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Low Carbon Innovation Centre

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Phil Nash
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Consultation on Smart Metering for Electricity and Gas

Dear Mr Nash

I was asked, as a member of the Low Carbon Innovation Centre (LCIC) at the Univeristy of East Anglia, to prepare a response to the Consultation on Smart Metering. The response was reviewed by other members of LCIC who made minor changes to my original draft. This agreed response is now submitted as attached. The response begins with a short statement relating to the background of LCIC and how it has become recognised worldwide for its excellence as a centre of learning, as a qualifying body.

The Low Carbon Innovation Centre wishes to thank the Department of Energy and Climate Change to for the opportunity participate in this consultation exercise.

Yours sincerely,

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Low Carbon Innovation Centre

Department of Energy and Climate Change
CONSULTATION ON SMART METERING FOR ELECTRICITY AND GAS

Response by N.K. Tovey, M.A. PhD, CEng, MICE, CEnv on behalf of the Low Carbon Innovation Centre
(July 2009)

The Low Carbon Innovation Centre

The University of East Anglia (UEA) is at the forefront of research and knowledge transfer in the field of climate change and carbon emissions reduction and is the home of a number of highly successful initiatives including the Tyndall Centre, CRed and Carbon Connections. In 2008, it created and incorporated the Low Carbon Innovation Centre (LCIC) to focus its externally-facing initiatives, to provide products and services to the private and public sector, on a commercial basis.

LCIC is now the operational home of Carbon Connections. UEA has successfully operated this HEFCE (Higher Education Funding Council for England) and OSI (Office for Science and Innovation) funded initiative since 2006, investing in carbon reducing technologies, businesses and university-based innovations. A portfolio of 25 live projects including a mix of equity and royalty-based investments has already started to bring returns to the fund - these being available only for reinvestment. The regional universities are involved in or are the originators of technologies in over half of the 25 investees and the region's universities and companies responsible for in excess of 100 outline concepts and applications in a 2 year period.

The LCIC is also home to CRed and provides carbon reduction expertise from the University to the public and private sector on a commercial basis. It is operated through a wholly-owned company of UEA which gifts its profits to the University. Our main services are consultancy, the provision of carbon reduction (IT) systems and innovation services including the operation of the Carbon Connections investment fund.

The LCIC has experience of trialling some Smart Metering through its involvement with projects in the Carbon Connections Programme, and thus is well placed to comment on the present Consultation.

Responses to Questions from Section 1

Q1 Do you have any comments on the Government's preference for the Central Communications model?

In general LCIC agrees with this preference, as a key disadvantage of the fully competitive model are the interoperability and these will occur even within a single area, and could cause problems for consumers wishing to change suppliers. However, variants of the Central Communications Model should be explored as suggested in the answer to question 2.

Q2 Do you have any comments on the analysis and conclusions on the delivery model contained in this consultation document, the reports prepared by Baringa Partners, or the Consultation Impact Assessment?

While in general agreement, starting a full Central Communications Model will be challenging in its software implications. When deregulation of the electricity and gas markets took place this was

phased in both industries over a period of time. There is scope to phase the development of a Central Communications Model in a similar way based initially on DNO areas or even sub-DNO areas. Each chosen area would be developed in tandem with the roll out of the Smart Meters in those areas. Experience gained in the logistics in the early adopting areas could be used to benefit in later areas. Finally, there would be the opportunity to integrate all DNO area based Communications into a Central version once the roll out of Smart Meters was complete.

Q3 Do you agree the Central Communications model effectively facilitates 'end to end' management of the electricity networks system needed for smart grids?

Potentially we are in agreement, but there are many potential issues relating to the management of "smart Grids" which need to be studied. However, Smart Metering with a Central Communications Model would be sensible. There could be significant additional communications difficulties with a fully competitive model.

Q4 Do you consider that Government should adopt measures to promote co-ordination of roll-out at local level? If so, what measures would you support?

A roll out program at the local level on a MLSOA or LLSOA basis is essential for the success of any roll out. Furthermore, it is important that in the initial provision in any one local area all properties have identical stand alone display units which would be consistent with a Central Communications Model. With new technology, there will inevitably be many in the domestic sector who will be confused and if identical units are located in an area, support from neighbours would be helpful. These points are partly covered in paragraphs 2.16 and 2.17 of the Consultation Document. Prior to a particular local area being involved, there should be adequate information provided of the planned changes and the benefits, and most importantly how the consumer could potentially achieve lower bills. This information should be targeted via local focussed leaflets, the opportunity for question and answer sessions, through the media, and also via the internet.

Q5 Should any particular policy considerations be taken into account in considering whether there should be priority target groups for early deployment of smart meters?

It would be unwise to target priority groups except in very special circumstances. If it is felt that priority groups are the fuel poor, vulnerable or elderly, then such a policy could be counter-productive as it is the elderly that would be less likely to be comfortable with the new technology. Equally with the fuel poor, there are issues with the cost of the parasitic electricity use (see also response to question 12), and unless this is addressed properly, such a policy could aggravate fuel poverty unless there can be shown to be benefits over and above the extra energy costs to consumers from smart metering

There would be a case, perhaps, to install smart meters early in such groups if the present meter fails prematurely, however, this would have to be done with care.

Q6 Do you have any comments on the merits of alternative approaches under which electricity and gas network businesses take on responsibility for aspects of smart metering?

There are some areas where the Distributed Network Operators could have a particularly useful role with regard to the opportunities that Smart Meters provide particularly where both import and export information is available, as this will not only enable effective control of areas in which significant micro-generation develops, but also provide early indications as to the specific locations where network reinforcement will be needed in responses changing patterns of demand and deployment of small scale generation.

In the connection of micro-generation, export smart meters should have the ability to differentiate between the type of the micro-generation source - see also response to question 8.

Questions from Section 3: Proposals for the Domestic Sector: Functionality

Q7 Do you agree with the functionality proposed for electricity meters? Please explain your reasons and if possible give evidence for your comments.

LCIC generally agrees with the proposed functionality as listed in the report "Impact assessment of a GB-wide smart meter roll out for the domestic sector" (Table 1). Such functionality as a minimum is important if it is to provide a system which gives flexibility not only for issues as perceived at the present time by also incorporate flexibility for future developments even if they are 10 years or more from likely implementation. It is important to think on a timescale of this length taking into account the time it is likely to take to implement full coverage of Smart Metering. Incorporating opportunities for additional flexibility will also encourage innovation.

There are, however, two specific areas under functionality categories D and E which need expanding in greater depth as indicated in the response to Question 8.

Q8 Are there any additional requirements that will be needed to facilitate smarter network management, efficient energy management and the development of "smart grids"? Please provide analysis, particularly on costs and benefits, where possible.

There are two specific areas in the functionality requirements as specified in Table 1 of the report entitled "Impact assessment of a GB-wide smart meter roll out for the domestic sector". These refer to Functionality items D and E

Functionality D: Support for a range of time of use tariffs - multiple registers within the meter for billing purposes

Multiple registers have been used in the domestic market in some parts of the world for over 20 years. Thus in the 1980s, the Salt River Project in Arizona had 5 different time of day tariffs for the domestic consumer. However, the opportunity should be taken, even in the domestic market, to have this defined by a maximum instantaneous power (averaged over a period of say 30 or 60 minutes) draw rather than a cumulative number of units drawn over an extended period of say a month or more between billings.

In this way tariffs could be flexible and reflect the true short term cost of power. Alternatively in a strategy to promote low carbon electricity flexibility in tariffs could reflect the relative proportion of demand met by low carbon electricity. Thus when the instantaneous mismatch between low carbon electricity generation and demand is relatively low, then tariff charges would reflect this by being lower. On the other hand at a time when fossil fuels predominate, the tariffs would be higher.

With suitable interactive displays, consumers would be aware of tariff changes and could act accordingly. On the other hand some consumers may prefer to have a tariff which is fixed to avoid the hassle, and this case the mean tariff would be slightly higher than a variable one. Those opting for the flexibility of a flexible tariff could potentially see their bills go down if they behave in an environmentally responsible way.

Functionality E: Load management capability to deliver demand side management - ability to remotely control load

Demand management has been available in large industry for many years and in some parts of the world, such management has also been available in the domestic sector. For example, even in 1984, demand side management for heavy electrical appliances – e.g. air-conditioners, immersion heaters was the norm for customers of Florida Power. This is not an isolated example as similar arrangements have been in place in New Zealand for at least 20 years.

However, more sophisticated demand side management should be explored or at least the functionality of any proposed Smart Meters should provide such facilities. Instead of basic on/off of selected

appliances which might be relatively few in number, a maximum power draw should be set which may be invoked at times of high demand. For instance if the maximum power draw was set at a level of say at 2 kW or 3 kW in a domestic property then the consumer would not be left in the dark and could use a limited amount of power – e.g. a TV and a modest kettle, but would not be able to use several heavy demand appliances simultaneously at such critical times. Consumers should be given the option of an override button for power on demand, but if this occurs at a critical peak, then they would be charged at a premium tariff, whereas if they waited a few hours, their normal tariff would apply.

Export Meter Functionality within Smart Meters.:

In the case of export meter provision within Smart Meters, there should be opportunity to identify the source type of the electricity supplied through this export meter. This is important following the introduction of multiples ROCs and indeed the former Marine Obligation Scotland. Functionality of smart meters should not preclude these.

Q9 Do you agree with the functionality proposed for gas meters? Please explain your reasons and if possible give evidence for your comments.

There is potentially less scope for a range of functions in gas meters, but the opportunity to introduce more accurate billing and provide more innovative tariffs is to be welcomed. However, one area of additional functionality would be the provision of an external temperature probe. This might be provided as a single probe for a group of premises, or provided for each premises, but in either way the temperature information should be capable of being associated with each individual meter In the domestic market, the majority of the gas is used for space heating which is highly correlated with external temperature.

This additional information would be beneficial to the Gas Network Operator to allow enhanced predictions of future demand. For the consumer, display units which provide comparison with consumption in previous periods should be temperature corrected for gas. If such information is available then early identification of faults in heating devices in the consumer's premises can be identified and this can lead to savings on their part. This is covered more in response to Question 13.

Q10 Is there significant scope for retrofitting non-valve functionality to gas meters? What are the costs and how many meters are capable of being retrofitted?

It is important that this functionality be explored. Is there not a case of having a mandatory manual valve fitted, which may well be required if work is needed on the customers premises?. With innovative design it should be possible to provide an automatic activator to sit on the manual value and thus covert it quickly for full automatic operation as needed, without the cost of replacing an existing meter.

Q11 Are there any additional maintenance, administrative or management costs associated with having all gas smart meters with a valve?

There probably will be additional charges, but we are not in a position to comment on these.

Q12 Do you agree with the Government's position that a standalone display should be provided with a smart meter?

This is a vital requirement that should be provided with all Smart Meter Systems. Furthermore all standalone displays should be powered by rechargeable batteries. The displays should in general not have direct mains connections otherwise there will be a tendency to leave them plugged in. These stand alone devices should be provided with their own battery powered wireless communication and not rely on a Home Wireless Network being in operation. The provision of standalone displays does not preclude the provision of enhanced displays for which commercial opportunities between supplier and customer will exist.

Experience with some commercial smart meters shows that there is a power drain of 5 W (in one case) and in a second case a power drain of nearly 40 W consisting of 15 W for the display itself, 5+ W for other peripheral equipment (e.g. individual remote plug monitors), and an addition 20 W for the requirement that a wireless network in one 24 hours a day. This latter smart meter display system will by itself cause an additional consumption of around 300 kWh per year, have a cost of around £36, and cause the emission of around 150 kg of carbon dioxide. The former smart meter will still consume around 40 kWh extra a year cost £5 to run and cause the emission of 20kg of CO_2. If such meters were replicated across all domestic properties, the displays alone would cause the additional emission of 500 000 tonnes of CO_2 even in the more efficient meter.

If standalone displays are provided, these can be checked to ensure that they cause minimal consumption overall. Any commercial display which provides more information and which some consumers will want, should be tested and approved for use only if the consumption level is below a specified level, and furthermore there should be and indication on the appliance at the time of purchase of the approximate annual running cost so that consumers can be adequately informed.

Q13 Do you have any comments on what sort of data should be provided to consumers as a minimum to help them best act to save energy (e.g. information on energy use, money, CO2 etc)?

Displays should be portable and provide instantaneous consumption information so customers can try to identify those appliances consuming the most by switching them on and seeing an immediate response. Information of cumulative consumption over a relevant period – such as day, week, or moth should be provided. This should also provide information on unit costs which should be updated automatically and also the CO_2 emission factors (which vary from half hour to half hour). Careful design of display units is needed to avoid over complexity and yet provide at least basic information. An adequate number of button switches should be provided on displays and over use of multiple button presses (say >2 or 3 button pushes) to change functions should be avoided.

Looking towards the time when for those non-domestic and keen domestic consumer wish to benefit from tariffs which are more aligned to Time of Use there should perhaps be a colour coded row of buttons indicating by different colours the likely approximate ranges of tariffs in the coming few time periods. For instance, four small LEDs could display the relative tariff costings for the current and following three time periods say using green, yellow, amber and red. This display would allow consumers to make informed choices about using heavy consumption appliances.

In addition to the above simple comparison with consumption data from an equivalent previous period should be available. Not only does this allow the consumer to track behaviour, but can also provide early warning of equipment malfunction and by such early identification any fault can be rectified. In the case of gas information this should be temperature corrected as indicated in the response to question 9.

Q14 Do you have comments regarding the accessibility of meters/display units for particular consumers (e.g. vulnerable consumers such as the disabled, partially sighted/blind)?

For partially sighted customers, larger displays should be available, perhaps also with more use of colour. For those who are blind, there could be a version of the display unit which would be activated to emit an audible sound for say 10 seconds giving basic information (which might included a pre-recorded voice message) on the press of a button. Careful design of these units would be needed.

Questions from Section 4: Proposals for the Non-Domestic Sector

Q15 Do you agree with the Government's proposal to extend to the small and medium non-domestic sector the minimum functionality that we will require for smart meters in the domestic sector, with certain exceptions to allow for individual consumer requirements?

We agree that there should be a role out of smart meters to Small and Medium Size non-domestic consumers which occurs at approximately the same time as that for neighbouring domestic customers, and that the provision should be for minimum functionality as provided for domestic consumers. However a separate more enhanced business model should also be considered. Thus non-domestic customers should have the option of an easy facility to extend the functionality and display options available to them. As indicated in the Baring Report there is a need for further discussion between the merits of advanced meters and smart meters.

However, there seem to be additional functionality aspects which would be relevant to some groups of businesses.

With businesses becoming involved in the Carbon Reduction Commitment, the ability to understand where potential savings can be made will be come increasingly important. Having modules which plug in to the basic smart meter to provide aggregate information from all areas of consumption for transmission of overall meter reading to the Utility Company will be important. However, appropriate sub-metering facilities provided will allow businesses to separate functional and intrinsic energy use and identify the most effective strategies for carbon reduction. Information such as this will command a premium price and it is here that there is scope for separate commercial development of innovative metering.

Q16 Do you have any comments on how such a requirement, and the exceptions to it, should be framed?

It is difficult to comment on this when issues of advanced metering and smart metering are still to be resolved.

Q17 Do you have any comments on how the proposed new requirements should work in the context of the current developments in metering in this sector?

Once again – see answer to Question 16

Q18 Do you have any comments on the implications of the Government's proposed approach in this sector for the future development of smart grids?

These will generally be similar to those discussed with respect to the Domestic Market (see also answer to question 6). However, on Business Parks, larger generation facilities may be operating such as CHP plants of a few MW or more and also providing district heating, or medium size renewable generation. These facilities will cause potentially larger power flows to the electricity grids and different methods for controlling such electricity through smart networks may be required in areas dominated by businesses.

Q19 Do you have any comments on the revised Consultation Impact Assessment for this sector?

We have few comments other than we concur that the deployment of Smart/Advanced Meters (or lack of deployment in the case of any exceptions) to small and medium size businesses should not compromise Climate Change Objectives. Indeed as indicated in the response to Question 15, businesses should be able to use information gained from smart metering to their advantage with regard to their Carbon Reduction Commitments.

Q20 Do you have any comments on the implications for the non-domestic sector of the options identified for a domestic delivery model?

A delivery model based on a Central Communications model would seem sensible, and ensure inter-operability which will be important for the smallest businesses particularly those which are interspersed with domestic properties (the small neighbourhood shop). However, where such businesses are larger or located on a Business Park, the competitive model may be relevant provided the issues of interoperability can be addressed.

With regard to functionality, several of the issues identified for the domestic market are relevant for small and medium sized businesses. In particular the opportunities for Time of Use tariffs (see answer to Question 13) could be even more relevant particularly for the large businesses in this group. Functionality for Load Demand management as covered in Question 8 potential will be even more relevant to some businesses.

Q21 Do you agree with the Government's approach to promoting interoperability in the non-domestic market? Do you have particular views about the interaction between the Government's proposals for the non-domestic sector and the domestic smart meter roll-out?

Interoperability is crucial to an effective system of smart meters, but unlike the domestic market there are other issues to consider.

During the roll out, small businesses located predominantly within domestic areas should be included at the same time as the neighbouring houses. However, for larger businesses and those located in business parks there may be cases for smart meters to be installed in Business Parks at a different time.

Question from Section 5: Other Issues and Next Steps

Q22 Has Government identified the right issues for the immediate next steps? Are there other activities or key issues which you think should be addressed at this stage of the preparations for roll out?

Insufficient attention is being placed on the potential parasitic drain on electricity from mains connected display units. Though there is an ambition to have 1W devices, these alone will still cause the emission of over 110 000 kg of CO_2, and with current models having levels up to 10 W or more, not insignificant emissions of 1 million tonnes or more may arise. In section E of the report entitled "Impact assessment of a GB-wide smart meter roll out for the domestic sector" there is a suggestion that the displays for gas meters would be battery operated, but why cannot those for electricity be the same, or even have a single combined display where there are two fuels to minimise parasitic electricity loss. This issue needs further consideration.

The issue of parasitic energy loss will not be as significant in the non-domestic market as there will be fewer such devices installed.

Q23 Do you have any other comments or evidence on issues relating to this consultation document or the accompanying Consultation Impact Assessments?

Smart meters must be designed with flexibility to allow incorporation of additional facilities via plug in boards or remote software provision. The role out speed needs careful consideration so as to provide a sustainable approach for the future, in both the employment of installers and the manufacture of replacement meters. This will require careful attention to the phasing of the role out in the later stages

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