



Consultation Title: Smart Metering Implementation Programme: Statement of Design Requirements

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CONFIDENTIALITY

What do you want Ofgem to keep confidential? None of the information submitted in this response is confidential..



Executive Summary

Qualcomm welcomes the opportunity to respond to Ofgem's public consultation on the Smart Metering Implementation Programme, conducted jointly with the Department of Energy and Climate Change.

As one of the world's largest developers and manufacturers of innovative wireless chipset technologies, Qualcomm is actively engaged in developing technologies that may increase energy efficient networking and that may overcome the challenges associated with rolling-out smart metering and smart grid technologies worldwide. We are therefore grateful for the opportunity to address the questions in this consultation and to share our experience as Ofgem investigates the most efficient way to implement smart metering technologies in the UK. We applaud the overall goals of the Smart Metering Implementation Programme and believe that, subject to certain conditions, it can be a significant "facilitator" in the transition to a low carbon economy and place the UK as a leading innovator in this area, together with substantial societal and consumer benefits. This will require appropriate implementation with sufficient "future proofing" built in from the outset, together with an approach that facilitates investment and innovative businesses to emerge and flourish. Full participation from the Information Communication Technologies (ICT) industries, and wireless communications in particular, will be essential if the appropriate regulatory approach and business solutions are to be realised.

Qualcomm is the pioneer of technologies which power the 3G cellular networks operated by O2, Orange, Three, T-Mobile Vodafone, and other global wireless carriers. Today, these networks enable many millions of UK citizens, in rural, suburban and urban areas alike, to enjoy advanced, high speed and ubiquitous mobile broadband services. These 3G networks are ideal from a technology and future proof perspective to cost effectively connect smart meters and grids. Qualcomm licenses its technology to over 180 handset and infrastructure manufacturers worldwide who make infrastructure equipment, handsets and other consumer devices, and develop applications for 3G cellular networks. Qualcomm also licenses technology that will be used in the next generation of cellular networks to be based on the so-called Long Term Evolution ("LTE") air interface. Qualcomm invests heavily in Research & Development; to date we have invested more than \$14.2billion in R&D in 3G and future wireless technologies and services; with over \$2billion invested in 2009 alone.

There are a number of key aspects that we believe need to be addressed more fully with respect to the implementation plan. Those aspects are discussed in further details below and focus on spectrum and standardization, the importance of innovation and investment, and of technology neutrality. We then introduce our belief that real time energy management has to be built in from the outset in order to enable a rapid, richer and simple user experience. We believe that this approach will facilitate an innovative and sophisticated energy market and that will lead to greater and permanent change in consumer behaviour. We also believe that Smart Metering potentially opens up new and innovative business opportunities and the potential for significant investment in the area of home management (such as home monitoring for the elderly, remote security provision, telemedicine, consumer electronics servicing & repair, etc). We also have some questions into the removable WAN/HAN modules.

Finally, Qualcomm encourages Ofgem to place this initiative in the wider European Digital Agenda and the European Commission proposals that call on Member States to ensure availability of radio



frequencies “for wireless technologies with a potential for improving energy saving, including smart energy grids and smart metering systems.”¹

Taking into account the wide range and complexity of the issues that are raised by this consultation, Qualcomm is focusing its response on the key strategic policy topics and will be happy to contribute to future consultations that will address the many detailed issues. We would welcome the opportunity to meet to discuss the various issues raised.

Our direct responses to questions raised in the consultation can be found at the end of this document.

¹ http://ec.europa.eu/information_society/policy/ecomm/radio_spectrum/eu_policy/rspp/index_en.htm



Key Considerations for smart metering implementation

a) The importance of Economies of Scale and a future-proof platform

The market for consumer devices such as washing machines, dryers, refrigerators, displays, etc, is increasingly pan-European, if not global. It requires as much commonality as is practicable in the WAN / HAN connectivity, in order to benefit from economies of scale and drive costs down. We recommend the UK government's approach is consistent with those throughout Europe, if not globally. It is also essential that a pan European approach is taken regarding spectrum so that the benefits of economies of scale can be realised through, for example, the use of the mobile operator's spectrum.

Qualcomm firmly believes that wireless communication networks, in particular those based on existing 3G commercial networks and their evolutions, are well suited for provision of customer and grid-side applications, as envisioned under this Smart Metering initiative. Today, these networks, which have required significant investment in licensed spectrum acquisition and network build-out, provide coverage and services to the large majority of the UK population², and could also provide a secure, reliable and resilient communications network for the purpose of Smart Metering applications.

As highlighted in the consultation document, the choice of technology will be critical to avoid obsolescence. It is our view that the choice of technology deployed should be future proofed as much as possible. This is because not only is it clear that the sophistication of smart metering capabilities will only increase, but that the scope of energy efficient applications will grow.

While there will be differing needs and applications and there will be need to incorporate various network types/topologies deployed to address these varied needs.

Usage of existing 3G wireless networks would ensure higher data speeds, enhanced capacity and lower latency than enjoyed by 2G and legacy networks. Scalability, reliability, resilience and low latency – essential characteristics of existing 3G wireless communication networks – are of particular importance in the event of emergencies, disaster recovery and surge scenarios. The fact that cellular networks handle billions of connections worldwide ensures that the technology will be able to scale in line with the potentially explosive demand for Smart Grid/Metering applications.

Multimode 2G/3G chipsets for the WAN component represent the optimum choice for initial deployment at this stage. 3G provides the mainstay technology in terms of superior latency, capacity and total cost of ownership characteristics. In areas where 3G is still in the process of being rolled out (such as rural areas) 2G can be used as a fallback until 3G is rolled out. Multimode WAN chipsets in the smart meter enable this.

The roll out of 3G in lower spectrum such as 900 & 1800 MHz will also enable more meters and grids to benefit from 3G. It is indeed crucial to have a future proof communication network to avoid the cost of switching technologies, especially considering the lifecycle required for products such as smart meters. Qualcomm strongly encourages Ofgem to work with the Ofcom to understand the timetable for the availability of spectrum for wireless broadband technologies (including, but not limited to, the 800 MHz, 900 MHz, 1800 MHz and 2.5 GHz bands). Qualcomm supports as a

² http://licensing.ofcom.org.uk/binaries/spectrum/mobile-wireless-broadband/cellular/coverage_maps.pdf



valid objective, the release spectrum for new innovative services as soon as possible, in order to maximize the value that the use of this spectrum is likely to bring to society.

b) Importance of Investments & Innovations

Deployment of Smart Metering will require tremendous investments by the industry. If consumers and UK society is to benefit from the scheme, any Government policy to support deployment of Smart Metering across UK must therefore create incentives for industry to invest and innovate. In particular, economic impact assessments should consider the long term impact on the whole value chain involved, especially the supply-side (utility) and the demand-side (consumer). For the programme to succeed it must foster investment and innovation in all areas and levels (e.g. technology, services, and businesses) if investors and businesses are to be able to recoup on the massive investments required in this initiative. It is therefore of great importance that the scheme provides certainty and innovative opportunities for the businesses involved and the models they follow.

Qualcomm agrees that the communication platform should be an integral consideration in the overall assessment process. Qualcomm is pleased to see that DECC/Ofgem are not advocating any specific platform, which will enable industry to select the technologies that best meet stakeholders' business models.

c) Need for a Technology Neutral Policy Approach

DECC and Ofgem rightly recognise that communication infrastructure represents an essential part of the Smart Metering roll-out. The consultation document also appropriately identifies a series of scenarios that will require hybrid communications technologies at the consumers' premises (WAN/HAN). Wireless communications are able to efficiently integrate multiple technologies to enable economies of scale and thus drive down the costs. Therefore, although different services and applications may necessitate different technical requirements, standardised wireless communications technology can effectively respond to all these requirements and do so in a cost efficient manner. As such, Qualcomm encourages proven commercial global technical standards to be leveraged in order to benefit from economies of scale.

Technology neutrality is particularly important given the rapid evolution of smart grid technologies, which increase the risk of lock-in to obsolete technologies, especially given the fact that the full extent of smart metering capabilities is not yet understood. Integrating within the Smart Grid 3G wireless connectivity at remote locations would provide important benefits given the data speeds, capacity and latency enabled by 3G. Benefits would include ensuring system security, attaining end-to-end integration, and managing customer distributed energy resources. In particular, 3G technology and its future evolutions, given that networks migration will continue to accelerate at an unprecedented speed, are particularly well suited for a future-proof solution.

Most importantly, in the context of technology neutrality Qualcomm notes that the Supporting Document states that HAN/WAN interfaces are to be based on "open and non-proprietary standards". Qualcomm is concerned that, by adopting a definition based on European public procurement recommendations for software and services, the Supporting Document suggests that only 'royalty free' communications technology should be eligible for the smart grid



communications platform. Such an approach would discriminate against the global wireless 2G, 3G & 4G standards that are used by 1.5Bn people globally and are recognised by the global standards organisations such as the International Telecommunications Union (ITU) and the European Technical Standards Institute (ETSI), etc. The approach suggested in the Supporting Document should therefore be modified or there will be a risk the choice of technologies available will be drastically reduced (and future evolutions thereof) to the detriment of the UK's smart grid policy, energy efficiency/supply strategy and consumers in general.

d) Enabling a real-time energy market to change user behaviour.

Providing information retrospectively to consumers in terms of what energy they have used should help raise awareness of energy consumption and hopefully result in a change in behaviour in terms of switching lights off more often, managing the heating more efficiently, switching on appliances when rates are cheaper, switching off appliances when not needed, etc, etc. However we would suggest that a much more instantaneous near real-time energy management approach is also required to really result in even greater and long term change. This is where technology can help. For example as the consumer switches on the washing machine in the early evening during a time of peak demand a message is quickly sent from the energy company or a third party provider 'EasyEnergy' to the washing machine display &/or mobile phone etc to offer "did you know that you could save £3 if you let us delay switching on your washing machine until after midnight – press yes or no" or "Did you know that its forecasted to be good weather tomorrow. You could save £5 if you let us delay switching on your washing until tomorrow morning when your solar panel will help offset the cost of the wash – press yes or no". This near real time management and the emergence of a future proofed sophisticated market should be taken into account into the implementation plan and potentially the DCC licensing requirements. Electric vehicle home charging and visitors roaming onto home charging stations also requires high capacity low latency wireless technologies to be put in place to enable a rapid consumer experience. The 'psychology' of engaging consumers to change behaviour should also not be underestimated and is likely to require high bandwidth solutions when interacting with some consumer segments. This confirms the point made in the above section about the need to adopt a future-proof platform that support long term technology evolution such as 3G/4G platforms.

e) Home management & services.

As outlined in the consultation, Smart meters have the potential to open a range of other new and innovative services beyond those currently envisaged for metering and energy management. While we understand that it may not be in Ofgem's scope and priorities, we believe that it is important to not lock the market into one direction. For example with the appropriate technology and business partnerships, new services may emerge that spill over into/out of smart meeting that increase energy efficiency, user experience or other priorities. For example the ability for manufacturers or insurance/repair service providers to undertake remote diagnostics of faulty or about to fail consumer electronics device. This could extend further to home security monitoring care services for elderly people, telemedicine and other public services could be delivered to citizens. These areas are priorities promoted by many governments around the world, including the UK, not only to bring societal benefits but also to introduce cost efficiencies into other organisations such as the NHS, etc. We recognise the importance to focus on the need to get smart meters rolled out but this should not happen at the expense of preventing other innovative technologies, services or markets



to also emerge in tandem. We have significant concerns that a one-sided approach may hinder business opportunities and the emergence of these types of market.

f) **Removable WAN module.**

The implementation plan correctly recognises that Wide Area Network wireless technologies evolve at a fast pace and that it's hard to predict the evolution of wireless technologies during the expected 15 year lifetime of the meter. It is therefore proposed in the plan that the WAN is developed as a module which is removable so that this can be periodically replaced without having to change the whole meter. We have a number of questions regarding this. The first is does the government really expect in practice that these modules will be removed & replaced due to the associated costs of sending an engineer out to replace millions of modules? We would also like to understand why the WAN module is seen as removable but the HAN module is not. Some of the Home Area Network (HAN) wireless technologies are just as likely to evolve as fast, if not faster, relative to the WAN wireless technologies and would ask therefore why the HAN module should also not be removable. In a fact, HAN technology such as Zigbee has shipped relatively small numbers thus far and there are expectations these standards are still evolving. In comparison the maturity of cellular WAN technology esp. 3G and its evolution are well proven and capable of sustaining upgrades without needs to change the supporting network infrastructure. We would also like to point out that from a technology perspective multiple WAN & HAN wireless technologies (2G/3G/4G/WiFi/Bluetooth/etc/etc) can be put onto a single device for multiple frequency bands.

g) Example of smart grid/metering initiatives leveraging 3G commercial networks

Qualcomm's experience in helping to connect machine to machine types of devices leads us to believe that 3G networks are ideal from a technology and future-proof perspective to cost effectively connect smart meters and grids. Wireless chipsets are essential components of smart meters and smart grids. Qualcomm's expertise in designing innovative, integrated and technology neutral wireless chipsets make us well placed to understand how to help meet the UK objectives. One such example is 'nPhase', a joint venture between the US Carrier Verizon and Qualcomm, who deliver a secure, reliable, scalable, end-to-end delivery platform, for machine to machine communications, with smart meters and grids being a key area³.

In the United States, Verizon Wireless is working with Echelon and Itron to use its 3G network for advanced metering and with Ambient Corporation to facilitate a number of Smart Grid applications⁴. AT&T is partnering with SmartSynch, a leader in the development of Smart Grid applications using commercial wireless networks, to offer a suite of smart grid solutions supported over the AT&T wireless network.⁵ These initiatives and others soon to be underway that take full advantage of wireless cellular connectivity show that commercial networks are well positioned to jump-start and drive the rapid proliferation of Smart Grid applications

³ See <http://www.nphasem2m.com/> and <http://opennetwork.verizonwireless.com/aboutOpenDev.aspx>

⁴ See "Verizon Wireless and Ambient Corporation Join Forces to Offer Utilities Smart Grid Communications Solutions," (Mar. 4, 2009) <http://www.reuters.com/article/pressRelease/idUS133942+04-Mar-2009+PRN20090304>; Verizon Wireless and Itron Combine Forces to Harness the Power of Wireless Technology in Advanced Metering and Smart Grid Market," (Apr. 1, 2009) <http://news.vzw.com/news/2009/04/pr2009-04-01a.html>.

⁵ See "AT&T to Offer Wireless Smart Grid Technology to Utility Companies," (Mar. 17, 2009) <http://www.att.com/gen/press-room?pid=4800&cdvn=news&newsarticleid=26613>.



One of the challenges for the Smart Grid will be the support of plug-in electric vehicles (PEVs) as these become more ubiquitous. PEVs will impose requirements on the metering and charging for power as the vehicle may need recharging in locations remote from the owners home and utility. PEVs charging is, therefore, a prime candidate for wireless communications support. ECotality manufactures and operate networks of Smart Chargers for Electric Vehicles. They are widely recognized in the Smart Grid space since the company received a grant from U.S Department of Energy for deployment of chargers across six states + Washington D.C. ECotality plans to include 3G technology in each charger it will produce⁶.

Another example is Consert, a home energy management system that uses Verizon's 3G network as its core communication backbone for its comprehensive Smart Grid home energy management solution. They are working with smaller utilities in North Carolina serving as their ASP, and they have been achieving substantial reduction in energy use based on their solution⁷.

⁶ See <http://www.qualcomm.com/news/releases/2010/07/27/qualcomm-and-ecotality-enable-electric-vehicle-charging-stations-cellular-c>

⁷ <http://www.consert.com/news.aspx>



Response to the consultation questions

Smart Metering Implementation Programme: Statement of Design Requirements

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

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

Qualcomm strongly supports the roles of wireless (WAN/HAN) technologies based on well recognised European and International standards. Such wireless technologies are able to provide communications capabilities throughout the energy grids, between the central data and communications function and the end users/meters and home equipments, via the use of standalone hub/interface. It is of critical importance that the license requirements take into account an end-to-end future proof approach to avoid cost of switching technologies and to enable near real time energy markets to emerge. Both WAN and HAN will evolve and be upgradable and they should be considered as part of the overall system. The WAN needs from the outset to account wireless communications link from other equipments within the home environment – not only from cost and backward compatibility perspective but also from a security and interoperability aspect. We believe that the HAN should also be considered to be removable also given the anticipated innovation and technology innovation in this area also. In many cases wireless WAN & HAN technologies exist on the same chipset therefore the relevance of considering an integrated WAN/HAN approach when appropriate.

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

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

Qualcomm believes that the opportunities provided by broadband and other advanced communications is a promising way to support smart grid technology, to promote energy efficiency, to reduce greenhouse gas emissions and to encourage energy independence. As listed in the consultation document, there is a long list of smart meter services that could be provided to the consumers and some that will potentially require significantly low latency and/or larger amount of aggregated volume. From load management, remote monitoring, alert notifications, diagnostics, service provisioning, pre-pay, etc. the data demand and management will be best supported over a secure IP-based cellular broadband network over the long term providing a greater opportunity for return of investment. An end-to-end full smart meter/grid approach will also enable the lowest total cost of ownership.

Qualcomm also appreciates the consideration given to other new value added services such as home automation, remote healthcare monitoring at the consumers request, etc. In fact, such services could benefit from a deployment of secure and reliable WAN/HAN gateways. Such services should be allowed from the outset.

Therefore, attention should be paid at the above mentioned requirements. We believe that at this time the Catalogue appears to be complete in both the choices for inclusion and omission of



functionality; of course as more experience is gained with deployments additional functionality could be identified for next generation metering capabilities.

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

Ofgem has identified two options for delivering the technical and interoperability specifications. Option 2 relies on Industry drafted specifications facilitated by the Programme, under Option 1 industry would not directly contribute to the technical specification. The document proposes that “Option 2 is taken forward”. Qualcomm strongly supports the selection of Option 2, as this is the only way in which convergence with commercial standards can be readily achieved and thereby result in the greatest economies of scale and economic benefit to the UK.

Qualcomm believes that DECC and Ofgem appropriately identified a series of scenarios that will require hybrid communications technologies at the consumer premises.

As a leader in multi-standards integration, Qualcomm recognizes that different services and applications may necessitate different technical requirements and, therefore, encourages Ofgem to leverage proven global technical standards.

As one example, integrating 3G wireless connectivity with sensors at remote locations would: 1) ensure the system is secure, 2) attain end-to-end integration, and 3) manage customer distributed energy resources.

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?

Qualcomm believes that a secure, efficient and economically sustainable deployment of smart grid/metering will require strong collaboration between market stakeholders. The specification process is important and will benefit from transparency and from involvement of all stakeholder. We encourage generally a market-based approach driven policies that trigger incentives for investments and innovations that will ensure consumer and societal benefits.

The level of obligation on the industry stakeholders should therefore carefully considered in view of the above. Participation should be voluntary and rely on the economic interests of the supplier as to whether they choose to participate.

Deployment of Smart Metering will require tremendous investments by the industry. It is of great importance to provide certainty in the business model. Economic impact assessments should consider all the value chain stakeholders especially the supply (utility) and the demand (consumer) side in the long term.