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DECC Consultation on Delivering Secure Low Carbon Electricity

Response

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Introduction

This document is Senergy Econnect's response to the Government's consultation on Secure Electricity Supplies.

Senergy Econnect has a 15 year history as Econnect, with the company providing services to 50% of all wind energy commissioned in the UK. Senergy Econnect is now deeply involved in providing advice to many stakeholders in the offshore renewable energy market, including offshore grid studies for Crown Estate, technical advisor role for offshore windfarm construction and current bidders for Crown Estate round 3 leases, and consultancy in developing tidal power technology.

Senergy Econnect also has experience in advising on the commercial and regulatory aspects of connecting renewable energy to the distribution network. While assisting many developers in gaining connections for their projects, the company has built its expertise in the operation of the GB electricity system, and provides representation for renewable generators on the grid code review panel.

Aside from the company's principal interest in connecting and energising renewable energy, Senergy Econnect has spent much time developing viable solutions for off-grid island electricity networks, such as can be found in the Inner Hebrides and other Scottish island groups. Perhaps the most notable project of recent years, for which Senergy Econnect led the design work, is the Isle of Eigg electrification project. This, along with other Scottish islands, makes use of the company's demand side management (or smart demand) solution, Powaplug. The island systems have very high renewable energy penetrations, and have experienced 100% supply from wind power alone.

Other innovative work in which the company has been involved surrounds Smart Grid technology. Senergy Econnect has for over 8 years been developing and deploying Active Network Management solutions, a precursor to smart grids, in the form of its GenAVC technology, currently deployed on EDF Energy's network to increase capacity for a landfill gas generator. The company has been involved in innovating smart grid solutions before such a name became common.

All of this provides background to the company's current interest in the Secure Electricity Supplies Consultation. Senergy Econnect is currently developing a demand side management solution for the grid and the company is therefore ideally placed to provide relevant input to this consultation. The company is willing to take part in follow up discussions as part of the Government's ongoing work on securing energy supplies.

Senergy Econnect's interests are aligned with the Government's in wanting to promote low carbon energy and maximise the electricity system's efficiency. The company believes that the content of this response is aimed at achieving just that.

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1 Contribution to Consultation

Q6. *What are your views on the problems that smart demand could address?*

With the requirement to move to a low carbon electricity supply using much more variable renewable energy resources, the GB generation fleet will be required to operate more flexibly to maximise the use of variable renewable resources. Smart demand can play a significant role in managing the costs of providing this flexibility.

Smart demand (or demand side management (DSM)) can address any short-run technical or commercial constraint issues within the electricity supply industry, e.g. total available generation, contracted generation, nationally or locally constrained networks.

By 'short-run' we mean in the range a few seconds to a few hours. Smart demand is not expected to change the total consumption of energy over a 24 hour period, simply the patterns of consumption. It could, however, form part of an arbitrage between differing sources of energy, e.g. gas and electric heating.

An excellent example is the GB system incident on 27th May 2009, where following the loss of 1993MW of generation over a three and a half minute period[1] 546MW of demand – an estimated 550,000 consumers were forcibly disconnected for up to 63 minutes. If Smart Demand were deployed the demand disconnection could have been achieved entirely through voluntary load management and no consumers need have been forcibly disconnected.

Smart demand is ideally placed to address "within day" problems, and is also applicable to "day ahead" issues. For "year ahead" problems static time-of-use tariffs in place today, such as economy 7, economy 10 and 20:20, are capable of modifying the demand profiles to maintain base load in the middle of the night and minimise the effects of any long-run shortfall in generation capacity.

Generally it is understood that static time-of-use tariffs are a DSM approach, although we would argue that it is actually quite dumb – simply a market mechanism for adjusting the patterns of demand in the long-run – and as such should not be included within the definition 'smart demand'.

Q7. *What are your views on the estimates of potential smart demand among the different consumer groups, and the approach used to reach these estimates? What other approaches or estimates might be helpful?*

Our work has concentrated on the domestic sector.

There is very little information provided in the report by IHS Global Insight on how the percentage estimates of discretionary demand were calculated. However, the estimates of domestic discretionary load between 6% and 37% of the 5 pm peak demand is consistent with others which explain in detail how their estimates have been originated[2,3] (although the Global Insight lower estimate errs to the conservative).

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[1] National Grid, Report of the National Grid investigation into the Frequency Deviation and Automatic Demand Disconnection that occurred on the 27th May 2008, February 2009.

[2] Infield, D., Short, J., Horne, C. and Freris, L. (2007) Potential for Domestic Dynamic Demand-Side Management in the UK. Power Engineering Society General Meeting, Tampa, FL, 24-28 June 2007, IEEE.

[3] Hamidi, V., Li, F. and Robinson, F. (2009) Demand Response in the UK's Domestic Sector in Electric Power Systems Research, 79, pp.1722-6, Elsevier.

The largest unknown in estimating potential future discretionary (or deferrable, or responsive) load is the effect of displacement of other sources of energy with electrical energy to achieve a lower carbon energy mix. Significant examples include displacement of fossil fuelled heating by heating using renewable electricity, and displacement of petrol and diesel fuelled vehicles by plug-in electric vehicles.

The significance of these demands is they could make up a substantial percentage of overall domestic electricity consumption, but both are deferrable. **Therefore, any estimates of current potential smart demand is likely to be an underestimate of what will be available in the future.**

Q8. *What are your views on the smart demand measures set out? In particular, for each of the measures, the Government are interested in your views on:*

- *Whether and how they should be explored further*
- *Their usefulness for maintaining a balanced system in different timescales*
- *Their appropriateness for different customer groups*

The significant difference between supplier-side activity and demand-side activity is that for suppliers it is their core business, while for consumers it is an acceptable method for reducing the cost of a commodity – electrical energy. This results in two features that should be present in demand-side schemes, particularly when applied to domestic and smaller commercial consumers:

1. It should be simple, convenient and easy, requiring minimum interaction between consumer and the system; and
2. The degree of centralised control to which a consumer will yield is likely to be less than for supply-side measures.

These features will be less applicable for large commercial and industrial consumers with dedicated energy management personnel who are familiar with market operations and who are used to interacting with trading systems as part of their role.

Senergy Econnect has coined the phrase "consumer-led demand-side management" and this, we believe, is a key point to the success of any smart demand scheme.

Because electrical energy is a commodity the consumer must have the ability to choose to use the energy at any point in time, regardless of cost. However sufficient information must be provided to inform that choice.

The key to releasing the value of smart demand is through the market mechanisms already in place. Energy suppliers become a key player, being able to aggregate their customers' response capability and offering it as a block to the market. Hence suppliers offer to consumers tariffs with smart demand that give them cost benefits. As consumers take up these tariffs suppliers aggregate the capability and offer it as a block to the system operator.

Of course it does not have to be an electricity supplier who acts as aggregator, and there are already commercial offerings of aggregated demand-side services to the system operator, but these tend to focus on large industrial sites. To enable small consumers, down to domestic level, to participate in a DSM or smart energy market, while keeping the mechanism as simple as possible, the electricity supplier is the obvious choice of intermediary.

Table 4.1 of the consultation document lists a range of measures and categorises them as system operator led, supplier led and customer led. This, in our opinion, is a simplistic view and we have recast that portion of the table in Table 1 of this response. The measures have been separated into those which address system issues, and as such the system operator takes the lead role; and those which are energy issues, for which the electricity supplier takes the lead role.

By showing the measures in this way it can be seen that **smaller consumers can make a much fuller participation in smart demand measures than is currently practised, but the supplier has a key role as aggregator and intermediary**. Senergy Econnect is currently developing the technology to enable this, but there are regulatory barriers, discussed in response to question 11, which need to be addressed to facilitate this.

Table 1 Stakeholder Roles for Smart Demand Measures

<table>
<tr><th colspan="2">Measure</th><th>System Operator role</th><th colspan="2">Supplier role</th><th>Consumer role</th></tr>
<tr><td rowspan="4">System response</td><td>STOR</td><td>Contract service and dispatch</td><td colspan="2">Aggregator and intermediary for dispatch</td><td>Respond to dispatch</td></tr>
<tr><td rowspan="2">FCDM

(incl. low frequency relays on appliances)</td><td rowspan="2">Contract service, manage frequency</td><td colspan="2"></td><td>Offer service, auto response</td></tr>
<tr><td>Offer service</td><td>Enable response</td><td>Fit relay, auto response</td></tr>
<tr><td>Interconnection shared reserve</td><td>Contract with other SOs</td><td colspan="2"></td><td></td></tr>
<tr><td rowspan="4">Energy response</td><td>Static time-of-use tariff</td><td></td><td colspan="2">Match tariff to market patterns</td><td>Respond to price</td></tr>
<tr><td>Dynamic time-of-use tariff</td><td></td><td colspan="2">Match tariff to market patterns</td><td>Respond to price</td></tr>
<tr><td rowspan="2">Customer exposure to market pricing</td><td></td><td colspan="2"></td><td>Trading, Respond to price</td></tr>
<tr><td></td><td colspan="2">Dynamically adjust pricing to reflect trading position</td><td>Respond to price</td></tr>
</table>

Q11. *What are your views on the barriers to customers providing smart demand? Are there other barriers?*

See response to Q12.

Q12. *What measures could be taken to overcome the barriers to smart demand? What are the costs and risks of these measures?*

In response to paragraph 4.55 we would argue that there are plenty of signals on system stress in the wholesale market place, reflected in long-term and spot market energy prices. The key is passing these signals through to retail customers.

It is our opinion that the provision of all smart demand needs to be market based. Energy suppliers could act as the intermediary in offering a service to the system, and would share the rewards with their consumers as part of their competitive offering in the market. Similarly energy suppliers could operate more flexibly in the wholesale marketplace, again sharing rewards with customers in the form of more favourable tariffs.

This mechanism allows consumers to proactively buy in to the concept of smart demand and see the benefits of it. However, it also means that the value chain passes through the suppliers, and that they need to be able to obtain that value from the system. This will entail changes to the current system of settlements, to allow the benefits of behavioural changes by a supplier's customers to be attributed to that supplier.

Currently the demand of small consumers is allocated to suppliers using profiling, but this will be unable to cope with behavioural changes in response to price signals. The introduction of smart metering opens up possibilities in this area, including entering all smart meters into settlement. These could be aggregated up by supplier/GSP to avoid overstressing the settlement system.

Currently the costs of entering a small consumer's meter into the settlement system is significant (£18 to £50 per meter per month[4]), however, step changes in volumes, and a change to the aggregation as described above should return them to the costs per metering point currently incurred by quarterly non-half hourly metering: £15 to £20 per annum.

We would go as far as to say that **modifying the settlement system to allow economical entering of small consumer metering systems into settlement will be enough to allow the market for smart demand or DSM to develop**. If any regulatory changes result from this consultation, this should be the one.

[4] E.ON UK Power Technology, Stark Software International and BEAMA (1996) Advanced Metering Technology for Embedded Generation. DTI, URN 06/1892.