

Ref:S871a/hmf

Margaret Coaster  
Smart Metering Team  
Ofgem E-Serve  
9 Millbank  
London  
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28 September 2010

Dear Ms Coaster,

## **SMART METERING IMPLEMENTATION PROGRAMME PROSPECTUS**

Thank you for the opportunity to comment on the Prospectus and proposed way ahead.

The Institution of Engineering and Technology is aware of the large amount of work that DECC and particularly, Ofgem E-Serve have put into this subject during 2010. We commend Ofgem E-Serve on their efforts in this regard. We feel that the level of understanding of the complexity of the proposed project has greatly increased. However in many areas it seems that the real work on resolving the many identified threats to the programme's success has yet to begin in a systematic way.

The IET is one of the world's leading professional bodies for the engineering and technology community and, as a charity, is technically informed but independent of network company, equipment supplier or service provider interests. It has a key role in smart metering and smart grids policy formation as the principal professional body to which chartered engineers working in the electricity sector belong. It is also unique in having in its membership engineers from all three disciplines needed to make the programme a success.

The IET's response to the issues due by 28 September is attached.

This submission has been prepared on behalf of the Board of Trustees by a joint team drawn from the IET's Energy Policy Panel, IT Policy Panel and Communications Policy Panel and takes into account input from the wider IET membership received in response to a call for comment.

The IET is liaising closely with the Royal Academy of Engineering on smart metering implementation, with significant joint membership of our senior policy panels. The Academy's high level response reinforces the main thrust of the IET's more detailed submission.

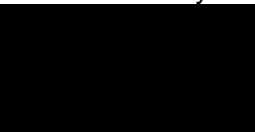
The IET's principal recommendations are:

1. That the roll-out of smart meters **should not be accelerated** unless it is demonstrable that a methodology can be developed that gives assurance of systems level functionality and scalability. In the IET's opinion this is currently not the case.
2. **Before planning to roll-out of millions of smart meters it should be demonstrated that, say, 100,000 would work as a system.** The roll out of large numbers of meters before the communications system is in place is potentially high risk, as this must be operational before full functionality can be demonstrated. One consequence of this approach could be the need to revisit each installed meter for further change-out or upgrade.
3. That Ofgem considers a plan to **install smart meters on a saturation basis in defined geographic zones** (e.g. by Post Code areas), sufficient to provide an installed base for functionality proving purposes. A zonal roll out offers many practical benefits (as demonstrated by natural gas changeover and currently the cast iron gas main replacement programme), but it requires an approach that reconciles the interests and responsibilities of the multiple energy suppliers and metering parties in the area concerned. This should not however be an insurmountable challenge.
4. That the **DataCommsCo (DCC) capabilities** at the heart of this Smart Meter/Smart Grid initiative should be in place early in the programme to avoid unnecessary upgrades to meter and WAN software.
5. A technically competent "**design authority**" is required to take overall technical responsibility for the entire system including the architecture and interoperability standards and end to end system level security.
6. The Institution of Engineering and Technology should **nominate** a suitably experienced and internationally recognised expert to serve on the Privacy and Security Advisory Group.
7. Even at this late stage we encourage DECC and Ofgem to engage in a **fundamental re-assessment** of the factors that are driving the proposal to accelerate the roll out of smart meters. Urgent attention should be given to assessing whether the required outcomes could be achieved in alternative ways that do not incur such a high probability of major project failure.

The IET is committed to working with DECC and Ofgem to address the issues raised and would be pleased to offer an expert to serve on the Privacy and Security Advisory Panel.

Please let me know if there are other ways in which the IET can be of assistance.

Yours sincerely



The Institution of Engineering and Technology



## SMART METERING PROSPECTUS

SUBMISSION BY THE INSTITUTION OF ENGINEERING AND TECHNOLOGY (IET)

28 September 2010

The Institution of Engineering and Technology is aware of the large amount of work that DECC and particularly, Ofgem E-Serve have put into this subject during 2010. We commend Ofgem E-Serve on their efforts in this regard. We feel that the level of understanding of the complexity of the proposed project has greatly increased. However in many areas it seems that the real work on resolving the many identified threats to the programme's success has yet to begin in a systematic way.

In the IET's submission to DECC on Smart Metering in July 2009, the IET drew attention to major issues surrounding privacy, security, the need for an overall systems engineering approach, the implications of smart metering rollout for the future development of smart grid, and the sheer scale of the engineering challenge. In responding to the Prospectus document we again focus on these key issues not all of which, we believe, are adequately covered in the formal questions. We also answer specific consultation questions where relevant to these key concerns.

### System architecture and the scale of the engineering challenge

The proposal to run this programme as a **centralised** project makes it a much bigger engineering exercise than Ministers, DECC or Ofgem seem to appreciate. An analogy is an iceberg: the top level policy makers see the visible tip of the iceberg but are unaware of the scale of what lies below and the potential threats it poses. However, in the absence of an agreed overall system definition, architecture and design, the programme is at high risk of cost escalation, delay, functional degradation and failure. Alternative **decentralised** market driven approaches around a solid architectural framework, system specification and defined standards for interoperability may present more effective ways to manage this risk.

The essential prerequisite feature of a "Smart" utility network is a bi-directional communication network. The system as a whole will only become "Smart" when it is complete. The role, responsibilities and capabilities of the DCC are thus pivotal to the whole scheme. Without some form of appropriate communications, the meters will bring no benefit other than the in home display, which could be provided at a fraction of the cost. It is vital to engineer the DCC/communications capabilities from the outset or the programme will have great difficulty in achieving its objectives.

This programme represents a very significant engineering challenge but there appears to be no reference to the teams and skills that stakeholders, Ofgem and DECC need to recruit or develop - nor much of substance about programme and project structure.

The IET is concerned not to find any mention of a "technically competent design authority" in the proposals. We do not consider that the establishment of separate stakeholder steering groups is an adequate substitute for a technically competent design authority. The two roles are different and both are required.

## The role of Smart Metering in facilitating a future Smart Grid

The Prospectus text invites comments on whether the proposals on page 29 will facilitate the development of a smart grid. However it is of concern that there is no specific question on transition to a smart grid. The implication seems to be that these are issues for the future, but they could become significant well within the life time of the first DCC contract.

It is vital that silo thinking is avoided in considering the future evolution of a smart grid. This presents considerable challenges if smart meters are planned to be rolled out before the functionality of a smart grid for the UK has been clarified. For example, there does not seem to be a long-term view of how smart metering/grids will integrate with large-scale adoption of electric vehicles (EVs) or with control of distributed renewable energy. The IET is concerned, for example, that:

- the introduction of Feed in Tariffs is leading to a step change in the take up of PV panels. Distribution Network Owners will have an increasing need for power quality information in areas of high PV take-up to allow harmonic content to be managed adequately.
- Another issue with high levels of PV is that there could be a risk that high density installed PV capacity, for example on a new housing estate where every house has a panel, could result in the possibility of a self-sustaining power “island”. Also with a high take-up of EVs and plug-in hybrids in the mid-2020s, there could be a requirement to limit loading at the local, not national, level. Such issues, which appear not to have been considered, would totally change the options for systems architecture.
- the data privacy principle that will allow customers to choose who has visibility of their data appears to be at odds with effective and ubiquitous smart grid management and control.
- smart meters represent only one aspect of the range of technologies involved in the as yet un-defined smart grid architecture. They are arguably not even a necessary one. Many of the benefits expected from smart metering, with the exception (probably) of the actual meter reading, could be obtained from a mix of smart devices (such as EV chargers, heat pumps and other systems) and smart clip-on meters which are already widely available at low cost. Indeed a complex mix of such smart devices, each with their own communications infrastructure and international standards is an extremely likely scenario – and smart meters within the UK need to be able to integrate with these. We see little evidence that this is appreciated.

## Privacy/Data Security and System and Functional Security

DECC and Ofgem lay great emphasis on the agreement by all stakeholders to adopt the principles of Privacy by Design and Security by Design. These are fine words yet, self-evidently, the programme is only paying lip-service to these principles. The separate document on Data Privacy and Security clearly indicates that there are fundamental issues still to be addressed. Thus, the desire to speed up the specification process, while the end to end system design remains incomplete, is at odds with the principles of privacy by design and security by design.

Though there has been considerable progress on **data protection and privacy**, the issue has not yet been resolved. Checks and balances have been added but their implications for the end to end system design need further consideration. How, for example, will the provision that customers will determine who has visibility of their data relate to the future needs of Distribution Network Owners to manage network efficiency and peak consumption?

Although work so far recognises the issue, major concerns remain over **cyber security** which has yet to be addressed in a comprehensive way. In the future, the HAN will link many

smart devices in the home as well as the smart meter. Every one of those devices becomes a potential attack point for cyber intrusion. Also, every node in the HAN and WAN networks will represent such attack points. With energy prices continuing to rise, the very powerful incentive for tampering is self evident. Software modification can be extremely difficult to detect compared with physical tampering with current meter systems. Once the “backdoors” into the smart network are discovered by stealth the opportunity for more malicious tampering leading to perhaps major energy network failure becomes realistic.

We note that NIST is being consulted by Ofgem and observe that NIST has recently published a three volume report on Smart Grid Cyber Security and Privacy (August 2010) which illustrates very well the complexity of the problem. The IET believes that much greater attention must be paid to cyber security through immediate incorporation of strong security policies within the system architecture and design process.

The Institution of Engineering and Technology has major expertise in cyber security and wishes to offer an expert from the IET’s IT Policy Panel to serve on the Privacy and Security Advisory Group.

## RECOMMENDATIONS

In view of the above the IET recommends:

8. That the roll-out of smart meters **should not be accelerated** unless it is demonstrable that a methodology can be developed that gives assurance of systems level functionality and scalability. In the IET’s opinion this is currently not the case.
9. **Before planning to roll-out of millions of smart meters it should be demonstrated that, say, 100,000 would work as a system.** The roll out of large numbers of meters before the communications system is in place is potentially high risk, as this must be operational before full functionality can be demonstrated. One consequence of this approach could be the need to revisit each installed meter for further change-out or upgrade.
10. That Ofgem considers a plan to **install smart meters on a saturation basis in defined geographic zones** (e.g. by Post Code areas), sufficient to provide an installed base for functionality proving purposes. A zonal roll out offers many practical benefits (as demonstrated by natural gas changeover and currently the cast iron gas main replacement programme), but it requires an approach that reconciles the interests and responsibilities of the multiple energy suppliers and metering parties in the area concerned. This should not however be an insurmountable challenge.
11. That the **DataCommsCo (DCC) capabilities** at the heart of this Smart Meter/Smart Grid initiative should be in place early in the programme to avoid unnecessary upgrades to meter and WAN software.
12. A technically competent “**design authority**” is required to take overall technical responsibility for the entire system including the architecture and interoperability standards and end to end system level security.
13. The Institution of Engineering and Technology should **nominate** a suitably experienced and internationally recognised expert to serve on the Privacy and Security Advisory Group.
14. Even at this late stage we encourage DECC and Ofgem to engage in a **fundamental re-assessment** of the factors that are driving the proposal to accelerate the roll out of smart meters. Urgent attention should be given to assessing whether the required outcomes could be achieved in alternative ways that do not incur such a high probability of major project failure.

**IET RESPONSE TO DECC ON SMART METERING PROSPECTUS**  
**Questions for answer by 28th September**

**CUSTOMER EXPERIENCE**

**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)?**

We have a concern over the impact on fuel poverty. This aspect does not receive enough attention in the consultation. For example, benefits here might be expected from attractive commercial deals so it will be important that such offerings are available as soon as the smart meters go live and are accessible to those who are categorised as fuel poor. We would recommend that Ofgem initiates this with suppliers or other service providers as an integrated part of the smart metering programme. We would note here that co-ordination with a national approach to demand response services (DR) will be helpful.

**6. Customer premises equipment: Do you have any comments on the functional requirements for the smart metering system we have set out in the Functional Requirements Catalogue?**

Much progress has been made but a lot more work is needed to take the functional requirements to the next level of technical detail before specifications can be developed. New elements in a smart energy system, particularly electric vehicle charging, micro-generation and heat pumps, will be significant from 2018 onwards, well within the life of the first smart meters. These aspects need to be considered urgently and from an international perspective.

The security policy needs to be developed in detail now, so that it can be a constraint on the refinement of the high level specifications in the Catalogue.

The IET has addressed this question in more detail in our response to specific questions in the Design Requirements document. Please refer to Appendix B of our response.

**7. Customer premises equipment: Do you see any issues with the proposed approach to developing technical specifications for the smart metering system?**

We have a concern over the lack of a technically competent “design authority”. The IET does not consider that the separate stakeholder steering groups and a privacy advisory group are an adequate substitute for a technically competent design authority.

We have a concern at apparent silo thinking rather than a systems approach. In particular there does not seem to be a long-term view of how smart metering/grids will integrate with large-scale adoption of Electric Vehicles (EVs) or control of distributed renewable energy.

It is important to know who has systems engineering authority. This programme represents a very significant engineering challenge but there appears to be no reference to the teams and skills that stakeholders, Ofgem and DECC will need to recruit or develop - nor much of substance about programme and project structure.

## INDUSTRY ROLES AND EXPERIENCE

### **8. 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)?**

It would be most unwise to plan a roll-out of millions of smart meters before demonstrating that, say, 100,000 would work as a system. Furthermore, it may be problematic to roll out large numbers of meters before the communications solution is in place, bearing in mind that the centralised communications system would need to be operational before full functionality could be demonstrated.

A possible way forward might be to install smart meters on a saturation basis in defined geographic zones (e.g. by Post Code areas), sufficient to provide an installed base for functionality proving purposes. Geographic roll-out would also have potential advantages for street by street installation efficiency and for positive launch handling with local communities. If it was impractical to co-ordinate this with the centralised communications provision, it would not be wasted effort to install local communications for this proving stage. Indeed, there would probably be advantages in developing a decentralised architecture for the main communications provision that could integrate subsequently with this dispersed geographic model.

It is conceivable that a further opportunity with this geographic approach would be to align with installations of smart meters being undertaken for Low Carbon Network Fund (LCNF) projects (which will most likely be on a geographic basis). This might be an effective acceleration and proving opportunity if co-ordination can be achieved.

A zonal roll out offers many practical benefits (as demonstrated by natural gas changeover and currently the cast iron gas main replacement programme), but it requires an approach that reconciles the interests and responsibilities of the multiple energy suppliers and metering parties in the area concerned. This should not however be an insurmountable challenge.

## IMPLEMENTATION AND NEXT STEPS

### **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?**

The system as a whole will only become “Smart” when it is complete. The essential prerequisite feature of a “Smart” utility network is a bi-directional communication network. The role, responsibilities and capabilities of the DCC are thus pivotal to the whole scheme. Without the DCC and its communication network, the meters will bring no benefit other than the in home display, which could be provided at a fraction of the cost. It is vital to engineer the DCC capabilities immediately or the programme will have great difficulty in achieving its objectives.

It would be most unwise to plan a roll-out of millions of smart meters before demonstrating that 100,000 would work as a system. Furthermore, it may be problematic to roll out large numbers of meters before the communications solution is in place, bearing in mind that the centralised communications system would need to be operational before full functionality could be demonstrated.

Fuel poverty does not receive enough attention in the consultation. For example, benefits here might be expected from attractive commercial deals so it will be important that such offerings are available as soon as the smart meters go live and are accessible to the fuel poor. We would recommend that Ofgem initiates this with suppliers or other service providers

as an integrated part of the smart metering programme. We would note here that co-ordination with a national approach to demand response services (DR) will be helpful.

**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?**

The IET does not support speeding up of roll-out unless a methodology can be developed that gives assurance of systems level functionality and scalability. Best practice indicates that roll-out should be of large scale pilot areas with time to learn from experience rather than accelerated.

**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?**

The originally specified timelines are very challenging, and particularly so in that the work has to be done in the right order and highly co-ordinated.

This programme represents a very significant engineering challenge but there appears to be no reference to the teams and skills that stakeholders Ofgem and DECC need to recruit or develop - nor much of substance about programme and project structure.

**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?**

We have commented in our responses to previous questions on this aspect. Key issues include:

- The need for a suitably competent Design Authority
- The importance of proving complete system functionality at pilot scale in advance of a mass rollout of meters
- A recognition of the exceptional engineering and programme management challenges to successful delivery.



## IET RESPONSES TO QUESTIONS IN THE STATEMENT OF DESIGN REQUIREMENTS

28 September 2008

### **1. Should the HAN hardware be exchangeable without the need to exchange the meter?**

Yes – a modular approach to all components within the SM/SG domain will have significant benefits for the ultimate success of the programme as it will allow granular development of the capabilities and lower impact upgrade paths.

### **2. Are suitable HAN technologies available that meet the functional requirements?**

It is not possible to say whether suitable technologies are available for the HAN until the specific design parameters are known and documented.

### **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?**

There are potential options for the architecture of the DCC communications system that would obviate any need for changes of this kind. The DCC should be designed to ensure device and transmission network independence at the end points of the WAN.

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

No. Much progress has been made but a lot more work is needed to take the functional requirements to the next level of technical detail. New elements in a smart energy system, particularly electric vehicle charging, micro-generation and heat pumps, will be significant from 2020 onwards, well within the life of the first smart meters. These aspects need to be considered urgently and from an international perspective.

The security policy needs to be developed in detail now, so that it can be a constraint on the refinement of the high level specifications in the Catalogue.

Additional issues the IET believes may need further consideration include:

- a) Measurement accuracy does not seem to be specified. Is it intended to cover this in the Metering Code, and, if so, what about any variables not covered there such as power quality?
- b) Ability to take power quality measurements at the times of day most likely to be problematic for management of the distribution grid, e.g. when multiple vehicle charging is taking place, and/or peaks of solar PV generation?
- c) Further consideration needs to be given to the granularity of the measurement requirement, particularly the power quality metrics and time period. Will it be sufficient to identify voltage spikes and the like?
- d) We need to move to a situation where smart grid technology gives suppliers the ability to offer customers attractive reduced tariffs in return for an element of demand reduction at peak times. Further thought should be given to how a smart grid instruction to reduce demand will appear at the consumer premises? Presumably this will need to be expressed as kW to be reduced with the HAN left to deal with implementation. What if the HAN cannot/has been instructed not to implement. Would this trigger a tariff change and if so how? How would this all be communicated

so the DCC knows how much load is coming off – or does it need to be communicated? We would expect there to be some sort of signal back about load reduction achieved. There are all sorts of systems engineering issues here that appear not to have been considered.

- e) Communication interfaces on the smart meter – has the ability for bi-directional communications with existing or future home networks other than the HAN been built in to the specification and with adequate security?
- f) WAN interface: The IET queries whether the bandwidth and latency requirement for (future) smart grids have been thought through sufficiently? The statement of design requirements 3.24 and 3.25 seems vague on this.

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

The problem with justifying smart grid functionality on a cost benefit basis (only) is that there are so many variables and consequently this research is at an early stage. On the other hand, with electricity generation increasingly dependent on variable renewable energy and the predicted take up of electric vehicles, it is difficult to see how the electricity system implied by all recent statements of Government policy could work without smart grid functionality.

Over time, many new capabilities and functional requirements may emerge as Smart Grid capabilities become more sophisticated. Their provision will inevitably need to be justified in terms of market forces or carbon reduction or security of supply. The regulatory environment in which this will take place is itself under review to make it fit for the challenges ahead. This illustrates the need to ensure a thorough end to end system design is developed at the first opportunity. The types of capability that might be required in the timescale of this programme (e.g. control of EV charging, V2G and PV panels) are already known and should be designed into the system architecture now.

Views are sought on whether **carbon emissions** should be displayed on the In Home Display (IHD) (Prospectus p48) A calculation that simply converts kWh to grams of CO<sub>2</sub> using a fixed rate is highly misleading and would be public dis-information. But a simple visual display that approximated the changing carbon intensity of electricity generation at different times of day and in different wind/tide conditions could perhaps add value and help develop public awareness of the desirability of shifting energy intensive tasks to times when energy has less environmental impact.

A further desirable capability is to use smart meters to facilitate reduction of reactive power losses in the distribution system. This could deliver real savings, especially if combined with regulatory incentives in this area. The IET would be pleased to put DECC in touch with suitable expertise in this specialist area.

**6. Do you agree that the proposed approach to developing technical specifications will deliver the necessary technical certainty and interoperability?**

No. As we have already said we believe it to be imperative to establish a technically competent Design Authority before more technical specification work is attempted.

**7. 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?**

Yes. The IET agrees that it is necessary for the programme to facilitate and provide leadership through the specification development process and that there a need for an obligation on suppliers to co-operate with this process.

**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?**

Yes and Yes.

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

There will be many new technical issues to emerge as the system design work proceeds and that fact must be anticipated. At this stage it seems very likely that the development of interoperability standards will need to be addressed early on to avoid technical issues in this area. There is already significant private sector work in this area which should be brought into the programme.

**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?**

As mentioned elsewhere, in order to ensure security and privacy by design, the first step is to develop the end to end system design and the security specification before developing the component level technical specifications.

IET  
28 September 2010