British Gas
Looking after your world

Legal & Regulatory
Lakeside West
1st Floor
30 The Causeway
Staines
Middlesex
TW18 3BY
t: 01784 874000
f: 01784 878719

Rachel Fletcher
Acting Senior Partner
Smart Grids and Governance : Distribution
Ofgem
9 Millbank
London
SW1P 3GE

Kevin Woollard
Regulatory Manager

Telephone 07979 563580

December 20th 2011

CC Petter Allison

Dear Rachel,

Smart Grids Evaluation Framework – A Smart Grids Forum Consultation Report

1. British Gas is committed to supporting the establishment of a low carbon energy sector. We are leading the industry in the deployment of smart meters and have installed over 400k meters in customer's properties.

2. We have supported the establishment of the Smart Grid Forum as we believe it is vital that the opinions of all stakeholders in the energy value chain are incorporated into the policy making process of both DECC and Ofgem.

3. The Low Carbon Network Fund provides an excellent opportunity for industry participants to work together to evaluate a range of smart grid technologies, customer propositions and commercial operating frameworks in a dedicated UK focussed environment. Indeed we are partnering with Northern Powergrid in the Customer Led Network Revolution project where we are working together to evaluate a number of smart grid technologies over the coming years.

4. We broadly agree that it is important to establish a framework that will allow smart grid investment opportunities to be evaluated as we believe it is critical to get this right and ensure investment is only made where customers will directly benefit.

5. The projects being progressed via the Low Carbon Network Fund have been established to capture and share the learning across the industry. Many of these projects are in the early stages of planning and deployment and so it seems to us premature to set out a long term smart grid evaluation framework which is overly restrictive at this stage.

6. It is essential that the UK market fully grasps the opportunities that smart grids offer. The role of suppliers will be critical to this, given we are best placed to enable true consumer engagement. It would therefore be to the detriment of consumers if this role fell to network monopolies.

7. We do not believe it would be in the interests of consumers for industry to duplicating functions and activities in the smart meter. This would only lead to ineffective, confusing and plural engagement with consumers. For example the proposed use of "top down" smart grid deployment to allow networks to deploy DNO led dynamic Time of Use Tariffs.

8. The responses to your consultation have been appended to this letter. These are not confidential and we are happy for these to be shared with the industry. If you have any questions or require any clarifications please contact me on 07979 563580.

Yours sincerely

Kevin Woollard
Regulatory Manager

A Framework for the evaluation of Smart Grids

Consultation Response

Section 2: Smart grid evaluation framework

Do you agree with our definition of smart grids?

The report uses the following proposed definition of a smart grid:

"A smart grid is part of an electricity power system which can integrate the actions of all users connected to it – generators, consumers and those that do both – in order to efficiently deliver sustainable, economic and secure electricity supplies."

This definition is very broad and could almost encompass any technology or innovation that relates to the electricity network. The definition could leave some uncertainty around at least the level of customer functionality that is relevant to smart grids. Whilst the report does refer later to time of use tariffs, this could be seen as not really integrated with the rest of the solution. Some additional wording/qualification that indicates what elements of smart meter/customer functionality are included may help. It is the customer end of smart grids that will need the clearest explanation as smart grids are very esoteric outside the grid domain.

Have we captured the main complexities associated with assessing the costs and benefits of smart grids ?

The report has identified the following complexities that will need to be addressed:

- Smart grids as enabling technologies
- Multiple solutions
- Scale and profile of investment required
- Uncertainty and option value
- Uncertainty over the level and value of demand response
- Disaggregated costs and benefits

These areas appear to be broad enough to capture the main complexities that will need to be addressed.

Do you agree with our approach to dealing with these complexities in the overall evaluation framework, in particular :

We propose to take a two-stage decision tree approach rather than relying on a conventional CBS framework alone. Does this constitute an appropriate approach given the need to measure differences in the "option value" that different smart grid investment strategies provide ?

Given the uncertainties involved in assessing costs and benefits of smart grids and the length of the time horizon we agree that the two-stage decision tree approach constitutes an appropriate approach.

We propose to use the year 2023 for the decision point in our decision tree analysis. We have chosen 2023 on the grounds that this is likely to coincide with the beginning of the first price control period after the completion of the smart-meter roll out and so is likely to be a natural point for the industry to take stock and adjust it's smart grid strategy if necessary. Do you agree that the year 2023 constitutes an appropriate "break point" in this regard ?

We agree that 2023 constitutes an appropriate "break point" given that this coincides with the beginning of the first price control period after smart meter roll out.

Section 3: Value drivers and scenarios

Do the technologies set out in Table 2 constitute a sensible list of value drivers?

We believe that CHP should also be included here. It is only mentioned in the context of Biomass generation. We believe demand led CHP could have a role to play in reducing further network reinforcement.

In addition the final column in the table "Impact on the amount of demand that is flexible" could be reworded to "Impact on the amount of flexible demand available or required" as some of the technologies listed in the table are supply side impacts that will require demand to be flexible.

Do you agree with our assessment of the technical characteristics of each?

Table 2 does not show voltage issues in relation to heat pumps and it could be expected that this significant load could cause voltage drop. Also, as heat pumps are a highly reactive load these could influence power factor as well.

Are there any other technologies that could have a significant impact on smart grids?

"Solar PV with storage" would also have an impact on the amount of demand that is flexible. Uptake is likely to be "uncertain" but we note that there is already considerable growth in PV connected residential storage in Japan.
As mentioned above micro CHP should also be included.

Our analysis suggests that the most important factors to vary across the scenarios will be:

- **The pace of electrification of heat and transport;**
- **The increase in distributed generation; and**
- **The increase in intermittent and inflexible generation.**

Do you agree? Are there any other variables that we should look to vary across the scenarios and why?

These factors all will have an impact on the timescales for smart grid investment. At a higher level, macroeconomic factors stand to have a considerable impact on UK smart grid uptake, especially in light of the Eurozone problems. This could be captured in the most negative scenario of minimal activity in each of the three factors.

The increase in uptake of insulation and energy efficiency technologies in both the residential and C&I sectors stand to make a serious impact as well. Extensive energy efficiency investment would lead to decreased electricity consumption, actually delaying the need for network reinforcement.

Section 4 Smart grid and conventional investment strategies

Out of the options presented, which set of assumptions should we make on smart meter functionality?

It is our view that option 1 represents the most accurate assumption on smart meter functionality. Smart meters will have the functionality to support dynamic supplier led ToU tariffs from 2014. We would question the additional investment by DNOs mentioned under option 1 which would be required to allow DNOs to directly influence demand. Suppliers will already be investing heavily in communications infrastructure using the DCC and additional expenditure by the DNO would not appear to be an efficient use of resources or provide good value for money for consumers.

Do you agree with our proposed approach of including smart appliances in the business as usual?

We do not agree that smart appliances should be included in the business as usual. It is likely to be financially unattractive for customers to choose smart appliances in significant numbers pre 2020. The scenario should assume with some form of investment/incentive beyond energy savings are required to encourage this.

Do our proposed smart grid strategies capture the main deployment options?

At this stage it is probably too early to say whether all deployment options have been covered.

Have we provided an accurate overview of the main services that smart grid technologies can provide?

The report outlines the main services of smart grid technologies as being:

- The provision of data on the distribution networks
- Assistance in optimising network power flows
- The facilitation of DNO-led DSR; and
- The provision of embedded storage

A Smart Grid facilitates all types of Demand Response, whether for STOR, supplier or DNO needs. Improved grid resilience and understanding are critical to allowing the operation of any and all demand side response programmes.
Though Smart Metering is providing a good deal of the necessary data for integrating electric vehicles and distributed generation to the network, an enhanced grid, with voltage optimisation, is required to handle the changes to traditional power flows. Smart Grid is a key enabler for distributed generation and electrification.

Do you agree with our proposed assumptions on the characteristics of these technologies?

The report details the following technologies as being representative technologies of a typical smart grid:

- Electrical energy storage (EES)
- Dynamic thermal rating
- Enhanced automatic voltage control
- Technologies to facilitate DNO-led demand side response

It summarises the key characteristics of these smart grid technologies as:

- Shorter-lived assets: while conventional assets have lifetimes of at least 40 years, these investments have lifetimes ranging from 10 years.

- Less 'lumpy' impact on headroom: these investments will generally make a less significant impact on available headroom on the LV feeder than conventional assets.

- Longer lead times: though physically installing these assets is likely to take no longer than their conventional alternatives, some of the technologies described here have never been trialled (e.g. dynamic thermal rating for underground cables). Others (e.g. dynamic thermal rating for cables and transformers) may need to demonstrate compliance with relevant equipment or operational standards which will add to the initial lead time for early adopters. Smart technologies may therefore sometimes involve longer lead times than their conventional alternatives.

- Declining costs over time: because smart technologies are mostly less mature than their conventional alternatives, their costs are likely to fall over time.

A number of these technologies are currently being trialled on various Low Carbon Network Fund projects. We believe it would be better to wait for some of the feedback from these projects so that the report could focus on the key characteristics of these technologies as experienced in a live, UK context.

The characteristics identified all seem to point towards perceived failings of smart grid technologies in comparison with traditional technologies. The report should also identify the ability to communicate with the control room, self heal, operate automatically and dynamically adjust and other "smart" features as key characteristics.

Section 5 Value chain analysis

Are there any other groups in society that we should consider in the value chain analysis?

From a supplier perspective the forming of one group called "customers" is a huge simplification of the UK customer base. We assume this group will include domestic, SME and I&C across a range of different demographics. To get any real value out of the analysis from a customer / supplier perspective) it has to be broken down further than that, not least as the success of DSM is largely dependent on customer behavioural change, which needs to be carefully managed (messaged, incentivised) by suppliers.

We would also highlight that we believe a review of the Short Term Operating Reserve arrangements should be carried out to allow players with a smaller demand reduction capability to participate in the process.

Do you agree with our conclusions regarding the distribution of costs and benefits?

We broadly agree with the conclusions however, there is significant risk associated with the full pass-through assumption based on DNO's investing in network equipment and passing the costs directly on to the customer base - this cannot be the answer going forwards. There must be a full business case assessment associated with any network investment, and customers must not be at the bottom of the chain underwriting investments – business cases must be favourable for them if they are expected to contribute.

In addition Smart Grid objectives can be met in a number of different ways. Again, prior to LCNF conclusions, it feels premature to assume that heavy grid investment is the way to meet those objectives in all cases. Local restrictions on space and grid infrastructure access, clustering of EVs or distributed generation, and high level of smart metering roll-out will all impact what smart grid solutions are optimal for any particular feeder line.

Do you agree with our proposed approach to assessing the costs and benefits for the transmission network?

The report suggests a three-step methodology for assessing the benefits that smart grid technologies could bring for balancing costs:

- Identify the current annual cost of using STOR to balance demand and supply

- Estimate how the cost of relying on STOR is likely to develop between 2012 and 2050 in the absence of smart-grid-enabled DSR

- Estimate the extent to which smart grid enabled DSR could help meet these projected STOR requirements

The report also looks specifically at how the costs and benefits re alleviating the need for future network reinforcement costs and potential network congestion could be assessed as follows:

- The framework model will generate peak load flow profiles between 2012 and 2050 for both BAU solutions and the smart grid solutions. By combining these load flow profiles with an assumed set of network reinforcement trigger points and typical reinforcement costs, this framework will take these impacts into account.

We agree hat this approach has two potential limitations in that it

- It will only provide a simple estimate of the implications of smart grids for transmission network reinforcement costs.
- The approach also assumes that the transmission system operator would have perfect foresight which is unlikely to be the case

It will also be interesting to see how valid the assumption is that smart technologies are applied at DNO level only it will be difficult to see how this won't move further up the network into the Transmission space as well, albeit in the medium to long rather than in the short term.

Section 6 Proposed Model Specification

How suitable is the proposed network modelling methodology which uses representative networks, with headroom used to model when network investments should be made on feeders?

Representative networks will allow for significant simplification of the modelling requirements and will also make the modelling more transparent, however it needs to be demonstrated that such a simplified approach will produce results that compare reasonably well with the alternative approach of using a full nodal load flow analysis. We also note that fault level will not be incorporated into the model. We understand that fault level is a significant driver for generation led distribution network reinforcement. Such reinforcement costs may typically be recovered through connection charges (rather than be funded by the DNO) which may suggest why they are not currently significant to DNO levels of investment today, but that does not mean the cost should be excluded from the CBA model.

Are the voltage levels (from 132kV down to LV) being considered by the network model appropriate, or should the model be limited to focus on any particular voltage levels?

The model should consider all network levels to allow for a more end to end analysis. We note that some regions have a significant amount of load that flows directly from 132kV to 11kV (c. 70% of load in the Eastern and West Midlands regions follows this configuration) and therefore the network may also need to consider this configuration.

For each of the voltage levels we are considering, are current models sufficient to recognise available headroom and the cost of releasing additional headroom in these networks? If not, is the proposed approach considered to be simple or overly complex?

DNOs are best placed to answer this question, although we note that by not incorporating fault level, the modelling may be ignoring a significant driver of generation led reinforcement on the DNO networks.

Is our approach to estimating of clustering of low-carbon technologies appropriate? Is any other evidence available in this area?

It seems reasonable to assume EV clustering similar to PV. It is less clear that this is the case with heat pumps as these are more likely to be driven by factors such as availability of grid gas connection.

Is our approach to generation model assumptions (a simple stack of generator types, no technical dispatch constraints, half-hourly demand profiles for summer and winter, and representative wind profiles) suitable?

The generation model assumptions appear reasonable for the purposes of this framework.

Should a simple representation of interconnection be included in the model?

Commercial arrangements surrounding interconnectors have been subject to recent change and may be subject to further change. It needs to be considered whether the removal of TNUoS charges from interconnectors, and the potential to remove BSUoS, affect flows sufficiently to warrant more complex modelling.

Does the model represent DSR("supplier-led and "DNO-modified" profiles, with a simple heuristics used rather than simultaneous optimisation) adequately?

Transmission, distribution and generator/supplier drivers for DSR are not all the same. As such, assuming that they will all want to enact DSR at peak is overly simplistic. Future increased reliance on wind will mean that DSR is likely to be key in responding to times of low wind capacity, which may occur at any time. Distribution companies may be interested in shifting demand as a result of a localised fault, which can also happen at any time.

The model also assumes consumer uptake of DSR to the extent that it changes the UK profile. This would require that a significant amount of the UK's energy demand is completely flexible and that customers will be fully engaged and sufficiently incentivised to participate in DSR. Many of the LCNF projects will be looking at the potential of DSR; it would be best to wait and see how UK customers react to various approaches to DSR before making assumptions about its potential.