

Smart Metering WAN Communications - Assessment

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Document Control

1.1 Version History

Version	Date	Author	Description
0_1	28 th July 2008	Simon Harrison	Initial draft
1	7 th November 2008	Simon Harrison & Alastair Manson	Final version updated following consultation exercise

1.2 Related Documents

Document Title	Version	Author	Date
Smart Metering Operational Framework, proposals and options	V1	ERA SRSM Project	August 2007
WAN Communications Requirements Definition	V1	ERA SRSM Project for BERR	July 2008
WAN Communications Options Definition	V1	ERA SRSM Project for BERR	July 2008

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1.4 Disclaimer

This document presents an assessment of WAN communications options and approaches. We have used reasonable endeavours to ensure the accuracy of the contents of the document but offer no warranties (express or implied) in respect of its accuracy or that the proposals or options will work. To the extent permitted by law, the Energy Retail Association and its members do not accept liability for any loss which may arise from reliance upon information contained in this document. This document is presented for information purposes only and none of the information, proposals and options presented herein constitutes an offer.

2 Executive Summary and Introduction

2.1 Executive Summary

This document is a product of the Wide Area Network (WAN) Communications workstream, part of the wider project undertaken by BERR to consider smart metering.

It presents assessments of the WAN Communications physical media options in terms of the WAN Communications requirements and against the high level market model proposals.

It does not recommend any of the individual WAN Communications over the others, and is intended to provide detail of advantages and issues to inform the ongoing consideration of market model options.

[Please note that the initial delivery of this document is not intended to represent a final and complete report. It requires revisions and updates from energy and communications experts as part of a process to support ongoing considerations of WAN communications and smart metering].

2.2 Purpose

This document presents a number of assessment matrices. These compare the suitability and compatibility of the WAN communications solutions options with WAN communications requirements and market model proposals.

It does not evaluate or conclude that any particular combination of solution technology and market model is the most appropriate to support smart metering in Britain. WAN communications is one of a number of technical and economic factors that will influence overall market model considerations.

2.3 Scope

The scope of this document is limited to the requirement for two way communications between smart gas and electricity meters and authorised parties.

The diagram below shows the SRSM view of the scope of smart metering, and the place of WAN Communications within that scope:

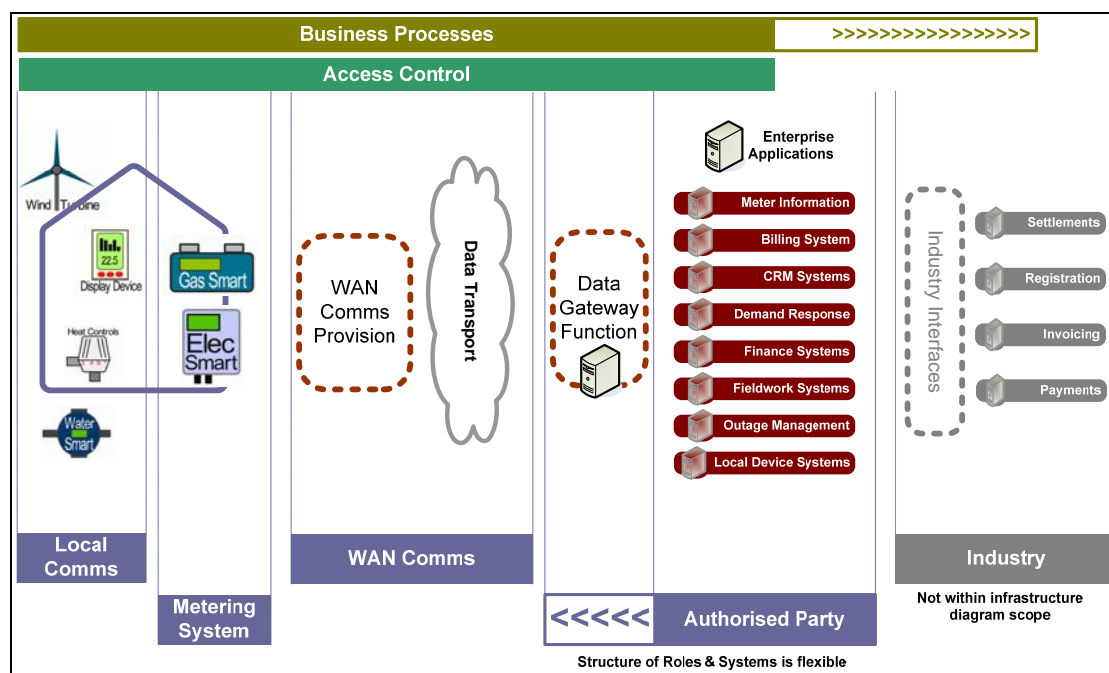


Figure 1: Smart Metering Scope

This document does not address the ‘upstream’ communications options - i.e. beyond the data gateway function, as these, to a large extent, will be dependant upon the market model approaches. Therefore it considers only how smart metering data moves between the meters and the data transport layer.

WAN Communications Options for smart metering are likely to flex over time as technology and commercial arrangements adapt to what is essentially a new GB market for metering communications. This document does not consider the commercial or contracting arrangements or implications for the provision of smart metering communications services.

BERR has stated that the selection of communications for smart metering will be a responsibility of the market in whatever guise that takes.

2.4 Objective

The objectives of the WAN Communications workstream as part of the wider BERR activities have been agreed as follows:

The objective of the WAN Communications workstream of work is to deliver a better understanding of the WAN Communications options and their potential impact on market models to feed into Phase 2 evaluation of market models.

A better description of the communications options and their requirements will enable the impact on market models for each option to be better understood, e.g. constraints, drivers, issues, risks.

What are the practical implications of operating different communications options within the different market models? This is a question that can be started in Phase 1, but will have to be answered in more detail in Phase 2.

The output from this workstream will feed into the market model evaluation planned for Phase 2.

A key objective of this workstream is to bring all stakeholders to a common level of understanding.

3 Glossary & Conventions

For a detailed explanation of the conventions and assumptions used in the preparation of this document, and the defined terms, please see either the 'Definitions of Options' or 'Requirements' documents referenced in 1.2 above.

4 Market Models

The following high level descriptions of market models are taken from a BERR paper seeking views on the suitability of market models. It is used here as the most up to date and current definition of the market model options.

These descriptions and definitions are expected to be refined and updated as the evaluation process progresses - this will include the assumptions.

4.1 Competitive Model

This model would be a minimal evolution of the existing market.

Suppliers would continue to be responsible for contracting for services to:

- Provide meters
- Install meters
- Maintain meters

In addition each supplier would be responsible for contracting for services to provide communications services to support data transfer to and from meters.

Assumptions:

- Industry processes and codes of practice (particularly relating to data flows) would need to be amended.
- An agreement on interoperability would be required to ensure all suppliers could communicate with all meters to operate the required functionality and to minimise future stranding; and
- Given constraints on the life of the battery required for the gas meter there might be one comms link to the home for both meters.

4.2 Centralisation of Communications Infrastructure

Under this model suppliers would continue to be responsible for contracting services to:

- Provide meters
- Install meters
- Maintain meters

The communications infrastructure and related data carriage would be provided by an exclusive centralised communications provider. This might be organised on either an exclusive regional or national basis. All suppliers would be obliged to use the communications services of the centralised provider via licence conditions.

NB: A convincing case would need to be made for provision of this service on an exclusive centralised (regional / national) basis. This would need to be sufficient to address potential UK and EU competition law concerns. However, the competition assessment cannot be completed until the model is sufficiently defined and the analysis of costs and benefits in relation to other models complete.

Assumptions:

- The agreement to support the centralised communications service would include sufficient specifications to ensure interoperability.
- There would need to be an appropriate process for identifying the provider(s) of the centralised communications services.
- The selection process / governance / regulatory structures would need to provide sufficient competition and/or regulatory oversight to ensure that the risk to consumers from excessive costs were minimised.
- There would only be one communications link to the home for both meters.
- The communications services would also be made available to 3rd parties to ensure equal access to the home, to maintain competition in 'smart' home services.
- Industry processes and codes of practice (particularly relating to data flows) would need to be amended.
- An agreement on interoperability would be required to ensure all suppliers could communicate with all meters to operate the required functionality and to minimise future stranding; and
- 3rd parties (e.g. network businesses) would be able to access metering data via the central communications provider(s).

4.3 Centralisation of all Smart Metering Services

Under this option all smart metering services would be provided on a centralised exclusive (national or regional) basis. This would include:

- Provision of meters;
- Installation of meters;
- Maintenance of meters; and
- Communications infrastructure & data carriage

Suppliers would be obliged, via licence conditions, to use only the smart metering services offered by this/these provider(s).

This model could be taken forward in various ways, for instance (among other alternatives):

- via a competitive tendering model which resulted in one provider for all of the above services per designated region. The services would be re-tendered every x years;
- via a competitive tendering model which split the provision of these services in some way (i.e. different exclusive providers for different services). This might be for instance to maximise competition for the

contracts or to ensure that re-tendering could take place at different points for the different services (e.g. it might be desirable to re-tender meter provision, maintenance and installation more often than comms provision) or because it was desirable to contract for some services on a national and some on a regional basis.

NB A convincing case would need to be made for provision of this service on an exclusive centralised (regional / national) basis. This would need to be sufficient to address potential UK and EU competition law concerns. However, the competition assessment cannot be completed until the model is sufficiently defined and the analysis of costs and benefits in relation to other models complete.

Assumptions:

- There would need to be an appropriate process for identifying the provider(s) of the centralised services.
- The selection process / governance / regulatory structures would need to provide sufficient competition and/or regulatory oversight to ensure that the risk to consumers from excessive costs were minimised.
- The communications services would also be made available to 3rd parties to ensure equal access to the home, to maintain competition in these services.
- Under this model the communications device would be included in the electricity meter. The gas meter would be linked to the electricity meter using the home area network and uses the electricity meter's WAN connection to communicate data to the supplier.
- Industry processes and codes of practice (particularly relating to data flows) would need to be amended.
- A (more minimal) agreement on interoperability would be required.
- This model would facilitate a street-by-street roll out and potentially a single visit per household (depending on availability of dual fuel installers).
- 3rd parties would have access to metering data via the central provider(s).

5 Assessment

The main table below uses a matrix format to assess, where possible, each of the communications options against a range of criteria:

- Against the requirements.
- Against additional criteria as suggested by BERR
- For the three market models for a number of key criteria

Where relevant it uses footnotes to explain the position shown.

For a number of the requirements and criteria it will be possible to assess them in terms of:

- Comparing the WAN Communications physical media
- Overall - assessment criteria that are agnostic of physical media - i.e. they are purely service oriented, or general.

Where there are differences that could arise as a result of the market model used, these are noted

- Both the physical media and the market model - e.g. it would be simpler to deploy a PLC infrastructure in a market where communications are centralised

For reference, the WAN Communications Options being assessed:

Reference	Physical Media
PLC	Power Line Carrier
TEL	PSTN/Plain Old Telephone System
DSL	Broadband xDSL
CAB	Cable
CEL	Cellular
RF1	Low Power Radio ¹
LRR1	Licensed/Private Frequency
LRR2	WiMAX
LRR3	WiFi

Key to table entries:

Symbol	Represents
✓	Meets or complies with requirement
✗	Does not meet or comply with requirement
↑	Better fit, more compliant - compared to other options
↓	More issues, less compliant - compared to other options
↔	No better or worse than other options
NA	Not applicable

¹ It is acknowledged that this is a broad category and that different solutions within this category could offer 'last mile' to varying degrees

5.1 Physical Media Assessment

Ref	Requirement/Assessment	Physical Media Option								
		PLC	TEL	DSL	CAB	CEL	RF1	LRR1	LRR2	LRR3
WAN Communications Requirements										
General Requirements										
WG1	Provide Carriage between authorised parties and metering systems ²	✓	✓	✓	✓	✓	✓	✓	✓	✓
WG2	Provide Carriage between authorised parties and devices local to metering systems ³	✓	✓	✓	✓	✓	✓	✓	✓	✓
WG3	Access Controlled Carriage ⁴	✓	✓	✓	✓	✓	✓	✓	✓	✓
WG4	Interoperability	⇩ ⁵	⇩ ⁶	↔	↔	⇧	⇧	↔	⇧	⇧ ⁷
WG5	Utility robust ⁸	✓	✓	✓	✓	✓	✓	✓	✓	✓

² As per the ‘Definition of Options’ paper, it is not envisaged that the Physical Media options will provide end to end connectivity from an Authorised Party to the meters themselves. However, all under consideration are communications solutions that could be suitable for smart metering

³ All WAN Communications options will provide a link to a metering system, the link to local devices will be via Local Communications

⁴ It is likely that security and Access Control will be delivered by applications, alongside inherent security within the options themselves

⁵ Current PLC offerings are typically proprietary from the meter to a head-end system

⁶ Whilst a PSTN fixed line could support interoperable communications as with other telephony options, in the current metering environment products are generally proprietary

⁷ Wi-Fi networks operate using a range of radio transceivers from a range of silicon manufacturers

⁸ Utility robustness will depend upon the design of the metering systems, which will be in accordance with requirements for utility robustness. If a meter cannot be provided with a utility robust WAN connection, it will not operate in the market. This requirement is a metering system design challenge, rather than a particular factor for individual communications options

Ref	Requirement/Assessment	Physical Media Option								
		PLC	TEL	DSL	CAB	CEL	RF1	LRR1	LRR2	LRR3
WG6	Geographic coverage	↑	↑	↓	↓	↑	↔ ⁹	↑	↓	↓
WG7	Premise type coverage	↑	↑	↑	↑	↔ ¹⁰	↔	↔	↔	↔
WG8	Longevity - see MET 2 below									
WG9	Growth of Use (scalability of data traffic)	↓ ¹¹	↓ ¹²	↑	↑	↔ ¹³	↔	↔	↑	↑
WG10 (WC5)	Reasonable cost Reasonable cost									
Supplier Requirements										
WS2 (WC4, WN1)	intermittent 2 way communication Consumer 20-30 minutes latency with expectation of much higher requirement to be established.	↓	↓	↑	↑	↔	↔ ¹⁴	↔	↑	↑

⁹ It is worth noting that radio mesh can service a wider geographic range and variety of premise types than Low Power Radio alone.

¹⁰ Some meter locations - cellars, meter rooms etc. - could cause issues for all radio based physical media

¹¹ The majority of current implementations are reasonably limited in terms of overall capacity and the ability to cope with 'blocking' - i.e. when multiple nodes are attempting to communicate

¹² Dial-up speeds, whilst reasonably high for current AMR applications, are lower than a number of the other physical media under consideration

¹³ Depending on the particular standard adopted, and the commercial arrangements - there may be traffic capacity in the network, but at how much cost?

¹⁴ Radio mesh would improve ability to provide short latency

Ref	Requirement/Assessment	Physical Media Option								
		PLC	TEL	DSL	CAB	CEL	RF1	LRR1	LRR2	LRR3
WS3	The communications solution(s) will support a minimum standard of service.	↔ ¹⁵	↑	↑	↑	↑	↔ ¹⁶	↑	↓ ¹⁷	↓ ¹⁸
WS4	The communications solution(s) will support a prioritised standard of service for the completion of Data Exchanges ¹⁹	NA	NA	NA	NA	NA	NA	NA	NA	NA
WS5	Avoidance of site visits ²⁰	NA	NA	NA	NA	NA	NA	NA	NA	NA
WS6	Communications Secure	✓ ²¹	✓	✓	✓	✓	✓	✓	✓	✓
WS7	Communications resistant to inappropriate interference by any party	↑ ²³	↔	↔	↔	↔	↔	↔	↔	↔

¹⁵ Depending on the protocols in use, PLC may have issues supporting minimum standards of service in busy traffic periods
 It is important to recognise that when operating in accordance with the European Standard EN 50065, PLC is narrowband and capable of being jammed. This is because interfering signals originating from within the customer premises will propagate into the LV network. Indeed there is practical evidence of unintentional interference with PLC signals used for metering. In addition, PLC signals propagate into the customer premises and are thus capable of being intercepted.

¹⁶ Mesh solutions would make it simpler to provide guaranteed service levels

¹⁷ WiMAX will provide a fixed capacity of bandwidth, and if this is being used for other purposes, guaranteeing space for metering will be challenging

¹⁸ Similar to WiMAX, Wi-Fi will see bandwidth being used for other purposes

¹⁹ The physical media itself will not deliver prioritisation, it will be a feature of the service procured and will be delivered using network management techniques

²⁰ The reliability of communications will be a feature covered by a number of factors - only one of which will be the MTBF (mean time between failures) of the physical hardware within the metering system itself. Visits to address issues with data concentrators or other parts of the network would not be seen as analogous to current metering visits to consumer premises

²¹ Narrowband PLC may have limited security

Ref	Requirement/Assessment	Physical Media Option								
		PLC	TEL	DSL	CAB	CEL	RF1	LRR1	LRR2	LRR3
	including the customer. ²²									
WS8	The communications solutions shall be resistant to viruses and other malicious software. ²⁴	↔ ²⁵	↔	↔	↔	↔ ²⁶	↑	↔	↔	↔
WS9	The communications solution(s) will comply with Schedule I Protocol Specification. ²⁷	NA	NA	NA	NA	NA	NA	NA	NA	NA
WS10	The communications solution(s) will comply with Schedule J Data Exchange Format Specification. ²⁸	NA	NA	NA	NA	NA	NA	NA	NA	NA
WS11	The data transport physical media will not alter, corrupt or permanently store any	NA	NA	NA	NA	NA	NA	NA	NA	NA

²³ Communications uses the electricity mains, so includes no vulnerable external components or opportunity for frequency jamming

²² Aside from PLC, all options feature some weaknesses - cutting of wires or radio interference - in one respect radio based solutions are easier targets for interception since you don't need to be physically connected

²⁴ The physical media is not expected to provide the majority of resistance to malicious software although some options do provide their own level of protection.

²⁵ PLC protocols currently tend to be proprietary and transmitted over a medium that is not easily intercepted

²⁶ Cellular communications are not wholly secure, but are protected by existing standards and protocols and use licensed frequencies to transmit

²⁷ All of the options will support a range of protocols - the current IP requirement is natively supported by DSL, CAB, WiFi etc. Others will have specific solutions available to deliver IP or IP equivalent

²⁸ All of the physical media options will support data transfer in any format - the cost and efficiency factors of using one format as opposed to another will vary. A format carrying significant messaging overhead (such as XML) may not be as effective or practical if sent as an SMS message, as it might, for instance, using WiFi

Ref	Requirement/Assessment	Physical Media Option								
		PLC	TEL	DSL	CAB	CEL	RF1	LRR1	LRR2	LRR3
	data it transports. ²⁹									
WS12	The communications solution(s) under reasonable usage profiles, will not critically affect the power consumption or battery life of a Metering System. - see ENV2									
WS13	The communications solution(s) will be capable of meeting the data traffic requirements of the Operational Framework. - Linked to WG9 ³⁰									
Consumer Requirements										
WC1	Safe ³¹	NA	NA	NA	NA	NA	NA	NA	NA	NA
WC2	Not interfere with existing networks	↑	↔ ³²	↔ ³³	↑	↑	↔ ³⁴	↑	↔	↓ ³⁵

²⁹ None of the physical media themselves - wires or radio waves - will 'store' data. Some upstream communications functions may include elements of data manipulation or storage

³⁰ The data traffic requirements remain un-defined. However, it is assumed that the traffic requirements for utility (and 3rd party) services will be very low compared to other applications using the physical media (voice, internet, multimedia).

³¹ It is assumed that all options will be safe

³² Only if the meter is 'sharing' a line with the customer for other purposes

³³ Will depend on the impact of a number of metering systems on the local bandwidth available

³⁴ Depending on the technology and frequency, there may be issues with applications already using the ISM bands (microwaves, WiFi, video senders etc.)

³⁵ Existing use of Wi-Fi networks in close proximity to each other shows that there are interference issues

Ref	Requirement/Assessment	Physical Media Option								
		PLC	TEL	DSL	CAB	CEL	RF1	LRR1	LRR2	LRR3
WC3	Minimal disruption	↑	↔ ³⁶	↔ ³⁷	↑	↔ ³⁸	↔	↔	↓	↓
WC4	Latency ³⁹ See WS2 above									
WC5	Cost See WG10 above									
Network Requirements										
WN1	Latency - See WS2 above									
WN2	Broadcast ⁴⁰	↓ ⁴¹	↓	↑	↑	↔ ⁴²	↔	↑	↑	↑
WN3	Prioritisation - See WS4									
Installer Requirements										
WI1	Repeatable processes	↑ ⁴³	↓ ⁴⁴	↓	↓	↑ ⁴⁵	↔ ⁴⁶	↑ ⁴⁷	↔	↔

³⁶ Assumes a physical wired connection to the metering system - which may or may not be in accordance with the customers preferences

³⁷ Assumes a physical wired connection to the metering system - which may or may not be in accordance with the customers preferences

³⁸ Some radio solutions, particularly for awkward meter locations, could require the use of an antenna or more equipment as part of the metering system

³⁹ The particular QoS performance will depend on the service procured, as opposed to the physical media

⁴⁰ Assumed not to be an issue for higher bandwidth physical media

⁴¹ There are known to be practical issues with broadcasting to current PLC implementations, often requiring careful scheduling and network management

⁴² Depending on the standard in use - sending mass SMS messages will present a different network challenge from sending a GPRS update

⁴³ As PLC communications are 'hardwired' to the electricity supply, there will be little or no configuration at customer site - pairing will all be done at the concentrator or via the head-end system

⁴⁴ All 'wired' telephony solutions could involve linking telephony wiring to metering system during the initial smart meter installation visit at a premises

Ref	Requirement/Assessment	Physical Media Option								
		PLC	TEL	DSL	CAB	CEL	RF1	LRR1	LRR2	LRR3
WI2	Avoidance of visits - See WS5									
Additional Assessment Elements										
Infrastructure Readiness										
INF1	Availability of physical infrastructure today	↔ ⁴⁸	↔ ⁴⁹	↔ ⁵⁰	↓	↑	↓ ⁵¹	↔ ⁵²	↓	↓
INF2	Effort required to implement physical infrastructure	↔ ⁵³	NA	↔ ⁵⁴	↓ ⁵⁵	NA	↔	↑	↓	↓
Technical Capability										
TC1	Effort required to deliver smart metering service in line with requirements - i.e. are	↓ ⁵⁶	↔	↑	↑	↔ ⁵⁷	↔ ⁵⁸	↑	↑	↑

⁴⁵ The infrastructure is pre-existing and does not require devices to be paired to networks by an installer

⁴⁶ Wireless options (except CEL and LRR1) may require some pairing effort to ensure that the metering system can connect to the correct concentrator/network/antenna

⁴⁷ Traditionally there will be no pairing of a meter to a private frequency transmitter, as there is little chance of the communication being paired incorrectly

⁴⁸ Electricity wires are present, upstream equipment in the form of concentrators are not

⁴⁹ Although a fixed line is available to over 90% of domestic premises, utility robust connection may require additional equipment

⁵⁰ Coverage is not national

⁵¹ Infrastructure does not exist today

⁵² Potential networks (and licensed frequencies) exist today, but there are no specific GB implementations, and this could require the installation of equipment at radio towers.

⁵³ Assumes support from distribution networks, or use of turnkey technology that does not require access to substations

⁵⁴ Would need to follow broadband roll out to achieve national/near national coverage

⁵⁵ Will be driven by 21CN and expansion of existing Virgin infrastructure

⁵⁶ Will require new services and service providers

Ref	Requirement/Assessment	Physical Media Option								
		PLC	TEL	DSL	CAB	CEL	RF1	LRR1	LRR2	LRR3
	new network management operations necessary?									
Metering Context										
MET1	Simple upgrade path - e.g. modular construction, use of external communications module ⁵⁹	↓ ⁶⁰	↔	↔	↔	↔	↔	↓ ⁶¹	↔	↔
MET2	Match with metering asset life expectations - i.e. available for at least 15 years and more	↑	↑	↑	↑	↔ ⁶²	↔ ⁶³	↑	↑	↔ ⁶⁴
MET3	Native support for dual fuel & separate fuel supply ⁶⁵	↓	↓	↓	↓	↑	↑	↑	↔	↔

⁵⁷ Will depend on standard being used, but there may be some requirement for specific traffic management for metering messages on lower bandwidth solutions

⁵⁸ RF1 solutions may be dedicated to the metering service and hence reduce effort although there is still a need to build the infrastructure and to manage new assets such as data concentrators.

⁵⁹ Largely dependent on meter design - if future flexibility is required, then meters will be designed with this in mind - it is likely to attract a higher initial cost than an all-in-one solution

⁶⁰ The transceiver/transponder component within an electricity meter is not expected to be simple to change without replacing the entire meter

⁶¹ The use of a specific frequency will require specific radio technology hardware within the metering systems

⁶² Although older cellular technology - e.g. GSM - may have a limited shelf life, the physical hardware and standards should be reasonably backwards and forwards compatible

⁶³ A number of low power radio solutions are new or pending, however this is an area of rapid technology turnover, and obsolescence represents a tangible risk

⁶⁴ WiFi standards have evolved significantly over recent years, and are expected to continue to do so - which may see support for today's solution diminishing as smart metering assets grow older

⁶⁵ Gas meters and wires are not compatible services - however, the use of a communications box in conjunction with a gas meter (assuming a low power radio link to the communications box) would mitigate the issue for wired options

Ref	Requirement/Assessment	Physical Media Option								
		PLC	TEL	DSL	CAB	CEL	RF1	LRR1	LRR2	LRR3
Commercial/Contractual										
CC1	Current GB offering for smart metering, or analogous data transfer services?	↓	↑ ⁶⁶	↔	↓	↑	↔	↑	↓	↔
CC2	Choice of WAN communications infrastructure service providers in GB	↓ ⁶⁷	↑	↑	↓	↑	↔ ⁶⁸	↓ ⁶⁹	↓	↓
CC3	Support for ongoing energy supplier choice in WAN communications service provision	↓ ⁷⁰	↔ ⁷¹	↔ ⁷²	↔ ⁷³	↔ ⁷⁴	↓ ⁷⁵	↓ ⁷⁶	↓	↓
Obligations & Governance										
OB1	Existing licensed communications service provision	↔ ⁷⁷	↑	↑	↑	↑	↑ ⁷⁸	↑	↔ ⁷⁹	↑

⁶⁶ Most current I&C AMR services used fixed line, most secured via Caller Line Identification protocols

⁶⁷ There are potentially multiple providers on geographic basis but see also note on competitive provision

⁶⁸ There are a number of companies in GB with experience of delivering radio mesh solutions

⁶⁹ Use of a private licensed frequency necessarily assumes a single service provider

⁷⁰ Within a geographical area, there will typically be only one PLC service provider. Multiple providers offering bandwidth is conceivable but unlikely

⁷¹ Purchasing bandwidth from a network operator is established practice in the communications market

⁷² Purchasing bandwidth from a network operator is established practice in the communications market

⁷³ Purchasing bandwidth from a network operator is established practice in the communications market

⁷⁴ Current issues with fixed physical SIM>Network are understood to be surmountable technically and commercially

⁷⁵ Whilst there may be multiple Low Power Radio infrastructures accessible to meters, even at the same frequency, the investment in the equipment is likely to be driven by smart metering

⁷⁶ Not applicable if smart metering is to use a private/licensed radio band

⁷⁷ There are existing utility applications of communications using power line carrier

⁷⁸ The majority of Low Power Radio solutions available for smart metering use internationally operate in the unlicensed ISM bands

Ref	Requirement/Assessment	Physical Media Option								
		PLC	TEL	DSL	CAB	CEL	RF1	LRR1	LRR2	LRR3
OB2	Effort required to establish licensed service provision if not already present	↔	NA	NA	NA	NA	NA	NA	↔	NA
Environmental										
ENV1	Power consumption of physical media infrastructure	↑	↑	↔	↔	↓ ⁸⁰	↔	↔	↓	↓
ENV2	Power consumption of physical media hardware within metering system	↑	↔	↓	↓ ⁸¹	↔	↑	↑	↓	↓
ENV3	Sustainability of infrastructure (i.e. new 'greener' components to replace existing, or re-using existing infrastructure)	↔	↑	↑	↔	↔	↓ ⁸²	↔	↓	↓
Customer										
C1	Support for added value services (telecare, security - low bandwidth, low latency etc.)	↔	↔	↑	↑	↑	↔ ⁸³	↔	↑	↑
C2	Support for shared service delivery (internet, voice, entertainment)	↓	↔	↑	↑	↓	↓	↓	↑	↑

⁷⁹ WiMAX licences are understood to be pending

⁸⁰ Cellular communications could require larger batteries in gas meters, and increase the power consumption in electricity meters compared to other technologies

⁸¹ Cable modems assumed to have comparatively high energy consumption

⁸² It is worthy of note that if the local solution and the WAN last mile is the same then there is only one chip (communication node) whereas all others have two.

⁸³ It is noted that well engineered mesh solutions have headroom available for additional services

5.2 Overall Requirements

Whilst the relative ‘inclusivity’ of the centralised communications model in particular remains under consideration, it is assumed that this is a straightforward provision of a common communications physical service to smart metering systems - either on a national or regional basis.

The centralised smart metering service is assumed to feature the same common physical communications service, with the potential addition of data gateway/network management/meter data management functions.

Ref	Requirement	Market Model Option		
		Competitive	Centralised Communications	Centralised Smart Metering
WG3	Access Controlled Carriage	Competition in communication provision would require some form of defined standard for access control to ensure service provision is suitably interoperable	Whilst there may be a requirement for an interoperable access control standard in a centralised communications model - if the central function is charged with delivering secure communications, it should be able to complete this service as it sees fit in line with the requirements	As for Centralised Communications

Ref	Requirement	Market Model Option		
		Competitive	Centralised Communications	Centralised Smart Metering
WS4	The communications solution(s) will support a prioritised standard of service for the completion of Data Exchanges	A competitive market should see the development of services to meet a variety of requirements from different users of the system	A centralised approach will allow for a structured approach to prioritisation, but could result in restricting individual service provision	As for Centralised Communications
WS5	Avoidance of site visits	Where faults occur, establishing who should visit to resolve them will be a feature of contractual terms between parties - service levels will not be standardised	Centralised communications should establish a single point of contact regime for handling communications issues. Identifying faults (and responsible parties) may be challenging for a service using several layers of service providers (as is likely)	It is anticipated that any site visit services would form part of the bundled provision of metering and communications
WS 6/7/8	Secure Communications	A competitive market for communications could introduce inherent risk, as standards will vary. However, a market could also encourage innovation and differentiation of secure service offerings	Depending on the 'breadth' of a centralised service, communications security could be delivered to a very high standard in line with requirements	As for Centralised Communications

Ref	Requirement	Market Model Option		
		Competitive	Centralised Communications	Centralised Smart Metering
WS11	The communications solution will not alter, corrupt or permanently store any data it transports.	Will be a requirement of any service procured - it may vary by solution option	Will be a requirement of any service procured - it may vary by solution option	Will be a requirement of any service procured - it may vary by solution option
WS13	The communications solution(s) will be capable of meeting the data traffic requirements of the Operational Framework.	Competitive contracting for communications should ensure that the market meets any anticipated growth in use of a smart metering communications service	Ensuring sufficient bandwidth to meet growth in use will form a key part of the establishment of a centralised service - this should not be considered a negative	As for centralised communications
WN2	Broadcast	Would be supported by individual communications providers, but there would be no guarantees of protecting the network from several Authorised Parties issuing broadcast messages	Depending on the scope and definition of the communications service Central management allows for simpler scheduling and prioritisation of mass-messaging for any number of authorised parties	Depending on the scope and definition of the communications service Central management allows for simpler scheduling and prioritisation of mass-messaging for any number of authorised parties

Ref	Requirement	Market Model Option		
		Competitive	Centralised Communications	Centralised Smart Metering
TC1	Effort required to deliver smart metering service in line with requirements - i.e. are new network management operations necessary?	A number of physical media have near-complete physical infrastructures, others could require investment by competing service providers - which may result in the dominance of existing services over new options. The cost of infrastructure deployment in a fragmented market represents a barrier to entry.	There may be existing parties in a position to meet the service provision requirements for smart metering, however there could still be considerable effort to establish the particular service	As for centralised communications
MET1	Simple upgrade path - e.g. modular construction, use of external communications module	Service providers should compete to deliver better technology and keener pricing of services to gain business. Similar business models discount equipment cost against term-based service contracts.	Procurement of a centralised service for a fixed contract term could see the communications technology in meters being fixed for the term of that contract.	Procurement of a centralised service for a fixed contract term could see the communications technology in meters being fixed for the term of that contract. There will be disincentives to provide metering assets that can be upgraded to a competitor's service at contract completion.

Ref	Requirement	Market Model Option		
		Competitive	Centralised Communications	Centralised Smart Metering
C1	Support for added value services (telecare, security - low bandwidth, low latency etc.)	One-to-one arrangements for communications services could limit the scope to include added value services, and could create contractual challenges where the primary customer (energy supplier) can change	Centralised provision will support any requirements for added value services that are specified when establishing the provision or if suitably rewarded would be motivated to add services that are identified later.	As for centralised communications
C2	Support for shared service delivery (internet, voice, entertainment)	A market could develop to deliver such services, it may be economic for the right business model but there will be little economic incentive on energy suppliers to contract for the initial service overhead	Procurement of communications service could include shared service delivery, or be based upon shared service delivery	As for centralised communications

5.3 Market Model & Physical Media

Requirement/ Assessment	Market Model	Physical Media Option								
		PLC	TEL	DSL	CAB	CEL	RF1	LRR1	LRR2	LRR3
WG4: Interoperability	Competitive	↓	↔	↑ ⁸⁴	↑	↑	↔ ⁸⁵	↔	↑	↑
	Centralised Communications	↔ ⁸⁶	↔	↑	↑	↑	↑ ⁸⁷	↑	↑	↑
	Centralised Smart Metering	↔	↔	↑	↑	↑	↑	↑	↑	↑
WG5: Utility Robust	Competitive	↑	↓ ⁸⁸	↓	↓	↑	↔ ⁸⁹	↑	↔	↔
	Centralised Communications	↑ ⁹⁰	↓	↓	↓	↑	↑	↑	↔	↔
	Centralised Smart Metering	↑	↓	↓	↓	↑	↑	↑	↔	↔

⁸⁴ All of the higher bandwidth models are assumed to support internet and other established standards

⁸⁵ Unless a particular solution/frequency is used for all metering systems, then competitive service provision of low power RF solutions could result in a variety of standards being implemented (e.g. Zigbee Smart Energy and M-Bus DLMS are not interoperable)

⁸⁶ Interoperability for PLC in a centralised model could be delivered at the data transport gateway - allowing several types of proprietary solution to be fitted in metering systems, but with a central head end providing an interoperable interface to Authorised Parties

⁸⁷ A centralised service should result in a single low power RF solution being procured

⁸⁸ All wired telephony options will include a wire as a point of vulnerability - and could well include communications hardware outside of the sealed meter itself

⁸⁹ Competitive service provision of low power RF could see a range of approaches for data concentrators, some of which may not be as robust as other options

⁹⁰ PLC in particular places no requirements on external equipment in a customers premises

Requirement/ Assessment	Market Model	Physical Media Option								
		PLC	TEL	DSL	CAB	CEL	RF1	LRR1	LRR2	LRR3
WG9: Growth of Use (scalability of data traffic)	Competitive	NA	↓	↑ ⁹¹	↑	↔	↔ ⁹²	↔ ⁹³	↑	↑
	Centralised Communications	↔	↓	↑	↑	↑ ⁹⁴	↑	↔	↑	↑
	Centralised Smart Metering	↔	↓	↑	↑	↑	↑	↔	↑	↑
INF2: Effort Required to Implement Infrastructure	Competitive	↓ ⁹⁵	↑	↔	↓ ⁹⁶	↑ ⁹⁷	↓	NA	↓	↔ ⁹⁸
	Centralised Communications	↔	↑	↑	↓	↑	↔	↔	↓	↔
	Centralised Smart Metering	↔	↑	↑	↓	↑	↔	↔	↓	↔

⁹¹ All high bandwidth options are assumed to have sufficient capacity to meet growth of use - metering communications are not anticipated to grow to a point where the capacity of these solutions would be affected

⁹² It is not clear how RF solutions could co-exist at a local level, but increasing the numbers of concentrators to meet growth in use would be supported by a competitive market as it would be for a centralised model

⁹³ The frequency of any private licence will determine the data transmission speeds, and the scope for additional bandwidth could be restricted by the licence itself

⁹⁴ Growth of use for a centralised provision could be delivered easily from a technical perspective - establishing who would be driving the increase in use and subsequent costs may prove challenging. Higher use could result in economies of scale

⁹⁵ Assumed that imposition of different carrier signals on common wires within a street/substation footprint would prove very challenging, therefore competition between PLC providers is thought to be difficult to implement

⁹⁶ Considerable effort required to provide national coverage

⁹⁷ Cellular infrastructure in place today, and could support all market models

⁹⁸ Competing public Wi-Fi networks currently co-exist and are expanding - however, there is no national network infrastructure

Requirement/ Assessment	Market Model	Physical Media Option								
		PLC	TEL	DSL	CAB	CEL	RF1	LRR1	LRR2	LRR3
CC1: Current GB offering for smart metering, or analogous data transfer services? ⁹⁹	Competitive	NA	X	✓	X	✓	NA	X	X	X
	Centralised Communications	NA	✓	✓	✓	✓	NA	✓	✓	✓
	Centralised Smart Metering	NA	✓	✓	✓	✓	NA	X	X	X

⁹⁹ Where there are existing metering or analogous services using the physical media, under which market model (or closest match) is this currently done? Central communications = connection only. Central Smart Metering = connection + service offering.