

Vodafone Response to the OFGEM Smart Metering Implementation Programme Prospectus

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1. Executive Summary

Vodafone welcomes the publication of the Prospectus and the broad policy framework it sets out. In particular, we strongly support the two central pillars of the programme, namely:

- Establishment of a Data and Communications Company (DCC) to streamline exchange of metering data and provide central co-ordination;
- Overall programme acceleration based on phased implementation with supplier-led rollout commencing pre-DCC to bring forward delivery of benefits.

Programme acceleration makes it all the more important to maximise the use of existing infrastructure and communication networks to minimise delay in rollout. Use of proven technology based on open standards stands to minimise technical risks and also provide a clear upgrade path for future innovation and development.

The mobile industry is well placed to support these objectives as widespread wireless data networks offering unrivalled coverage already exist today. Cellular technology is proven in a range of Machine to Machine (M2M) applications including smart metering, both in the UK and internationally. For all these reasons we strongly advocate mobile technology based on GPRS as the WAN communications technology of choice.

While the overall framework presented in the Prospectus is a good one, there are several key areas that in Vodafone's view will be critical to the programme's success:

- **Early agreement on technical specification** – we believe WAN modules should be physically as well as functionally separate from meters. Requirements should be agreed in close co-operation with communications providers. The choice of WAN and HAN technology should be based on existing open and non-proprietary standards to drive scale economies, competition and specialisation in manufacture, and innovation;
- **Regulatory and commercial certainty** – we agree that regulation is necessary to create an appropriate framework for licensed energy suppliers and the DCC. However, commercial investment by unregulated manufacturers, communications providers and systems integrators is also required, and it is vital that regulation provides the right incentives to support such investment;
- **Commercial interoperability** – while the DCC itself can provide some of the necessary co-ordination, it is crucial also to ensure a positive customer experience from the very outset, including seamless switching between energy suppliers without the disruption of a home site visit or a long hiatus. Communications providers such as Vodafone can support this aim through delivering value added services to suppliers, providing there is continuity in communications provision through contractual novation on change of supply. Vodafone also recommends an early specification of the data interface between suppliers themselves and energy network operators to support seamless supplier switching.
- **Managed transition to the DCC** – it is in the interests of all stakeholders and the programme as a whole to avoid a 'big bang' change when the DCC comes into being. In addition to contract novation between suppliers pre-DCC, and between suppliers and the DCC itself, the costs and risks of transition can be minimised by anticipating the post-DCC model as closely as possible. For this reason we see a valuable role for existing settlement bodies to act as a focal point for data exchange both pre- and post-DCC.
- **Flexibility and future proofing** – one of the key benefits of early rollout with competitive provision of communications and data services is that it provides flexibility and avoids the risks associated with appointing a single monopoly provider. The alternative of trying to second guess

all future needs over the 30-plus year asset life of smart meters through a 'once and for all' approach, risks delaying rollout and making the wrong technology calls that will constrain rather than support evolution and innovation. Future proofing to accommodate additional services and technology upgrades over time is best assured through a modular approach to design. This enables the development of value added services and de-couples WAN communications choices from the meter, providing a migration path that can be pursued as and when it is cost-effective to do so.

This initial response focuses on the technical and early implementation questions that Ofgem has prioritised for response by 28 September. There are clear links between short term technical and implementation issues and the longer term vision for future development beyond the initial regulatory mandate, notably in relation to the evolution of smart grids, support for electric vehicles and remote provision of value added services to end-user consumers. Vodafone's view on these issues, and the regulatory and commercial framework necessary to underpin them, will be set out more fully in our follow-up response to the October questions.

In the meantime, we welcome and endorse the core decisions on the DCC model and programme acceleration, highlight the key success factors set out above, and look forward to working with DECC/Ofgem and other stakeholders to make the programme a success as it unfolds.

2. Introduction and Overview

Vodafone welcomes the opportunity to respond to this joint Department of Energy and Climate Change (DECC) and Ofgem Prospectus on Smart Metering.¹ This submission provides Vodafone's initial response to the questions to which Ofgem has invited views by 28 September 2010. Our further response to the remaining questions for 28 October will follow separately. This chapter provides a summary and high level overview of Vodafone's initial response but should be read in conjunction with our more detailed answers to the specific consultation questions in the following chapters.

Vodafone Limited is the UK operating company of Vodafone Group plc. Vodafone has grown from a start up business in 1984 to become the world's leading mobile telecommunications company, with operations spanning Europe, the Middle East, Africa, Asia Pacific and the United States through subsidiary undertakings, joint ventures, associated undertakings and investments, serving almost 350 million customers worldwide.²

Vodafone is committed to managing its own environmental impact with a Group target of reducing energy use and CO2 emissions by 50 per cent by 2020 against the 2006/07 baseline, and looks forward to playing an active part in the wider national programme to meet the UK's carbon reduction commitments.³ Vodafone is the UK market leader in Machine to Machine (M2M) applications. In the Automated Meter Reading (AMR) market, Vodafone has over a decade of specialised experience and is already pioneering the rollout of smart meters to domestic customers in the UK in partnership with British Gas as part of their plan to rollout nearly 1 million smart meters by the end of 2012.⁴ We also have international experience in the field of smart metering, notably major deployments in the Netherlands and New Zealand.⁵

Vodafone wholeheartedly endorses the Government's high-level policy aims for smart metering as regards sustainability, energy security and transition towards a low carbon economy. Smart metering also promises substantial customer benefits in terms of energy market competition, choice and innovation - an end to estimated bills, more seamless switching between suppliers the prospect of new value added services to manage household energy usage remotely.

We endorse the DCC model, programme acceleration and phased implementation

Overall we believe the policy framework set out in the Prospectus goes a long way towards addressing many of the outstanding practical and policy questions remaining following the previous in principle decision to adopt the so-called Central Communications Provider (CCP) model.

¹ Smart Metering Implementation Programme, Prospectus, DECC/Ofgem, July 2010, http://www.decc.gov.uk/en/content/cms/consultations/smart_mtr_imp/smart_mtr_imp.aspx

² At 30 June 2010, based on the registered customers of mobile telecommunications ventures in which it had ownership interests at that date, Vodafone Group plc had 347 million customers, excluding paging customers, calculated on a proportionate basis in accordance with the Company's percentage interest in these ventures.

³ We note the Coalition Government's commitment to push for the EU to demonstrate leadership in tackling international climate change, including by supporting an increase in the EU emission reduction target to 30% by 2020.

⁴ <http://www.centrica.co.uk/index.asp?pageid=39&newsid=1970>

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http://www.vodafone.com/start/media_relations/news/local_press_releases/new_zealand/new_zealand_press/vodafone_technology.html

In particular, we strongly support the two central pillars of the programme, namely:

- Establishment of a Data and Communications Company (DCC) to streamline exchange of smart metering data and provide central co-ordination;
- Overall programme acceleration based on phased implementation with supplier-led rollout commencing pre-DCC to bring forward delivery of benefits.

We therefore welcome the decision to accelerate the overall timetable and to bring forward the start date for national rollout through staged implementation starting before the DCC comes into being. This is critically important to securing early realisation of benefits, and also enables early experience to be factored in to subsequent phases of the programme as it evolves.

Mobile operators such as Vodafone are well placed to support early rollout because they have suitable wide area communication networks with extensive coverage already available. GPRS technology in particular is well established and proven in a highly competitive market for M2M applications including smart metering. Established mobile networks start from a high base in terms of geographic coverage, which is important to achieve the objective of getting a smart meter in every home. In addition, competition in the mobile market guarantees continued network investment and innovation. Vodafone also has its own established complementary data access network, Paknet, which offers exceptional long range radio coverage and in-building penetration for difficult to reach locations.

We believe the procurement model chosen for the DCC, with the DCC buying services in a competitive market rather than self-providing those services is the right one. It offers the benefits of central co-ordination while avoiding the clear risks of placing practical delivery within the hands of a single statutory monopoly. Importantly, this model also supports pre- to post-DCC transition providing the right regulatory and commercial framework is in place to support novation as we discuss further below.

Since this is an iterative process, there are inevitably further detailed decisions that need to be taken in order to move the programme forward. We highlight below a few of the more important areas from Vodafone's communications provider perspective.

Early agreement on technical specification

As noted above, we strongly support the proposed supplier led rollout of smart meters ahead of the DCC coming into being. The success of this approach does, however, depend on establishing clearly what functionality is required both in the initial pre-DCC era and beyond for the transition to the DCC. In particular, design and technical specification is a critical area to get right given the long life assumed for these assets.

We strongly support the modular approach to design envisaged in the Prospectus with the Wide Area Network (WAN) module being separate from the meter itself. Vodafone believes the WAN module should be *physically* as well as *functionally* separate from the meter (a 'box' with a power/data cable to the energy meter and an alternative power source to provide for gas meter only situations). The advantages of such an approach include flexibility in manufacture, installation and upgrade path for WAN communications as the applications to be supported by smart meters develop beyond the initial regulatory mandate.

Since the replacement cycle for smart meters is expected to be long, the choice of Home Area Network (HAN) technology is critical as any upgrades will at least need to be backwardly compatible with the technology already built into existing equipment. We discuss current technology options more fully in answer to specific consultation questions below. Vodafone currently sees Zigbee v2.0 (IEEE 802.12.5) as the best initial choice for standardised wireless HAN technology. Among other things it is based on open standards, and allows for dynamic routing and communication diversity between meters and WAN modules as well as appropriate end-to-end security.

Vodafone also sees the WAN module as more than a dumb interface between the HAN and the WAN. Vodafone believes that a 'smart' WAN module is a necessary complement to the smart meter if the full potential of smart meter rollout is to be achieved cost-effectively in the pre- and post-DCC era. This is particularly true for gas meters where we see a need for a data metering mirroring application on the WAN module to extend the life of gas meter batteries, but the ability to support supplier specific Application Programming Interfaces (APIs) is also necessary to underpin commercial interoperability.

In Vodafone's view the WAN module needs to be designed for ease and reliability of installation and maintenance with full regard to the customer experience and for end-to-end security. It also needs to incorporate sufficient functionality to support seamless switching between energy suppliers without the need for a home visit and provide an upgrade path for provision of value added services.

To accelerate the definition of requirements we recommend making the process as open and transparent as possible with meeting agendas published in advance and the prompt sharing of outcomes. We see a need for direct involvement of communication service providers as their input is essential for optimising WAN communications. Finally we recommend a modified approach of publishing information on technical requirements, prioritising those elements that pose the highest risk for suppliers and manufacturers (e.g. hardware elements which pose asset stranding risk) rather than waiting to release a complete set of defined standards for all elements at once.

Regulatory and commercial certainty

While Vodafone agrees that regulatory intervention is necessary to create an appropriate framework, it is important to recognise that end-to-end delivery and operation of smart metering is not something that licensed energy suppliers or the DCC can deliver on their own. Commercial investment is also required by manufacturers, communications providers such as Vodafone and systems integrators, among others, so it is important that the regulatory framework is conducive to such commercial investment.

Ofgem thus has a vital role to play in creating the right incentives to call forth investment. The public policy objective should be to maximise lifetime benefits from the programme while minimising lifetime costs. This requires an appropriate 'bridge' from early pre-DCC rollout into the DCC era, avoiding deadweight costs in the form of stranded assets while allowing cost recovery over an appropriate period supporting commercial returns commensurate with the degree of risk involved.

In particular, Vodafone considers that in order to ensure a smooth transition from early supplier rollout into the DCC era, contracts for data and communications services will need to be novated. In practice, this is likely to require regulatory underpinning. It is important also to provide some certainty over the transition around commercial terms. The window between the pre- and post-DCC world is simply too short to enable efficient cost recovery without some transitional guarantee of tenure, and would leave all industry players with potential 'big bang' uncertainty upon commencement of the DCC.

To avoid such uncertainty, we propose that energy suppliers should be obliged to contract for a minimum term that bridges transition, and that the DCC should be obliged to honour the contracts it inherits (subject to agreed variation in accordance with contract terms). This need not necessarily extend to full term of the DCC franchise. The DCC will be able to re-tender elements periodically as initial terms come up for expiry, thus providing flexibility for revision to service levels or functionality as appropriate as requirements move from basic remote metering functionality to more advanced applications. Our further views and specific recommendations on these issues will follow with our October response.

Commercial interoperability and managed transition

We note and endorse the objective of enabling customers to switch easily between energy suppliers without requiring a site visit to the home to replace or reconfigure the meter or WAN module. This objective can be achieved by the exchange of metering data between suppliers (and energy network operators) over a standardised data interface. When a supplier is able to handle data from another supplier's meter and WAN module, a simple way to achieve this objective is to provide commercially for any new energy supplier to use existing communications infrastructure rather than over-build or replace, since this will add unnecessarily to overall programme costs and be disruptive to end-user customers. Once the DCC is up and running the choice of communications provider and responsibility for the data function rests with the DCC in any event so should be a matter of indifference to the energy supplier.

The remaining challenge to avoid a hiatus when customers switch energy supplier – one of the key programme benefits envisaged in the impact assessment – is to ensure that data from the customer's meter are re-directed towards the new supplier while maintaining appropriate end-to-end security.

We have considered various options to achieve this objective in the pre-DCC phase and believe part of the answer lies in WAN communications providers providing value added services with regard to routing of data to different suppliers or other parties. From a technical perspective, this can be achieved through industry-wide agreement on appropriate APIs. This and the surrounding commercial framework will need appropriate regulatory support, however.

To ensure data can be efficiently routed without a wasteful proliferation of communications links, we recommend allowing third party data aggregators to provide a 'hub' data function enabling any-to-any connectivity between all pairings of energy supplier and communications provider. In principle, existing settlement bodies that already have appropriate connectivity to all energy suppliers would seem well placed to take on this role. Fulfilling this valuable function pre-DCC should not prevent such bodies from becoming data service providers to the DCC on a novated basis as described above.

Flexibility and future-proofing

One of the key benefits of early rollout with competitive provision of communications and data services is that it provides flexibility and avoids the risks associated with appointing a single monopoly provider. The alternative of trying to second guess all future needs over the 30-plus year asset life of smart meters through a 'once and for all' approach risks delaying rollout and making the wrong technology calls that will constrain rather than support evolution and innovation.

Future-proofing to accommodate additional services and technology upgrades over time is best assured through a modular approach to design that de-couples WAN communications choices from the meter, providing a migration path that can be pursued as and when it is cost-effective to do so. A clear advantage of mobile technology over others is that it is based on open standards, enabling substantial scale economies and promoting continual innovation and investment in network performance as this is a key dimension of competition between mobile networks.

The level of WAN capability required for initial deployments is ultimately a matter for Ofgem and the energy industry as customers. GPRS is more than capable of meeting the initial regulatory mandate at low cost, but WAN modules based on successive standards can certainly be developed as and when there is demand for them and it is cost-effective to deploy. Modular design based on open standards means it is not necessary to 'gold plate' initial deployment before the market is ready, however.

By using a technology platform already subject to these dynamics, the UK smart metering programme can share in these advances and will not be limited by current capabilities of proprietary networks that do not benefit from similar scale economies or competitive drive to support investment and innovation.

Physical separation of the smart meter from the WAN module also provides useful flexibility in installation where small variations in location can make a difference to radio reception. Moreover, there are clear benefits in terms of specialisation and flexibility of manufacture, procurement, ownership and maintenance which can be split between different parties. Indeed, while the Prospectus currently envisages that energy suppliers should be responsible for all customer premises equipment, we believe formal responsibility for the WAN module sits better with the DCC in a post-DCC environment, given that the DCC rather than the supplier is responsible for procuring communications. Separating the WAN module from the meter enables suppliers to assign operation and maintenance responsibility to different subcontractors e.g. allowing communications providers to look after the WAN module, harnessing their experience optimising and maintaining end user equipment (e.g. broadband modems, mobile phones, M2M equipment). Enabling communications providers to take responsibility for both HAN and WAN communications is also attractive from the perspective of providing continuity on novation of contracts from suppliers to the DCC and/or on change of supplier pre-DCC.

Vodafone plans to work closely with manufacturers to develop WAN modules that are easy for energy suppliers to install, and additionally provide sufficient functionality to ensure secure HAN/WAN interworking. We will also look to build in the capability to support additional third party value added services to end-user consumers in due course, subject to appropriate customer authorisation. On this last point, we believe Ofgem should consider mandating a minimum level of support for such third party value added services since it is not immediately clear that energy suppliers will have sufficient incentives to support this feature in the absence of regulation. A further advantage of mobile technology is that it enables new features such as this to be activated remotely, and securely, through 'over the air' (OTA) upgrades.

In summary

We welcome the decision to accelerate the programme and consider the Prospectus provides a good policy framework to enable progress towards full national rollout and the realisation of the benefits smart metering will bring. We look forward to working with DECC/Ofgem and other stakeholders to make the programme a success as it unfolds.

Structure of this response

Chapters 3, 4, 5 and 6 contain Vodafone's answers to those specific questions in the Prospectus, Statement of Design Requirements, Rollout Strategy and Implementation Strategy volumes that are due for response by 28 September. Supplementary information is included in the appendices at Chapter 7.

The further areas on which DECC/Ofgem are inviting comments by 28 October include:

- data privacy and security;
- consumer protection;
- energy displays and information provision;
- the approach to smaller non-domestic consumers;
- responsibilities for customer premises equipment;
- proposal for a new Smart Energy Code;
- the establishment and scope of the central data and communications function.

Vodafone's further comments on these areas will follow separately with our October response.

3. Responses to Prospectus Questions

3.1 Consumer Experience

Question 3: Do you have any comments on the proposed approach to ensuring customers have a positive experience of the smart meter rollout (including the required code of practice on installation and preventing unwelcome sales activity and upfront charging)?

Vodafone agrees that delivering a positive customer experience is integral to the acceptability and success of the entire programme. We therefore support the proposals to develop an appropriate code of practice in support of this objective.

Second site visits in particular are costly to suppliers and disruptive for customers and must therefore be minimised. Vodafone therefore recommends the installation code of practice detail robust procedures for completing installation in a single visit wherever possible. Please see our response to Rollout Strategy Question 13 for further details.

In addition to ensuring best practice installation procedures, Vodafone recommends that operational and commercial workarounds should be used by suppliers wherever possible to minimise the need for second site visits in the case of two different suppliers supplying a single customer.

Finally, in exceptional cases where two visits are necessary, Vodafone recommends that interoperability with the equipment of a second supplier should be guaranteed so that this situation never gives rise to customer issues.

All customer premises devices must work together smoothly (technical interoperability) to ensure an excellent customer experience. Completing installation should therefore include the installer verifying full functioning of the smart meter, WAN module and in-home display together. Vodafone recommends that the devices display a clear visual indicator to demonstrate that they are fully functioning.

The whole installation process must be customer friendly. It should be quick and unobtrusive, causing the minimum level of disruption and inconvenience to households and businesses. Installation and integration to the WAN communications network should take place at the same time to ensure optimal service.

Ease of switching supplier is a critical issue if consumers are to realise the full benefits of competition. We recognise that industry switching processes may involve wider issues outside the immediate scope of the smart metering programme. Nevertheless, we see considerable scope for the smart metering programme based around a DCC model to streamline the switching process so that it is as seamless as possible from a customer perspective, providing this goal is clearly kept in mind from the outset.

Vodafone agrees that there should be safeguards in place to ensure all customers' interests remain protected. These safeguards should cover all aspects of the service, including unwelcome sales and marketing activity and data protection.

Vodafone sees the success of this stage of the process as critical to gaining the overall buy-in the smart meter programme needs from customers, and to driving successful behaviour change with regards to energy consumption in the future.

3.2 Industry Roles and Responsibilities

Question 6: Do you have any comments on the functional requirements for the smart metering system we have set out in the Functional Requirements Catalogue?
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Vodafone welcomes the proposal that the WAN module should be exchangeable without the need to exchange the meter, as this promotes and allows for future innovation.

We propose that the WAN module be a physically separate device from the meter, connected with the electricity meter through a tamper proof, standardised wired connection for power and data transmission, for the following reasons:

- As electricity meters will be supplied by different vendors, it will be easier to agree on a standardised wired connection than on a standardised form factor for the WAN module to be built into the meter.
- Having a wired connection of some length provides freedom in positioning the WAN module near the meter. This is important for optimising WAN communications.
- By using a separate WAN module it will be easier to optimise internal antenna characteristics and therefore have better WAN connectivity.
- It will also be easier to design the WAN module such that special external antennas for WAN connectivity can be used in cases where this is required.
- In case of failure or upgrades which are not possible to implement over the air (OTA), it will be relatively easy to replace the WAN module.

Vodafone recommends that the WAN module must be capable of hosting applications. As a minimum, application(s) for mirroring the gas metering data are required; the gas meter will only have limited communication, processing and storage capabilities as it will be powered by a battery that is not to be replaced in a very long period (15 years proposed). Dependent on the overall system design, including end-to-end security measures, it may also be practical to host an application on the WAN module that mirrors the electricity metering data.

To deliver additional value, the WAN module should be capable of supporting narrowband telemetry value added services, for example home energy management and potentially other complementary services such as home security management. It should have an operating system and processing and storage capabilities sufficient to enable new applications to be installed in the future.

Secure communication is vital to authenticate the endpoints and prevent the data being altered. The WAN module can also contribute to the security challenge by providing safe storage of keys. Note that the cellular SIM is a low-cost, high-volume, very robust location for security functions, with a proven record against copying, tampering or key extraction.

Vodafone suggests that further development of requirements is needed to deal with single fuel premises (i.e. customers supplied with gas and electricity by two different suppliers). In particular, in order to ensure commercial interoperability, Vodafone recommends a standardised interface be required between the data function and suppliers or between suppliers themselves in the pre-DCC phase (this solution has been demonstrated in international experience, for example the 'P4' interface defined in the Dutch Smart Meter Requirements Version 2.2). For further explanation and rationale on this recommendation, please refer to Vodafone's response to Statement of Design Requirements in Question 3.

Finally, we note that the messaging capability of the In Home Display (IHD) mentioned in Functional Requirement 1.61 could inform the customer and significantly reduce call centre impact (e.g. advising the affected customers that a power cut is known to the supplier and the expected duration). Cellular technology can readily support this.

Question 7: Do you see any issues with the proposed approach to developing technical specifications for the smart metering system?

Vodafone emphasises the importance of defining technical standards in a timely way and in co-operation with all relevant stakeholders and offers both its support and experience in developing these standards for communications.

We see a key role for Ofgem in making sure that the right interests are fairly represented during the process and that all who may need to contribute are able to do so fairly and effectively. We suggest, therefore, that the remit and terms of reference of all expert groups is made public prior to final decisions on membership and representation being made.

We further suggest that in the interests of transparency, meeting agendas should wherever possible be published in advance so that all affected stakeholders who may need to contribute are able to do so effectively and in a timely fashion. Similarly, Vodafone recommends the publication of minutes of the meetings where key decisions have been made.

Vodafone believes it is imperative that WAN service providers and not just suppliers be involved in defining WAN module standards, especially with regard to the WAN interface. Coverage or connectivity is a combined characteristic of WAN technology and terminal equipment like a WAN module. Vodafone advocates an end-to-end approach to WAN communications for smart metering and believes it is important to avoid a situation where terminal equipment is developed and installed independent of WAN communication providers.

Based on our experience of professional services consulting with smart meter manufacturers, suppliers and energy network operators during the development of functional specifications and technical requirements, we would further emphasise the point that early consideration and incorporation of WAN communications requirements in the process often results in considerable time, effort and cost savings. In contrast, it is our experience that deployments which have needed to take account of network requirements later on in the design or deployment phase have been subject to considerable avoidable additional costs and time delays.

Vodafone also believes that the programme could investigate modifying its approach to developing technical specifications by decoupling and prioritising the publication of standards which may be linked to asset stranding risk or could require a second site visit (e.g. hardware) from other elements.

This alternative approach has the potential to offer suppliers a series of points at which they could potentially commence rollout even in advance of the formal regulatory mandate being confirmed. While there might still be an element of risk in moving ahead in advance of the full definition of standards, this level of risk would be at an increasingly acceptable level, and this could counteract any tendency that might otherwise develop for industry to adopt a 'wait and see' stance.

We identify the current lack of certainty in the market in this regard as a key factor limiting early rollout activities and believe this recommendation should be evaluated closely as it has the potential to materially contribute to accelerating the rollout.

Question 16: Do you have any comments on the proposals for requiring suppliers to deliver the rollout of smart meters (including the use of targets and potential future obligations on local co-ordination)?

Vodafone believes that, in the competitive UK market, the supplier is best positioned to deliver the rollout as they manage the relationship with the customer. This relationship is also important in

ensuring the customers have a positive experience of the smart meter rollout as addressed in Question 3.

We think there will be a need for robust and standardised plans and procedures for all installations that can be adapted to encompass specific exception locations and circumstances. The installation process must be customer friendly. It should be quick and unobtrusive, causing the minimum level of disruption and inconvenience to households. This will also limit the disruption to customers through a single visit to dual fuel customers.

Vodafone welcomes the early rollout activities and the requirement to deliver smart meters through the use of targets. We believe that key considerations will be the interim market structure and the development of early standards, both of which will be important in reducing market risk and promoting a stable environment for investment.

The use of existing technology, such as GPRS, will offer the greatest flexibility and least risk to the rollout by suppliers. It is an existing, robust and trusted technology already used for large scale smart metering deployments and applications by suppliers. Network capacity is not a constraint to rollout acceleration, however other technologies may need street-by-street rollout or require upheaval to infrastructure such as roads etc.

Vodafone sees the success of the rollout of smart meters by suppliers as critical to gaining the overall buy-in to the smart meter programme from consumers and in leading to successful behaviour change with regards to energy consumption in the future,

3.3 Implementation and Next Steps

Question 17: Do you have any comments on our implementation strategy? In particular, do you have any comments on the staged approach, with rollout starting before DCC services are available?

Vodafone welcomes the encouragement of accelerated rollout activities and supports the proposal for a staged approach to implementation, but identifies two outstanding areas which could benefit from further development: contract novation and interim market arrangements.

Contract novation

Contracts between data and communications providers and suppliers typically involve high upfront costs which are recouped over the lifetime of the contract. Vodafone believes that the currently planned window between the commencement of mandated rollout and the establishment of the DCC is too short to enable efficient cost recovery on contracts which would end before the establishment of the DCC. Such contracts are therefore very unlikely to be agreed in the interim period.

Vodafone therefore believes that contracts will need to bridge the transition to the DCC and agrees that the novation of contracts from suppliers to the DCC will be necessary. This situation currently leaves all industry players with a potential 'big bang' uncertainty as to what will happen to their commercial agreements upon the establishment of the DCC.

We believe this uncertainty should be reduced with guarantees provided through regulatory obligations on energy suppliers and the DCC.

Vodafone recommends that the DCC and suppliers should be obliged to accept novation of all contracts that meet a mandated minimum agreed specification (to be clearly defined as early as possible for market participants).

Vodafone further proposes that energy suppliers should be obliged to close contracts for a minimum term that bridges the transition. It will also be important to provide some certainty over the transition around commercial terms; Vodafone therefore proposes that the DCC should be obliged to honour the contracts it inherits (subject to agreed variation in accordance with contract terms).

As contracts will not necessarily extend to the full term of the DCC franchise, the DCC will be able to re-tender elements periodically as initial terms come up for expiry. This will also provide flexibility for revision to service levels or functionality as appropriate, when the move from less advanced remote metering functionality to more advanced applications takes off.

Vodafone sees no contradiction between providing a transitional guarantee on pre-DCC terms and the obligation on the DCC to procure efficiently. The contracts it inherits will have been awarded following competitive tender. The proposed contract novation avoids the potential overhead and risk otherwise imposed by retendering by the DCC immediately on appointment. If providers to the DCC have no certainty on a reasonable length of contract beyond the pre-DCC period, this will inevitably inflate costs through the need to front load cost recovery and build in a risk premium.

Vodafone believes that the programme's aim should be to minimise programme lifetime costs and to maximise net benefits. Regulatory certainty is key to bringing forward necessary market investments.

Interim market arrangements

Vodafone highlights the importance of getting the customer experience of smart metering 'right first time', as this will shape perceptions about the programme and facilitate its acceleration. To support this outcome, technical and commercial interoperability issues must be resolved in advance of large scale rollout. In the pre-DCC period, these issues are complicated by the lack of a central data and communications interface and management function. Depending on how this issue is addressed, it could potentially add substantially to lifetime programme costs insofar as it could require investments which might be high relative to the short period they are required for (e.g. temporary interfaces between all market participants).

To avoid this difficulty, Vodafone suggests the programme considers allowing third party aggregators to take on a central 'hub' role pre-DCC with a view to continuing to provide this function at least on a transitional basis as a supplier to the DCC. This solution should help the market to resolve technical and commercial interoperability issues with reduced complexity and cost. It should therefore contribute significantly to accelerating the rollout. Furthermore, it could prepare the market more gradually for the transition to the DCC as considerable experience will have been gained, lessons learned and a number of higher quality candidates for the DCC and service provider roles may emerge, de-risking the programme and providing further benefits.

Question 18: Do you have any other suggestions on how the rollout could be brought forward? If so, do you have any evidence on how such measures would impact on the time, cost and risk associated with the programme?

While successful acceleration will deliver benefits, achieving it will require the reduction of currently high levels of risk facing suppliers, service providers and other market participants.

Vodafone identifies the current level of uncertainty in the market regarding open technical and commercial questions as the key barrier limiting programme acceleration, reducing the willingness of market participants to make decisions, commit to investments and agree new contracts for early rollout.

The most effective way for the programme to bring the rollout forward is therefore to reduce this level of uncertainty by providing the market with further timely, clear and satisfactory information, guidelines and assurances on the key open questions and concerns of participants. Below, we identify

what we see as the four most important open questions for suppliers and service providers (two technical and two commercial in nature) and outline our specific recommendations for reducing the uncertainties arising from them.

- A first set of technical risks arises from uncertainty about the compatibility of equipment with standardised requirements to be developed. To reduce this uncertainty the programme should:
 - Make the smart metering technical standards development process as transparent and co-operative an undertaking as possible to ensure appropriate exchange of information and incorporation of experience
 - Avoid over-specifying wherever possible
 - Develop a set of test procedures and tools to verify technical interoperability
 - Consider a staged development process whereby elements linked to asset stranding or second site visit are decoupled, prioritised and published first
 - Incorporate further lessons and outcomes from international examples of smart metering requirements wherever possible
- A second set of technical risks arises from uncertainty about what communications technology will be used. To reduce this uncertainty the programme should:
 - Ensure technical requirements development takes into account the characteristics and requirements of proven, scalable and open standards based WAN technology and existing infrastructure and monitors market developments closely
 - Encourage the use of efficient and self-provisioning communications services or equipment to reduce unit installation times
- A first set of commercial risks arises from uncertainty about how the transition to the DCC will happen and what the interim market arrangements will be. To reduce this uncertainty the programme should:
 - Provide guarantees around contract novation
 - Provide clarity on interim market arrangements and the transition to the DCC
- A second set of commercial risks arises from uncertainties about specific points in the Prospectus. To reduce these uncertainties the programme should:
 - Clearly state that the process of switching energy supplier can and will be decoupled from that of switching the WAN communications provider
 - Clarify and confirm arrangements for single fuel households or those with two different suppliers
 - Provide the market with greater certainty around arrangements for the delivery of Value Added Services

Question 19: The proposed timeline set out for agreement of the technical specifications is very dependent on industry expertise. Do you think that the technical specifications can be agreed more quickly than the plan currently assumes and, if so, how?

Vodafone agrees with the proposed timeline and invites Ofgem to utilise expertise in the market to ensure that the timelines are realistic for all parties.

Agreement on a complete set of technical specifications faster than Summer 2011 may not be realistic. However, we recommend several measures which we believe have the potential to facilitate quicker agreement, improve the robustness of output and ensure the proposed deadline is met.

Firstly, we believe that leveraging the experience of WAN communications providers as core participants designing WAN and HAN technical standards will help in agreeing these more quickly and offers further reductions in risk.

Secondly, we believe that splitting off the WAN module from the meter may result in an earlier and more robust definition of requirements for these elements individually.

Thirdly, we note that agreement on using existing technology and services with defined open standards as far as possible will also help to advance timeframes. There are a number of technologies and services which have an extensive track record and have already proven themselves in the market for smart metering in UK.

Finally, as proposed in our response to Prospectus Question 7 above, we recommend the programme investigate the feasibility of a carefully planned staged approach to requirements development to prioritise agreement on elements linked to asset stranding risk.

Question 20: Do you have any comments on our proposed governance and management principles or on how they can best be delivered in the context of this programme?
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Vodafone wholeheartedly agrees with the need for clear, open and transparent governance – including clarity on who is in charge as opposed to merely involved at any one time.

We therefore support the proposal for Ofgem to continue leading the programme on DECC's behalf into the next stage, and would underline the need for close Ofgem involvement and oversight of any task-based industry groups that may be required.

We see a key role for Ofgem in making sure that the right interests are fairly represented and that all who may need to contribute are able to do so fairly and effectively.

In relation to communications matters in particular, it is important that decisions are based on fact not supposition. We suggest, therefore, that the remit and terms of reference of all expert groups is made public prior to final decisions on membership and representation being made.

We further suggest that in the interests of transparency, meeting agendas should wherever possible be published in advance so that all affected stakeholders who may need to contribute are able to do so effectively and in a timely fashion. Similarly, Vodafone recommends the publication of minutes of the meetings where key decisions have been made.

4. Responses to Statement of Design Requirements Questions

4.1 Introduction

Vodafone broadly agrees with the functional requirements at high level. Support of seamless switching between energy suppliers (commercial interoperability) both in the pre-DCC and DCC phases will be of key importance to the success of the programme. Vodafone believes there is no need to switch WAN communications provider simply because the end-user customer switches energy supplier, as explained below. The DCC model will in principle make the energy supplier independent of the WAN communications provider, just as there is no change in the identity of the local energy distribution network operator (DNO) when a customer switches supplier due to separation between distribution and supply. Therefore we recommend and assume that switching of WAN communications provider, and especially the replacement of WAN module (or SIM), as a consequence of supplier switching, should be avoided.

While useful to highlight the various functional requirements individually, it is important also to recognise the potential interactions between them. Significantly, notwithstanding the decision to separate the meter asset from the WAN module (which we support), end-to-end operation depends critically on how HAN equipment, WAN modules and WAN service systems work together.

This end-to-end approach is particularly relevant for getting smart meters in every home in the UK, as is the objective of the Smart Metering Implementation Programme; this would involve meters, HAN equipment, WAN modules, WAN service systems and even central 'data function' technology. We have included our considerations with regard to getting smart meters in every home in Appendix 7.2.

Other recommended additions to the Catalogue concern the support of an installation procedure that determines and takes into account the reachability characteristics of a specific meter location, and the definition of a standardised interface to exchange metering data between suppliers themselves and between suppliers and energy network operators. The latter addition will be needed for support of commercial interoperability in the pre-DCC phase (this interface standard will also be relevant for communications between the DCC and other parties).

The end-to-end approach is also relevant for support of supplier switching while avoiding replacement of the WAN module. For this purpose communications providers can offer value added services that may also require additional functionality in the WAN module. This is a further reason for our view that communications providers should be able to take operational responsibility for both the WAN module and for the WAN service. In the pre-DCC phase this can be contracted for by suppliers. In a post-DCC environment Vodafone believes formal responsibility for the WAN module sits better with the DCC, given that the DCC will then be responsible for procuring communications.

Since communications is integral to what makes a smart meter 'smart', it is important that decisions on this aspect are well informed. For this reason, communications providers need to be included alongside other interested stakeholders in the process of refining technical specifications and design requirements.

Attempting to deal with these issues separately or iteratively may result in sub-optimal decisions, and/or less streamlined decision making with knock on consequences for the delivery timescales. Therefore, a high degree of inclusion and transparency is needed to avoid such potential pitfalls resulting in delay.

4.2 Overview of the Smart Metering System Functional Requirements Catalogue

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

Vodafone does not believe the HAN hardware in the electricity and gas meters should be exchangeable. Making this interface exchangeable would require a modular design and result in a cost increase which may not be justified by the benefits. Making the HAN equipment modular will require new interfaces and physical contacts, introducing additional risks, and potential delays to the programme.

Vodafone therefore believes it is preferable to ensure the use of a standardised HAN and a high degree of future proofing. In case of HAN upgrades Vodafone agrees that backwards compatibility should be required.

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

It is Vodafone's expectation that wired HAN technology will not meet the smart metering requirements; it is our view that wireless or power line based HAN solutions fit better. As 'low power' is a requirement, WiFi (802.11a/b/g/i/n) does not yet seem an option for wireless. As Zigbee Pro (802.14.5) is especially designed for this type of application, this is in our view the best available candidate standard for a wireless smart metering HAN.

Zigbee Pro has extended routing capabilities beyond the Zigbee stack that was ratified in 2006. This results in more reliable communications in larger networks and can help resolve situations where WAN connectivity can be challenging or in-home displays are located far away from their smart meters or WAN modules (as in blocks and flats) using inter-HAN communications.

Taking into account that relatively long in-home distances need to be bridged in a reliable way, the sub GHz version of Zigbee Pro (at 868 MHz) is most interesting. In-home propagation properties at such a low frequency are much better than in the alternative 2.4 GHz unlicensed band which raises interference conflicts as it is already extensively used in residential and commercial premises, e.g. for WiFi. Note that the unlicensed 868 MHz band is still relatively unused.

With regard to Power Line Communications (PLC), another relevant and promising technology, but one still under development, is the HomePlug Command & Control standard, which operates in the so called Cenelec bands. Note that, although the Cenelec band is licensed, it is not free of disruptive signals. It should also be taken into account that in-building electricity networks are split in phases and this may cause issues in using PLC.

Given the fact that gas meters will typically have no connection with an in-home power line network, the use of wireless technology to enable communications between gas meters and WAN modules seems to be unavoidable. Should PLC be used, interworking with wireless will therefore be necessary. Developments in this direction have come a long way; convergence of Zigbee and HomePlug CC solutions can already be demonstrated by some vendors.

It is Vodafone's view that suitable HAN technologies should in the long run support IP, especially IPv6 and its adaptation to low power 'Personal Area Networks': 6LoWPAN. The current version of Zigbee, v1.1, only offers limited IP support. However, a new version of the standard is under development,

v2.0. This version will offer full IPv6/6LoWPAN support and is expected to be released in the first half of 2011. As it looks now, the HomePlug Command & Control PLC standard will also support IPv6/6LoWPAN.

Please see Appendix section 7.1 (Vodafone's view on the use of IPv6 / 6LoWPAN for smart metering) for further details.

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

With reference to the Smart Metering System overview as included in the Prospectus (page 25, also see Figure 1 in this document) Vodafone has developed a view on commercial interoperability particularly when cellular WAN technology, including GPRS SIMs, is used.

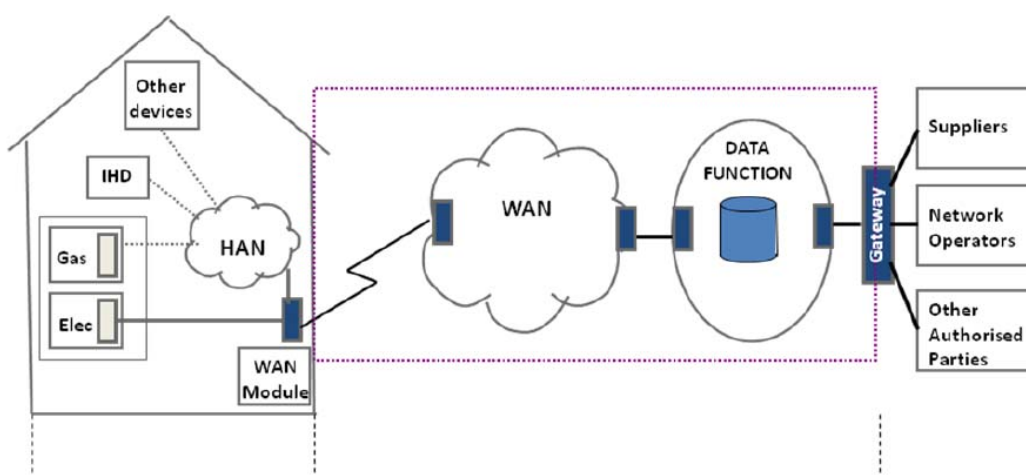


Figure 1. Smart Metering System overview

Our view covers the following approaches:

1. Using standardised data interfaces to deal with supplier switching;
2. Use of 'old' WAN connection to switch to Data Function of 'new' supplier;
3. Use of WAN Intelligence to split connections with different suppliers.

1. Using standardised data interfaces to deal with supplier switching

In the pre-DCC phase of the programme, the issue of how to deal with the WAN module and WAN services not only occurs in case of switching supplier; the issue also relates to the situation where gas and electricity suppliers differ. In that case one of the suppliers has to make use of the WAN module and WAN services of the other supplier. This implies that one supplier, 'A' will have to act as 'interim DCC – supplier A' to the other party (supplier 'B') in the pre-DCC period (Figure 2).

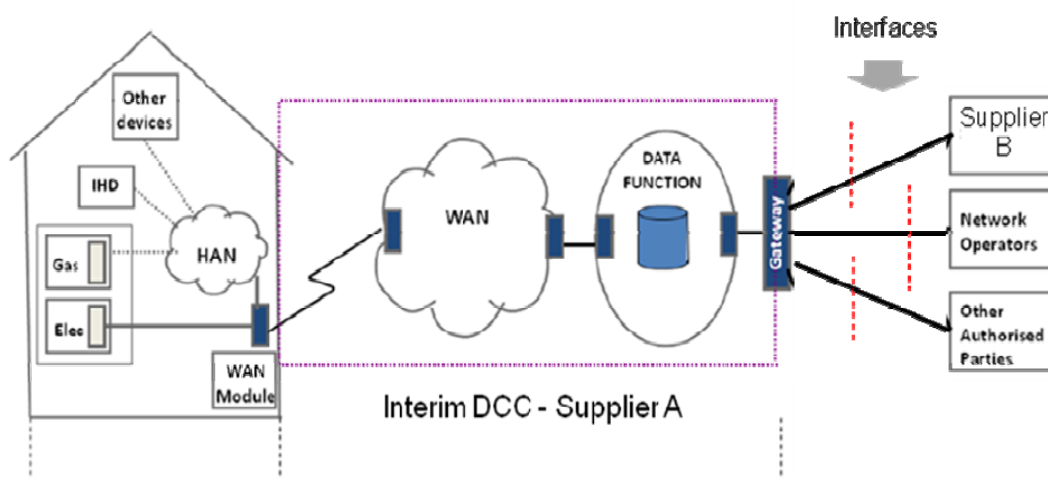


Figure 2. Supplier A acts as an 'Interim DCC' to Supplier B

Although the question is framed in terms of “minimising costs of switching mobile networks in case of switching supplier”, the necessity of having ‘interfaces’ between the ‘Data Functions’ of all suppliers, also offers a technical solution for this. In that case the interface between the ‘old’ and ‘new’ supplier can be used to provide the ‘new’ supplier with the required functionality.

This technical solution, of course, has to be combined with appropriate commercial arrangements and may also need some regulatory involvement e.g. to determine principles for cost sharing between suppliers and possibly also operational matters such as customer handover or service processes (OLAs) and non functional performance (SLAs).

Now that the need for data interfaces between suppliers in the pre-DCC phase has been established, let us look at a practical aspect of this. Assuming 6 suppliers, if every supplier had to have a direct data interface in place with every other supplier $15 (= 6 + 6 \times (6 - 3) / 2)$ two way data interfaces would have to be developed between suppliers themselves. Each supplier would also have to exchange data with each network operator. Again assuming 6 suppliers and also assuming 7 electricity network operators and 8 gas network operators, this implies that $90 (= 6 \times (7 + 8))$ interfaces would need to be developed between suppliers and energy network operators in the pre-DCC period (Figure 3).

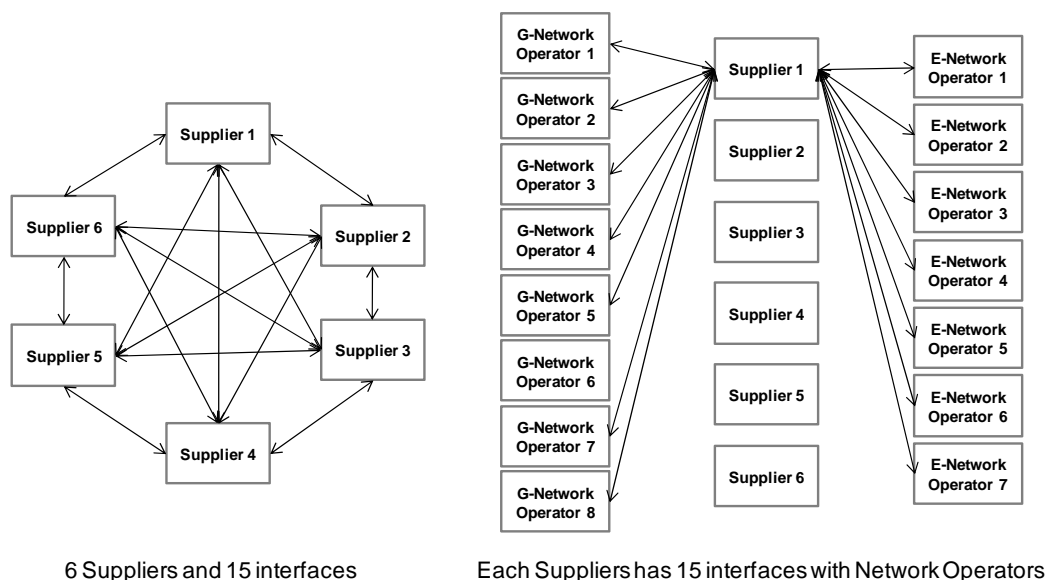


Figure 3. Data interfaces between 6 suppliers and 15 energy network operators

Faced with such an 'interface explosion', the programme might consider investigating 'Shared Interim DCC' possibilities. Again assuming 6 suppliers and 15 energy network operators, the creation of 3 Interim DCC roles would reduce the number of to be developed interfaces to 18 one way interfaces with suppliers and 45 with energy network operators. That makes 53 in total, to be compared with 105 (= 15 + 90) as discussed above (Figure 3).

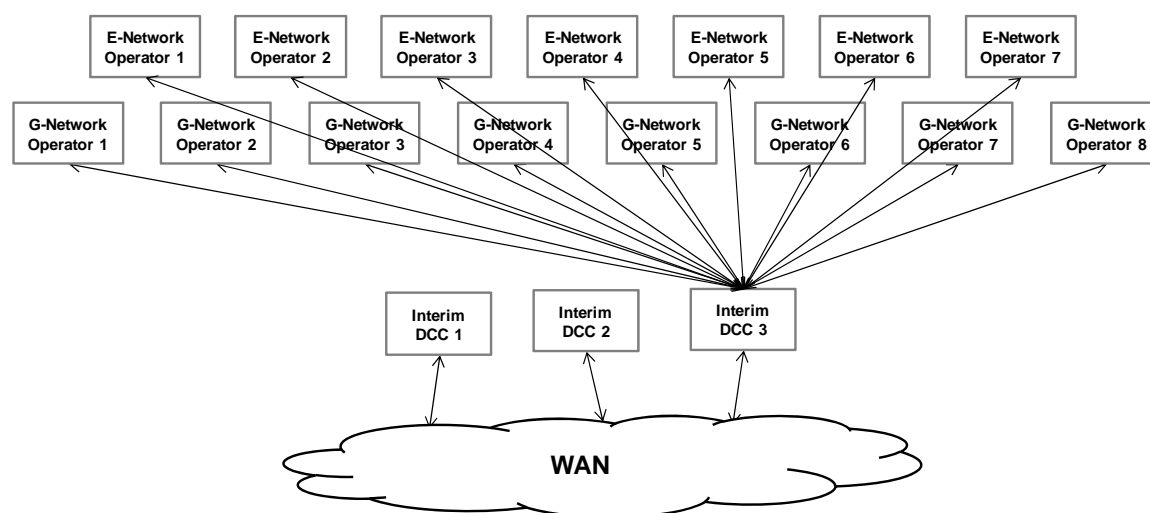


Figure 4. Reduction of data interfaces of 3 'Shared Interim DCCs'

In order to limit costs of interface development it will be key to have appropriate standards defined, already in Phase 2 'Establish Framework' of the programme.

Note that data interface standards between energy network operators and suppliers are also an important element of the smart metering solution that is currently being deployed in The Netherlands. In this solution (Figure 5) there are five interfaces:

- P0 for on site maintenance;
- P1 for communication with other in house service modules, also unregulated; Data received from this meter interface can also be used by Independent Service Providers through other WAN (e.g. standard broadband services);
- P2 for communication with gas meters and other smart meters;
- P3 for regulated communications with utilities.
- P4 as interface between the Central Access Server (CAS) and suppliers. Note that the CAS resembles the Data Function in the Ofgem Smart Metering Programme.

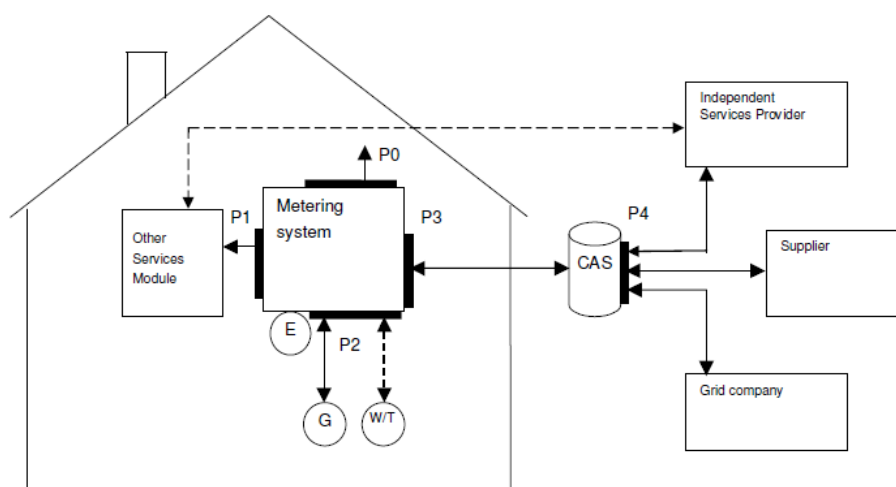


Figure 5. 'P4 interface' to suppliers in Dutch Smart Metering solution (DSMR v2.2)

2. Use of 'old' WAN connection to switch to Data Function of 'new' supplier

By adding intelligence to the WAN it is possible to disconnect a WAN module / smart meter from the Data Function of one supplier and connect to another supplier. To support this process the WAN service provider should offer a value added service to suppliers that enables them to integrate WAN switching in their supplier switching processes. In practice this means that the service providers offers a web services API to suppliers, that enable them to execute (dis)connect use cases (Figure 6). This API can also be used to optimise operations associated with other processes like SIM provisioning or connectivity testing.

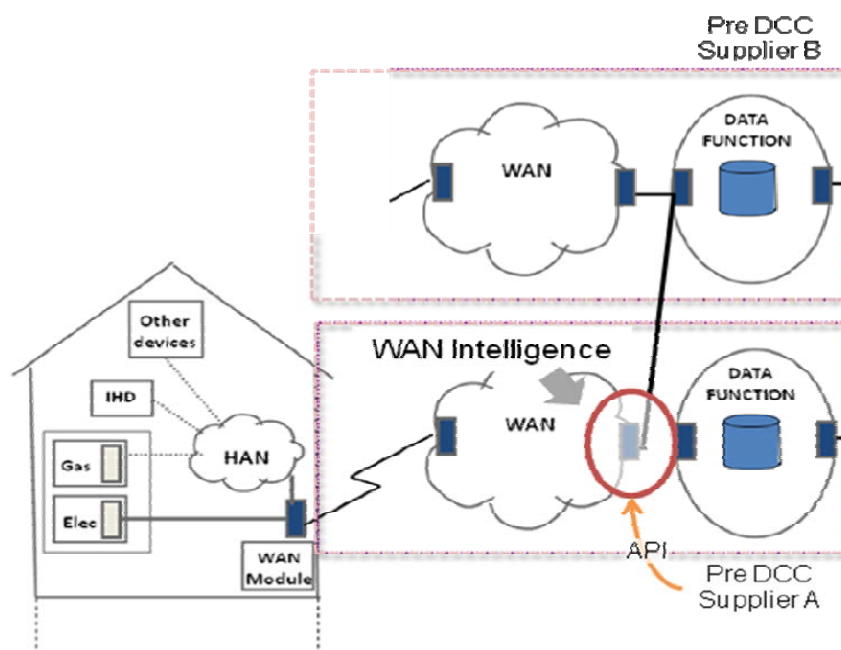


Figure 6. Intelligent WAN that offers APIs for reconnecting, provisioning, or testing

Disconnecting from the Data Function of one supplier and connecting to another supplier may require additional functionality in the WAN module. This is a further reason for involving communications providers in the requirements definition of the WAN module and allowing them to take operational responsibility for both the WAN module and for the WAN service. In the pre-DCC phase this can be contracted for by suppliers. In a post-DCC environment Vodafone believes formal responsibility for the WAN module sits better with the DCC, given that the DCC rather than the supplier is responsible for procuring communications.

3. Use of WAN Intelligence to split connections with different suppliers

The characteristics of cellular coverage mean that in general a WAN module cannot be switched from one WAN provider to another with confidence that connectivity will be retained: in general a site visit would be necessary to reinstall the WAN module. Hence if a switch of energy supplier is to avoid a site visit this should not involve a switch of WAN provider.

By adding intelligence to the WAN it should be possible to let 'Supplier A' connect with one smart meter in a home, and 'Supplier B' with another smart meter in the same home (Figure 7).

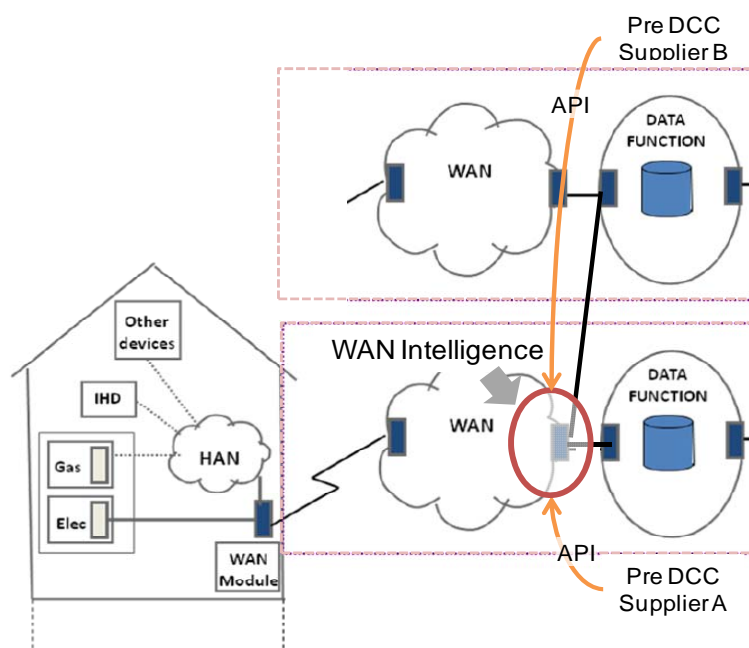


Figure 7. By use of Intelligent WAN different suppliers can use same WAN

Connecting several suppliers via the same WAN module and WAN service may require additional functionality of the WAN module. As above, this a further reason for involving communications providers in the definition of the WAN module and allowing them to take operational responsibility for both the WAN module and for the WAN service.

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

Vodafone recommends the addition of requirements about defining a standardised interface to exchange metering data between suppliers themselves and between suppliers and energy network operators. The latter addition will be needed for support of commercial interoperability in the pre-DCC phase (this interface standard will also be relevant for communications between the DCC and other parties). Please see our response to Question 3, where more is said about this standardised data interface in relation to commercial interoperability, especially in the pre-DCC phase.

Vodafone notes that it will most probably be required to add an application to the WAN module that mirrors, at least, the metering data of the gas meter. The reasons for this have to do with the fact that the gas meter is proposed to be battery powered. In order to prolong the life time of the battery, from a system design point of view, it seems inevitable that part of the 'smart' gas meter functionality should be provided by another system component, most probably, the WAN module. Note that in some other smart metering system architectures this role is fulfilled by the electricity meter (cf. Dutch Smart Meter Requirements v2.2).

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

The Prospectus contains insufficient information about the quantitative cost benefit implications of additional functionalities for Vodafone to be able to comment in detail. However, Vodafone is broadly

in agreement with the proposals in the statement of design requirements and welcome the inclusion of last gasp communications. Though the need to manage a correlated mass usage of the WAN network in a power-fail scenario ("Thundering Herd" risk) reiterates the need for the WAN provider to be involved in the design of the WAN module and also the Data Function, as management of "Thundering Herd" risk may require functional or procedural capabilities at the DCC.

In particular, Vodafone is fully supportive of the proposal that the WAN module be exchangeable without exchanging the meter. Vodafone believes a physically separate WAN module is desirable for the following reasons:

- A separate WAN module allows the installer to position the box at an optimal location near to the smart meter.
- Antenna characteristics have a substantial impact on chances for getting a connection. A separate WAN module offers much better possibilities for optimising the design of the antenna over a module that has to be 'squeezed' into a smart meter. In addition, the smart meter itself contributes to loss of signal strength, so having a separate module also reduces this effect.
- In exceptional cases it may also be helpful to position the module outdoors. This would not be possible if the module were integrated into the smart meter.

Please refer to the Appendix section 7.2, entitled 'Vodafone's view on getting a smart metering into every UK home' for further details.

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

Vodafone is not aware of new evidence at present. However, additional functional requirements and evidence on cost benefit implications can soon be expected to be derived from experience with early installation and rollout activities.

Stakeholders (including WAN service providers) involved in early rollout activities should therefore be consulted closely as informative evidence could be gathered as their rollout activities progress. Vodafone would be pleased to support the programme in this regard.

4.3 Achieving Technical Interoperability

Question 7: Do you agree that the proposed approach to developing technical specifications will deliver the necessary technical certainty and interoperability?
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Vodafone agrees that technical specifications should be industry drafted and programme facilitated and believes that the timescales indicated are challenging but realistic. Rigorous programme management will be required to deliver successful results within the required timelines.

Suppliers have rightly been placed at the heart of the technical specifications process, however to supplement their contribution, Vodafone underlines the need for close involvement of other industry participants, including WAN service providers in the process.

In particular, Vodafone envisages serious challenges with interoperability and believes that more emphasis on resolving the issues around interoperability at an early stage is critical. Vodafone looks forward to playing a full and active role in discussions to address and resolve such issues.

In addition, Vodafone recommends that technical interoperability tests and tooling also be developed by the programme alongside the technical requirements development process. The availability of standardised tests and tools to verify compatibility will reduce uncertainty and could

accelerate delivery significantly for manufacturers, suppliers and data and communications providers.

Please refer to our response to Prospectus Question 7 for further details.

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

As none of the suppliers are in a position to manage the others, Vodafone recognises that the programme is playing a necessary and valuable role in facilitating and providing leadership through the specification development process.

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

With regard to the potential use of Zigbee (802.15.4), we would highlight several potential issues which could add delay to timescales:

- There may be challenges with making Device Language Message Specification (DLMS) IEC62056 work over Zigbee;
- There is insufficient research data available on propagation characteristics of Zigbee within buildings – however, positive indications about such characteristics, especially in the sub GHz band (868 MHz) have been communicated;
- Future transition from Zigbee v1.1 to Zigbee v2.0 (supporting 6LoWPAN) may present issues, e.g. devices may not be detected or function correctly if HAN is upgraded in future. This may present delays to timescales.

More broadly, the use of multiple communications technologies with different protocols could cause delays; in particular the use of proprietary standards should be avoided where possible to minimise this risk.

Finally, Vodafone believes that the proposed gas meter battery specifications would be challenging to realise may not be possible and could add delays to timescales.

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

Vodafone reiterates the importance of ensuring that all of the key parties and likely market participants, including WAN communications providers, are represented in discussions and planning to make use of wider industry expertise and discover or prevent the emergence of any design flaws or potential issues as early as possible in order to prevent delays and agree specifications more quickly.

Please also refer to our response to Prospectus Question 18 for further details.

5. Responses to Rollout Strategy Questions

5.1 Introduction

Vodafone agrees that energy suppliers are best placed to manage and drive the rollout as they already have the direct retail relationships with the customer. As customer engagement and a positive customer experience is integral to acceptance and the ultimate success of the smart metering programme, rollout activities need to be designed from a customer-centric view, minimising inconvenience and disruption, whilst also educating and informing customers.

Consideration should be given to whether any code of practice to encourage best practice across industry is purely voluntary and owned by industry on a self-regulatory basis or additionally backed by formal regulation.

Vodafone recommends extending the scope of the installation code of practice to include a standard process, formalised responsibilities and a clear definition of what constitutes 'a complete installation'.

5.2 Approaches for Rollout

Question 1: Do you believe that the proposed approach provides the right balance between supplier certainty and flexibility to ensure the successful rollout of smart meters? If not, how should this balance be addressed?

Vodafone supports the proposal to allow suppliers broad flexibility over the pattern of their installations, especially in early stages of rollout (i.e. approach 1, market led implementation).

In addition to the benefits identified in the Prospectus, Vodafone believes that suppliers' ability to selectively target or exclude single fuel customers may also be important to enable 'operational workarounds' which will minimise interoperability issues in the pre-DCC phase (e.g. some suppliers might wish to avoid gas only installations until the DCC is operational to avoid implementing costly temporary solutions which would no longer be required once the DCC is operational).

Vodafone notes that cellular WAN communications solutions and/or existing national wireless networks are capable of supporting a flexible market led implementation and realising these benefits. In addition, they are equally capable of supporting the alternative approaches identified, i.e. local project based initiatives or area based coordination, should these be required later.

Question 2: Would the same approach be appropriate for the non-domestic sector as for the domestic sector?

Vodafone believes that market led implementation and flexibility will be even more important for the non-domestic than for the domestic sector, given the more dispersed nature of non-domestic meter locations. The same approach is therefore appropriate.

Question 3: Is there a case for special arrangements for smaller suppliers?

For smaller suppliers Vodafone again believes that a market led implementation approach would be appropriate, as some have nationwide customer bases with even less regional concentration than larger suppliers.

5.3 Mechanisms for General Consumer Engagement

Question 4: What is the best way to promote consumer engagement in smart metering? As part of broader efforts, do you believe that a national awareness campaign should be established for smart metering? If so, what do you believe should be its scope and what would be the best way to deliver it?

Vodafone agrees with the importance of consumer engagement, both to communicate the policy aims of the programme and to provide information and reassurance about practical aspects and consumer benefits. We note the report by FDS that Ofgem has published with the prospectus which provides a useful starting point to understand the current level of consumer understanding and concerns that may need to be addressed.

Vodafone believes that a marketing campaign needs to achieve the objectives of informing, educating and inspiring consumers in relation to smart metering.

- Inform - drive national awareness of smart metering and the benefits for consumers, the environment and society. This phase needs to focus on de-mystifying smart metering and making it accessible.
- Educate - Explain how smart metering works in the home, what consumers need to do and how smart metering will help them. This phase should focus on providing relevant information to consumers online and through regular communications.
- Inspire - Make smart metering an inspirational talking point, create mass market appeal by bringing to life the benefits of smart metering and generating talking points and anecdotes.

For each phase, a different suite of tactics and activities should be adopted:

- TV advertising works effectively for informing the mass market with a simple message to position timescales and consumer benefits.
- Use of existing communications vehicles and relationships that consumers have with their energy providers, including the use of bill inserts, online communications and direct mail helps to provide deeper education.
- Reference stories, key statistics, and a co-ordinated public relations programme will drive appropriate inspiration and involvement in the smart metering programme.

Vodafone would be happy to discuss these ideas further with Ofgem in due course. It will be important to recognise the different needs and concerns of different customer groups. For instance vulnerable customers may require more/different information or help in accessing smart metering.

Question 5: How should a code of practice on providing customer information and support be developed and what mechanisms should be in place for updating it over time?

As above, other stakeholders may be better placed to comment on this question in the first instance though we look forward to reviewing what others have to say. Nevertheless, from our international

experience as the world's leading mobile telecommunications company, we would like to share a few best practices concerning a code of practice:

- Identify the right stakeholder groups that are representative of different needs in the market - including consumers, energy companies, smart meter suppliers and communications providers;
- Engage these stakeholder groups in shaping the code of practice and identifying the level of support needed;
- Provide an appropriate measurement system and benchmark to ensure that the code of practice is being upheld by the supply side community;
- Audit organisations against this code of practice on an annual basis and ensure that regular consumer feedback is reviewed;
- Develop mechanisms to keep it updated including regular focus groups with stakeholders and regular assessment of how needs have changed as routes to market and channels to market change.

5.4 Obligations on Suppliers to Complete the Rollout

Question 6: Do you agree with the proposed obligation on suppliers to take all reasonable steps to install smart meters for their customers? How should a completed installation be defined?

Vodafone agrees with the proposed obligation and advocates the early development of solutions and an agreed procedure for implementing successful installations in difficult to reach meter locations. Vodafone offers its experience and co-operation in this regard.

Vodafone believes that any definition of a completed installation should include the successful and reliable execution of data communications sessions for a number of selected use cases and potentially also test use cases.

Question 7: Do you think that there is a need for interim targets and, if so, at what frequency should they be set?

Vodafone has no firm view on interim targets at this stage but may wish to respond to any specific proposals subsequently.

Question 8: Do you have any views on the form these targets should take and whether they should apply to all suppliers?

Please refer to our response to Question 7 above.

Question 9: What rate of installation of smart meters is achievable and what implications would this have?

Vodafone has no comment except to note that cellular WAN communications would not present a constraint with regard to either the rate of installation indicated in the Prospectus, or the higher levels indicated in Ofgem's Rollout Information Request Open Letter.

5.5 Prioritisation of Specific Consumer Groups

Question 10: Do you have any evidence to show that there are benefits or challenges in prioritising particular consumer groups or meter types?

Vodafone suggests that new build properties should be prioritised.

Vodafone also recommends that the programme works with suppliers to find ways to do combined installations of gas and electricity meters together wherever possible as this will save a second site visit and prevent issues associated with powering the WAN module.

5.6 Reporting Arrangements

Question 11: Do you agree with our proposed approach to requiring suppliers to report on progress with the smart meter rollout? What information should suppliers be obliged to report and how frequently?

Vodafone has no comment.

5.7 Consumer Issues

Question 12: Do you agree that there is already adequate protection in place dealing with onsite security or are there specific aspects that are not adequately addressed?

Vodafone has no firm view on this issue either way at present.

Question 13: Do you agree with our proposal to require suppliers to develop a code of practice around the installation process? Are there any other aspects that should be included in this code of practice?

Vodafone supports the proposal and believes it will be a key measure to ensure a positive and consistent customer experience around the installation process and support consumer engagement.

Vodafone believes this code of practice should also include a carefully designed, standardised, robust process for completing installation, including contingency based procedures for successfully installing WAN communications and ensuring interoperability of the smart meter(s), WAN module and in-home display within a single visit wherever possible, even in exceptional locations and circumstances. Vodafone believes that with sufficient co-operation, preparation and planning in this regard, instances requiring a second site visit can be greatly reduced and limited to extremely exceptional cases. This would result in significant time, effort and cost savings, both for customers and suppliers.

Vodafone offers its experience, support and co-operation to the programme in developing procedures for achieving 'right first time' installations.

6. Responses to Implementation Strategy Questions

6.1 Introduction

Vodafone welcomes the decision to accelerate the programme through a supplier led rollout ahead of the DCC coming into being. There are some complexities to be addressed with regards to necessary data exchange between suppliers themselves and with energy network operators. There are also issues to be addressed concerning novation of contracts agreed in the pre-DCC period to the DCC once it is established, but we do not believe these are insurmountable.

Establishing any-to-any data connectivity in the pre-DCC period in a completely different way from that required once the DCC comes into being would add additional complexity and may turn out to be prohibitively expensive given the potential stranding risk of short lived assets. For this reason, our answers to the Statement of Design Requirements questions suggest a number of potential solutions to reduce these complexities and mitigate associated risks.

Contract novation is also a key area to address in order to provide the requisite commercial certainty to underpin investment. However, with the right regulatory framework and incentives in place, we believe the transition from pre- to post-DCC era can be managed successfully at a commercial level with minimum technical change and disruption.

These issues are detailed further in our responses to specific questions below.

6.2 Programme Management and Governance

Question 1: Do you have any comments on our proposed governance and management principles or on how they can best be delivered in the context of this programme?

Please see our response to Prospectus Question 20.

6.3 Programme Activities

Question 2: Are there other cross-cutting activities that the programme should undertake and, if so, why?

Vodafone's recommendations are set out elsewhere in this response against the specific questions to which they relate.

6.4 Implementation Plan for Regulatory Framework Changes

Question 3: Do you agree with our proposal for a staged approach to implementation, with the mandated rollout of smart meters starting before the mandated use of DCC for the domestic sector?

Please refer to our response to Prospectus Question 17.

Question 4: Do you have any comments on the risks we have identified for staged implementation and our proposals on how these could best be managed?

Vodafone recognises and agrees with the risks identified; however we believe the mitigations described may be developed further.

In mitigating issues of technical interoperability, it is Vodafone's experience that compliance with standards on its own may not resolve a range of issues. This is especially true in a new product introduction and first draft standards. Specifications for new systems are typically and understandably not complete and the practical situation encountered often depends on open implementation choices. Achieving technical interoperability would therefore also benefit from the development of interoperability testing and tools and from the involvement and co-operation of various stakeholders with allowance for time to resolve anticipated issues.

In relation to the procurement of WAN communications by suppliers, Vodafone does not believe this constitutes a material risk as we recommend the use of commercially available cellular communications solutions and networks (GPRS in particular), which are based on already existing assets, open standards and offer a range of highly competitive, efficient and economic options which can deliver the required service quality.

Vodafone recognises that the creation of a new national proprietary network solution for smart metering may not be justifiable without the co-operation of multiple suppliers in the pre-DCC phase. However, Vodafone considers it highly doubtful that the creation of a new national communications network solution dedicated to smart metering is either necessary or otherwise justified.

Vodafone does believe that contract novation uncertainty represents a risk in this regard, as outlined elsewhere in our response. This implies mitigation should be undertaken to provide suppliers and service providers with certainty over novation of contracts which have terms bridging the establishment of the DCC.

Vodafone emphasises that the use of GPRS and open standards can mitigate the key risks of interoperability and procurement of an effective solution. Finally, the implementation of the DCC under GPRS should be a smooth transition given working interim market arrangements and certainty around contract novation.

Question 5: Do you have any other suggestions as to how the rollout could be brought forward, including the work to define technical specifications, which relies on industry input?

Please see our response to Prospectus Question 18 for an overview of what we consider to be the key questions which are currently causing uncertainty in the market and limiting acceleration of the rollout. We believe that the measures we recommend to address these questions and reduce uncertainty potentially represent important policy levers the programme can use to achieve material acceleration.

Please also see our response to Prospectus Question 7, where we suggest that the programme consider modifying its approach to developing technical requirements and publish information to the market in a number of stages, prioritising the release of information on those elements that pose the highest risk to suppliers deployment first (e.g. key hardware elements and other requirements which pose asset stranding risk or would necessitate a second site visit), rather than waiting to release a complete set of defined standards for all elements all at once as is currently proposed.

In addition to the above mentioned points, Vodafone emphasises that one of the most simple and effective ways to bring the rollout forward is for suppliers to scale up their utilisation of commercially

available, operationally and technically mature, extensively proven and trusted cellular wireless WAN communications technology based on open standards. Leveraging the existing networks and spare capacity of cellular wireless services as far as possible will significantly reduce the time, cost and risk of the rollout as these are immediately available and proven to be both cost effective and efficient. Vodafone is pleased to already be involved in major early rollout activities and believes that successful demonstration of progress and success in these early activities will provide one of the most effective encouragements of further acceleration.

Question 6: Do you agree with our planning assumption that a period of six months will be needed between the date when supply licence obligations mandating rollout are implemented and the date when they take effect?

Vodafone considers that a six month period is more than sufficient for suppliers to contract for WAN communications services using the existing cellular networks, with large scale, operationally proven smart metering applications (GPRS is particular). In contrast, Vodafone believes that contracting for new build networks could represent a risk to this timescale.

However, Vodafone recognises that suppliers need significant time to prepare organisationally for rollout.

In addition, this time will also be required for testing and/or product development in line with the technical standards once they have been defined.

In both cases, six months provides a challenging timeline. Depending on the technical standards published, availability of compliant hardware may be on the critical path for the smart metering rollout.

Question 7: Do you have any comments on the activities, assumptions, timings and dependencies presented in the high-level implementation plan?

No, not at this stage.

Question 8: Do you have any comments on the outputs identified for each of the phases of the programme?

Vodafone recommends adding interoperability testing and tools to the outputs for Phase 2, as outlined in our response to Implementation Strategy Question 4. We also recommend that the Installation Code of Practice include a detailed, customer friendly and efficient installation procedure that should ensure site visits are 'right first time' and the need for second visits is minimised, as outlined in our response to Rollout Strategy Question 13.

7. Appendices

7.1 Vodafone's view on the use of IPv6 / 6LoWPAN for Smart Metering

It is Vodafone's view that the combined use of IPv6 and 6LoWPAN (IETF RFC 4944) will be the long term network layer protocol of preference for smart object communications in general and smart metering in particular.

This view is based on the following observations:

- Support of IPv6 in new products and applications is already substantial, and growing;
- The address exhaustion of IPv4 already is now becoming imminent;
- And working around this exhaustion by creating separated IPv4 networks is not a sustainable solution in the long run;
- An adaptation of IPv6 in the area of low power smart objects is available and already standardised (6LoWPAN), so that the burden of IPv6 addressing is reduced and a platform is created for new smart object routing solutions;
- Relevant industrial parties in the smart objects and smart metering space (like NXP, Cisco, Itron, L&G) are already moving towards IPv6 and 6LoWPAN.

The interface between current GPRS packet domain networks of cellular service providers and other Packet Data Networks support IPv4. IPv6 is still relatively new in this area and requires further developments. Timelines for such developments still have to be established. In case smart metering technical requirements will demand the use of IPv6 for the WAN cellular from the beginning of the smart meter rollout, cellular network operators will be challenged to accommodate that.

Vodafone notes that use of IPv6 in the HAN in the short term does not immediately require support of IPv6 in the WAN. Intermediate solutions based on IPv6 tunneling are available and have been demonstrated.

Furthermore, should IPv6 not initially be used in the HAN, future migration to IPv6 is possible using an OTA firmware update.

7.2 Vodafone's view on getting a smart meter in every UK home

Vodafone's view on how to get a smart meter in every UK home, as is the objective of the smart metering programme, covers the following measures:

1. Use of existing cellular network assets – GPRS in particular
2. Separation of WAN module for coverage optimisation
3. End-to-end approach – making WAN providers responsible for WAN module
4. Investigate inter HAN communications to deal with coverage in difficult locations
5. Use low frequency network for in-fill of remote locations
6. Develop procedure to complete installation, adaptive to location

1. Use of existing cellular network assets – GPRS in particular

The combined cellular networks of wireless service providers in the UK already constitute an asset of strategic national importance for citizens' and business' mobile telephony and data communications

needs. Driven by increasing voice and data demand and intense competition, cellular networks have delivered continuously increasing coverage, availability, reliability and service quality, as well as a track record of technology innovation and evolution.

It is Vodafone's view that existing cellular technology, especially GPRS, should also be the primary WAN solution for the proposed smart metering system, for the following reasons:

- The GPRS solution is very well established in the UK market and has already proven itself in a wide range of large scale smart metering rollouts around the world.
- Existing cellular networks are ideal for dispersed or geographically scattered rollouts, which is particularly important to support a market-led implementation.
- No high upfront investments in WAN service technology (i.e. network infrastructure) will be required.
- The additional traffic associated with smart metering (and smart grids in a later stage) is relatively small compared with loads caused by other uses, as also noted in the Statement of Design Requirements (page 20) and will not present a constraint to rollout. Such additional capacity usage is in fact complimentary to consumer utilisation as peak loads can be managed to occur outside of busier voice and data.

In contrast, it is Vodafone's view that rollout based on a new WAN technology using proprietary standards or new build assets for smart metering would introduce substantial risks in terms of upfront investments as well as long term operational costs, coverage, reliability, capacity, and future proofing. All of these risks and the associated potential for delays and cost increases can and, in our opinion, should be avoided through the use of GPRS.

2. Separation of WAN module for coverage optimisation

Making the WAN module a physically separate piece of equipment to the smart meter has a number of advantages relevant to optimisation of WAN connectivity. Note that the WAN module still needs to have a wired connection with the electricity meter (when present) for power and possibly also data exchange. For present purposes we assume that the connecting cable is not longer than approximately 1.5m and that a wireless WAN service is used.

A physically separate WAN module is desirable for the following reasons:

- A separate WAN module allows the installer to position the box at an optimal location near to the smart meter.
- Antenna characteristics have a substantial impact on chances for getting a connection. A separate WAN module offers much better possibilities for optimising the design of the antenna over a module that has to be 'squeezed' into a smart meter. In addition, the smart meter itself contributes to loss of signal strength, so having a separate module also reduces this effect.
- In exceptional cases it may also be helpful to position the module outdoors. This would not be possible if the module were integrated into the smart meter.

It is Vodafone's view that physically separating the WAN module from the smart meter, sophisticated design of its antenna, and a smart on-site positioning process, will substantially contribute to getting an operational smart meter in every UK home.

3. End-to-end approach – making WAN providers responsible for WAN module

Coverage or connectivity is a combined characteristic of WAN technology and terminal equipment like a WAN module. This is a strong argument for making WAN service providers also responsible for the technology of the WAN module and its installation processes. This may be a delegated responsibility from suppliers or the DCC; it is important to avoid a situation where terminal equipment

is developed and installed independent of WAN providers. Vodafone advocates an end-to-end approach to WAN communications for smart metering.

In the pre-DCC phase suppliers can contract with communications providers to optimise the integration of the WAN module and the WAN service. In a post-DCC environment Vodafone believes that formal responsibility for the WAN module sits better with the DCC, given that the DCC rather than the supplier is responsible for procuring communications. The DCC will then be in a position to make communications providers operationally responsible for the WAN module and associated WAN service.

Note that WAN module is a communications device comparable with a DSL or cable modem. To manage the performance of the communications supported by such devices it is common practice to provide them with a device management agent (software) that works together with a central device management. The fact that device management of communications equipment is a core capability of WAN providers further supports Vodafone's view that WAN providers should also be made responsible for WAN modules connected to their network.

4. Investigate inter HAN communications to deal with coverage in difficult locations

There will always be exceptional situations where regular communications over a cellular network will be difficult. As mentioned in the Rollout Strategy (paragraphs 7.16 and 7.17) this may concern basements of blocks or flats. In such cases it will help if WAN modules can communicate with each other and automatically search a better located WAN module that has an operational WAN link that can serve as a gateway for other WAN modules.

If WAN modules are equipped with a HAN interface, it would be cost effective to also use this interface for a limited form of inter HAN communications. For this purpose the HAN should support dynamic routing and rerouting capabilities. The Statement of Design Requirements states that the HAN should be based on open standards and protocols as a functional requirement. Assuming that a newly wired solution is not an option for the HAN, and that the HAN should therefore be either wireless or based on existing power line infrastructure, a serious candidate for a wireless solution is IEEE802.15.4 ('Zigbee'). Another interesting but not yet fully established candidate is HomePlug Command & Control (based on Yitran technology). Both 'Zigbee' and HomePlug CC offer dynamic routing capabilities and might be suitable for the above described inter HAN communications solution for optimisation of WAN communications in difficult situations.

It is Vodafone's view that possibilities for inter HAN communications should be investigated by the Smart Metering Implementation Programme.

Note that this concept of routing between homes to connect with an available WAN gateway aligns with ongoing 'Communication Diversity' developments at a leading Dutch DNO, Alliander (Figure 8).

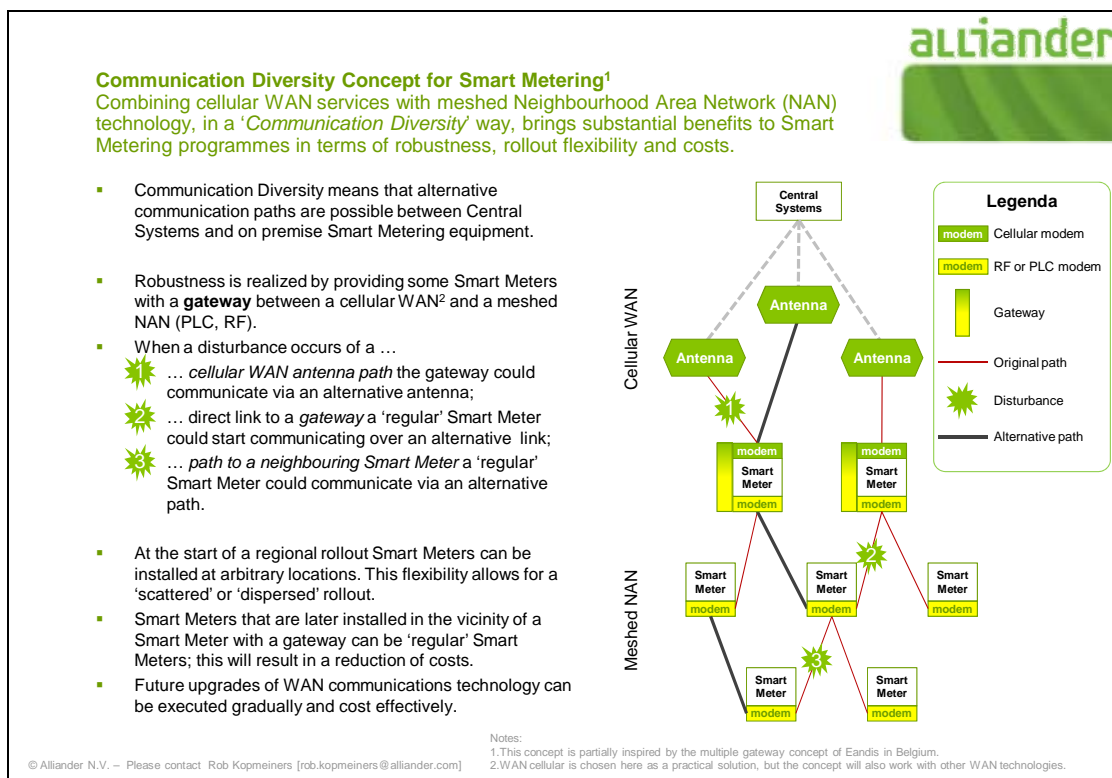


Figure 8. Communication Diversity Concept for Smart Metering

5. Use low frequency network for in-fill of remote locations

Getting a smart meter to every UK home implies that also homes in remote rural and scarcely populated areas should get an operational smart meter. Current cellular networks achieve very high coverage levels when it comes to connecting the UK's population. Although measures have been taken to also provide scarcely populated remote areas with some level of coverage by at least one commercial cellular service, it is not realistic to assume that deep indoor penetration as required for smart metering is always achieved. This may be resolved by building out of cellular networks in such areas. There are indications that deep indoor penetration losses have a strong directional dependency; this may be relatively low in the direction of the front door of a home and very high in the direction of the back door. This could make building out of cellular services for smart metering in rural areas an even more costly operation as more antenna installations may be required than initially anticipated.

In this case it is Vodafone's view that the use of an existing wireless network that operates at a very low radio frequency (160 MHz band) and therefore has substantially better propagation and penetration features than cellular networks that use 900 MHz or higher frequencies, should be the preferred solution for smart metering in remote and scarcely populated areas.

Vodafone has extensive experience with such a network, known as Paknet. This network has been operational for many years is used for security alarm monitoring, remote meter reading, gaming, telemetry, payment, and management information services. This network has available capacity to in-fill a limited percentage of the UK's homes that can possibly not be served by regular cellular services.

Note that some research and development will be required for use of Paknet for smart metering. A special WAN module with a Paknet WAN interface and low power usage will be required.

6. Develop procedure to complete installation, adaptive to location

As mentioned above, coverage is a combined characteristic of the WAN module and WAN technology. There is strong dependency on the exact positioning and characteristics of WAN antennas (in base station towers) and the exact positioning and characteristics of the WAN module. In cases where WAN connectivity is difficult, successful completion of a WAN module installation is very much dependent on the installation procedure that is performed by the installer. The installer has to make supported decisions about where to mount the module, how to orientate it, whether it should be place outdoors, etc.

Such a procedure requires intelligent tooling support and consistent execution of a carefully designed and efficient procedure. We expect that development of special test use cases that can be executed by on-site installers will be required, and ideally, a clear visual indicator should be displayed when installation is complete.

It is Vodafone's view that development of such an installation procedure and the execution of it as an element of the code of installation will be necessary to achieve optimal access to all UK homes and ensure a positive customer experience.