers and customers can operate. The design and implementation of these registration processes took a considerable amount of time and money to develop. The limited amount of industry expert knowledge should be focused on delivering the new processes needed to support smart metering, not spread to undertake a mass re-design of the market. Such an approach would bring substantial risks to the project, both in terms of achieving the required implementation dates and maintaining a robust registration system.
- **Distribution Licence Obligations.** Any desire to move to centralised registration would require a change to the current obligations DSOs have to provide an MPAS Registration System (Condition 18 of the Electricity Distribution Licence and Part IV of the Master Registration Agreement).

These points are emphasised to ensure that all key stakeholders fully appreciate the potential financial impact on a number of industry participants that may not have been fully factored into the overall CBA for GB.

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8 Key Points to Note about Network Requirements

Although there will be a commonality of requirements between Network Businesses and Suppliers, it is critical that all stakeholders fully understand and appreciate the impact that certain network requirements will have now and as Smart Grids begin to become a reality.

8.1 Planning v Active Management of Networks

Since much of the need for active management of electricity and gas networks will be driven by the timing of adoption of new carbon neutral technologies such as micro-generation, Electric Vehicles, electric heat pumps etc.

This means that in the early stages of the GB smart metering roll-out, the need for network specific data will be primarily to assist in the infrastructure planning process of Network Businesses. This planning process, by its very nature, requires access to historic rather than real-time data, and this means that the emphasis will be on ensuring that the smart metering system has a storage buffer sufficient to ensure that data can be systematically downloaded to the Networks' systems where it can be archived for longer periods (for example to provide a complete 12 month profile). However, as the take-up of new technologies expands, this will put major strains on the network businesses (especially the DNOs) and they will need to move to a much more 'active' management of their networks. This will require much more immediate access to key data for example real time voltage measurements as an input to more localised automatic voltage control systems.

This key change in processes will bring with it major implications for the communication network that will support these processes. The question of volume of data, response time and required bandwidths etc., need to be considered and planned for. This will require the procurement of a communication service that will allow this upgrade of the communication infrastructure to occur, or the consideration of how these potentially different communication requirements could be provided separately.

8.2 Key Network Requirements

What follows is a brief resume of key requirements that networks businesses will need to provide to facilitate an enhanced infrastructure planning process initially, which can transition to providing a smart grid capability when required.

8.2.1 Communication Capability

The emphasis in the Networks communication capability is the provision of a flexible communication system that can not only accommodate a variety of technologies that exist now, but can also embrace the inevitable faster communication technology evolution that will occur in the future.

8.2.2 Electricity Networks

The following areas are important to be able to undertake via a smart metering system.

8.2.2.1 Outage Management

DNOs need to be able to detect and react to unplanned outages. This requires an ability to both configure the details collected and obtain reports pertaining to these outages in order to improve the service provided to customers.

8.2.2.2 Import/Export and Active/Reactive Power measurements and capture of profiled data

This information is critical to allow the DNO to understand how distributed generation and the development of new high energy usage applications such as Electric Vehicle charging supplies and heat pumps will have on the operation of their networks. The initial capture and use of this data in infrastructure planning processes will help to instigate load control initiatives that will offset costly infrastructure investment. As this impact grows then this data becomes a key feed into a more proactive management of the electricity network.

8.2.2.3 Voltage Measurement / Profiling / Movement from defined limits

Linked to Section 8.2.2.2 will be the resultant variability of voltage data that needs to be closely monitored / captured and acted upon. This power quality type issue will become more prevalent as the networks increasingly have to accommodate higher levels of utilisation as well as new sources of reactive, disturbing and non-linear demand.

8.2.3 Gas Networks

The following area is important for gas networks.

8.2.3.1 Capture of configurable periods data

Much of the planning process for gas is based on small samples of data gathered from a few sources that are extrapolated. The ability to capture data for selective meters for identified periods will greatly improve the potential benefit that a GDN planning process will have and the actions resulting from this will be much more accurate and optimised than at present.

Appendix A - Glossary

Term	Description
AVC	Automatic Voltage Control
CBA	Cost Benefit Analysis
CBM	Communications Business Model
CEN	European Committee for Standardisation (Deals with all non-electric meter standards).
CENELEC	European Committee for Electrotechnical Standardisation
CPP	Critical Peak Pricing
CV	Calorific Value
DECC	Department of Energy and Climate Change
DG	Distributed Generation
DNO	Distribution Network Operator
DSM	Demand Side Management
ENA	Energy Networks Association
ENSG	Electricity Networks Strategy Group
ESO	European Standards Organisation – CEN, Cenelec & ETSI
DSM	Demand Side Management
ECV	Emergency Cut-off Valve (Gas)
ERA	Energy Retail Association
ETSI	European Telecommunications Standards Institute – deals with all smart metering communication standards
EV	Electric Vehicle
FIT	Feed in Tariff – The schedule of prices per unit of electricity produced and per unit of electricity exported that a supplier must pay to a customer deploying a qualifying generator
GDN	Gas Distribution Network
HAN	Home Area Network
IGEM	Institute of Gas Engineers and Managers
IHD	In Home Display

LAN	Local Area Network
MID	Metering Instruments Directive
MOCOPA	Meter Operation Code of Practice Agreement
NETSO	National Electricity Transmission System Operator
PID	Project Initiation Document
SM-CG	Smart Metering Coordination Group set up by European Standards Organisations – CEN, CENELEC and ETSI to address Mandate M/441 from EU regarding development of smart metering standards for electricity, gas, water and heat meters.
SMRR	Smart Metering Regulatory Regime
SODR	Statement of Design Requirements
WAN	Wide Area Network

Appendix B - Electricity Requirement not included

The following requirements were created prior to the development of the Use Cases, and as part of the Use Case development a number of these were deemed to either be covered by requirements already highlighted by Retailers, or superseded by new requirements post Use Case work.

Display Information on Meter

These requirements relate to the ability to display relevant and pre-defined information on the smart metering system. The DNOs' requirements have assumed that this will be present, or this requirement is not specified as key.

Ref	Previously: DNO 01, Now: DNO 09.02
Title	The meter will clearly indicate whether the Active Power is imported or exported.
Description	The customer will be able to see whether the power at the premises is being exported or imported.
Rationale	Allows DNOs to be notified of the metering system event
Criterion	The metering system will add 'imported' or 'exported'.
Version	3
Date	Feb-10
Origin	DNORSM

Ref	Previously: DNO 14, Now: DNO 09.05
Title	The meter will display status of the Supply cut-off switch.
Description	The metering system will be able to indicate constantly whether the supply switch is on, off or absent (null)
Rationale	Allows customer to be notified of the status of the supply switch.
Criterion	i.ON ii.NULL iii.OFF
Version	3
Date	Feb-10
Origin	DNORSM

Appendix C – Gas Requirement not included

The following requirements were created prior to the development of the Use Cases, and as part of the Use Case development a number of these were deemed to either be covered by requirements already highlighted by Retailers, or they were not considered relevant, post Use Case work.

Meter will incorporate measures against tampering

This requirement was considered needed to ensure that the smart meter will incorporate measures against tampering. It is assumed that these requirements will be similar to those required by a Supplier.

Physical Tampering

This requirement covers physical tampering with the smart meter and the associated ERA requirements are shown for reference.

Ref	Previously: GDN 09, Now: GDN 09.01
Title	The metering system will detect physical tamper attempts *(as per B.COM.003 from ERA)*
Description	The metering system shall be no more susceptible to fraud than modern 'non-smart' meters.
Rationale	Fraud prevention (and detection) is a fundamental requirement, and the introduction of smart metering cannot be a retrograde step.
Criterion	Metering equipment register the following information for physical intervention: - Gas equipment identifier for the meter that detected the physical intervention; - Time stamp of the moment of the intervention. - Alert type The meter will detect the following tamper attempts: - Terminal cover removal - Meter cover removal - Backward running/reverse energy - Attempted unauthorised electronic access - Valve for fault breaking - Flow of gas exceeds configurable level within configurable time period (to detect possible leaks)[2]
Version	3
Date	Feb-09
Origin	DNORSM

[2] ERA Smart meter requirements v2.2

Valve Operation (if present)

This section covers the requirements related to the presence and operation of a gas valve, if there was one present, over and above the simple ability to close the valve discussed in Section 5.2.2.1.

Record & Store Enable / Disable Information

This requirement focuses on the need to record and store information related to enable/disablement of the gas valve. GDN is only interested in disabling gas valve in specific instances and GDNs assume that a Gas valve is present. The requirements described below will be in place to deliver a Retailers' requirements in this area.

Ref	Previously: GDN 01 Now: GDN 05.02
Title	The metering system will record time/date and trigger information of any changes to the enable/disable status of the valve *(B.GAS.018 for ERA)*
Description	The metering system will be able to record any changes to the status of the valve and timestamp it to indicate when this happened.
Rationale	Allows Authorised Parties to keep track of any changes to energy supply status by the metering system.
Criterion	The metering system will record the following information: - Meter id - Event id (e.g. valve status change) - Valve status ('on', 'off', 'null') - Timestamp (YYYY,MM,DD / hh:mm:ss) - Party which authorised and carried out the valve status change
Version	3
Date	Feb-10
Origin	ENA

Ref	Previously: GDN 01 Now: GDN 05.08
Title	The metering system will store the gas enablement/disablement information for at least 3 months
Description	The system will be able to store the configured information for at least 3 months to ensure the parties are able to access the information.
Rationale	This is to ensure that Authorised Parties have enough time to access the data and registered by the metering system. .
Criterion	The data must be held within the meter system for at least 3 months allowing sufficient time for periodic transfer of the data into a DNO data archiving system. The meter will record the following information: - meter id - gas valve status ('on'; 'off'; 'null' – where meter does not have a valve) - timestamp of valve position change - reason for changing the valve position - id of the authorised party which carried out the gas enablement/disablement
Version	3
Date	Feb-10
Origin	ENA

Ref	Previously: GDN 01 Now: GDN 05.09
Title	The metering system will be able to record gas enablement/disablement action.
Description	This functionality allows the smart metering system to report on successful gas enablement or disablement, indicating whether the action has been carried out successfully or not.
Rationale	This allows Authorised Parties to receive necessary information on gas supply enablement / disablement.
Criterion	The meter will be able to produce gas enablement/disablement report. The information will contain - meter id - time stamped changes to valve position - indication of the valve position - reasons for change - responsible party id who carried out the activity - request type - indication whether the disablement and enablement was successful or not - gas flow status (isolated or flowing)
Version	3
Date	Feb-10
Origin	ENA

Valve Operation Characteristics

This describes a number of requirements related to how the valve might operate.

Ref	Previously: GDN 01 Now: GDN 05.03
Title	Valve must not reopen until message received instructing that opening of the valve is permitted. (B.GAS.007 for ERA)
Description	Where an Authorised Party has disabled the gas metering system remotely using the valve, or where the valve has closed for any reason other than insufficient credit balances being maintained, the metering system can be enabled remotely by an Authorised Party, but the valve will not open until there has been positive acknowledgement at the meter that the flow of gas should be restored.
Rationale	Allows gas metering systems to be enabled remotely following disablement, but retains the requirement for customers (or Meter Workers) to confirm their acceptance that it is safe to open the valve.
Criterion	It is anticipated that the metering system could display messages to the customer or on Meter Worker device such as: Metering System Requirements - "ensure that all gas appliances are turned off"
Version	3
Date	Feb-10
Origin	ENA

Ref	Previously: GDN 01 Now: GDN 05.04
Title	Valve must not reopen until customer has acknowledged safe to do so by pressing button on meter. (B.GAS.008 for ERA)
Description	The metering system will only open a valve following a period of disablement where the customer positively acknowledges that they accept that it is safe to do so.
Rationale	Customer is responsible for 'self reconnection' and therefore will need to approve reconnection.
Criterion	It is anticipated that the metering system could display messages to the customer such as: Metering System Requirements - "ensure that all gas appliances are turned off"
Version	3
Date	Feb-10
Origin	ENA

The requirement below may be more of a non-functional requirement which is linked to performance.

Ref	Previously: GDN 03 Now: GDN 05.11
Title	Where gas valve is included, the metering system will facilitate a certain maximum time from instruction to operate valve.
Description	Having called interruption the valve must operate within a reasonable period.
Rationale	
Criterion	Maximum time from instruction to operate valve to its operation to be no greater than 5 minutes. Should the operation take longer, the meter should produce an error report with the following information: - Equipment id - Timestamp of the operation - Status of valve - Error type
Version	2
Date	Feb-10
Origin	ENA

Daily synchronisation

This requirement deals with the ability to remotely synchronise the time in the metering system to a defined time, to allow synchronisation.

Ref	GDN 10.01
Title	Metering system will be capable of accurate remote synchronisation (as B.COM.052;B.COM.054 for ERA)
Description	The meter will have the functionality to respond to daily synchronisation signals to ensure continued accurate time-stamping of information.
Rationale	To maintain ongoing accuracy of the time and date where required.
Criterion	The accuracy requirement is not anticipated to be in excess of that required by Suppliers.
Version	3
Date	Feb-10
Origin	DNORSM

Produce Alarm

If tampering detected then the smart metering system could be capable of producing an alarm to the authorised parties.

Ref	Previously: GDN 09, Now: 09.02
Title	The metering system will produce an alarm on detection of interference or errors with metering equipment. (similar to B.COM.030 for ERA)
Description	The metering system will automatically send the alarm to the Authorised Parties on detection of the tampering or errors with the gas metering equipment.
Rationale	For safety and maintenance reasons.
Criterion	Meter will produce the alarm in case of the following: - Detection of loss of inlet pressure - Tilting from installed angle - Significant vibration - Meter cover removal - Clock resets and faults - Backward running, reverse energy - Attempted unauthorised electronic access - Flow of gas exceeds configurable level within a configurable - time period (to detect possible leaks) On detection of tamper, the meter will produce the following alert: - Equipment id - Alert type - Timestamp
Version	3
Date	Feb-09
Origin	DNORSM

Detection & Alarm

Ref	Now: GDN 04.01
Title	Where meter has a valve, the metering system shall support Remote Valve status check.
Description	Meter will periodically carry out a supply presence check. It will issue an alarm where loss of supply is registered.
Rationale	Allows the monitoring of supply presence at the meter.
Criterion	The smart metering infrastructure shall be able to remotely determine such information as: i. The status of a Supply Valve ('on' or 'off' or 'null') ii. Supply Capacity Limits currently in operation
Version	3
Date	Feb-10
Origin	DNORSM

Ref	Previously: GDN 04 - Now: GDN 04.02
Title	Where meter has a valve, the meter will issue an alarm when supply is detected after shutting down the valve. (similar to B.GAS.009 for ERA)
Description	The meter will have the capability to configure alarm notification to Authorised Parties when supply is still on after shutting down the valve.
Rationale	To improve safety issues.
Criterion	The meter will send the alarm of gas flow detected when valve status is on.
Version	3
Date	Feb-10
Origin	DNORSM

Ref	Previously: GDN 04 Now: GDN 05.01
Title	The metering system will be able to detect gas flow after the valve was closed.
Description	Meter detects that the gas is still flowing even after shutting down the valve.
Rationale	The isolation/ shut down of gas could have failed; therefore it is important to determine whether there is still gas flow after shutting down the valve.
Criterion	Meter detect gas flow when valve position is on 'shut', and produces alarm with the following information: - Timestamp - Equipment id - Error type - Gas valve position - Time of the gas valve shut down request
Version	3
Date	Feb-10
Origin	ENA

If any of these gas quality events were deemed as necessary, then they would be configurable and this data would be captured. This requirement is not seen as necessary at this point in time.

Ref	Now: GDN 04.03
Title	The meter will store Gas Quality of Supply events
Description	The meter will be able to log and store Quality of Supply events.
Rationale	To support Authorised Parties ability to be informed of and act on such events, where possible.
Criterion	The meter will store Quality of Supply Events such as: i. Gas flow detection ii. The Gas Supply valve status has changed state (turned on or off) and the reason (emergency disablement / enablement ; scheduled remote/local connect disconnect) iii. HAN Message (initiated from the SMMS) acknowledgement received by the meter's HAN interface from a HAN device iv. HAN Interface load control report event exception status; and v. Tariff update has been received
Version	3
Date	Feb-10
Origin	DNORSM

Ref	Now: GDN 04.04
Title	The meter will continuously store a specified minimum number of Quality of Supply events
Description	Authorised Parties will be able to specify how many Quality of Supply events will be stored by the meter.
Rationale	To support Authorised Parties ability to be informed of and act on such events, where possible.
Criterion	The meter will store the information for the X number of configured Quality of Supply events:
Version	3
Date	Feb-10
Origin	DNORSM

Support varying tariff structures

The requirement GDN 03.01 illustrates specific tariffs structures that the meter should be able to support. GDN 03.01 illustrates the more general ability to be able to support configurable combination of register types (as B.COM.007 for ERA).

Ref	Now: GDN 03.01 (as DNO 03.01)
Title	The metering system will operate as a multi-rate meter and will support Time of Use, Time of Day and Critical Peak Pricing (similar B.COM.007 for ERA)
Description	The meter will be able to support a variety of tariffs including: Time of Use, Time of Day and Critical Peak Pricing tariffs.
Rationale	This will allow the use of various rates and load profiling by registering, recording and time stamping the data thus facilitating the network balance and manage constraints. This will also facilitate demand side management by the power company and would allow DNOs to offer ancillary services to GB System operator.
Criterion	The options should include the following different rates/registers: - Time based registers – 'Time of Day' - Time of week - Consumption based registers – 'Block Registers' - Calendar based registers – 'Type of Day' - Critical Peak Pricing - Real time pricing - At least 8 separate daily (day/night) periods
Version	3
Date	Feb-10
Origin	DNORSM

This requirement is only relevant if there are gas valves in the smart gas meter.

Ref	Previously: GDN 01 Now: GDN 05.10
Title	The metering system will be able to communicate gas enablement/disablement information
Description	The metering system will be able to send information on gas enablement/disablement events.
Rationale	This allows Authorised Parties to receive necessary information on gas supply enablement / disablement.
Criterion	The meter will be able to produce gas enablement/disablement report. The information will contain - meter id - time stamped changes to valve position - reasons for every change - responsible party id who carried out the activity - time period of the report
Version	3
Date	Feb-10
Origin	ENA