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Ben Smithers
Smarter Markets
Ofgem, 9 Millbank,
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Dear Mr Smithers,

CREATING THE RIGHT ENVIRONMENT FOR DEMAND SIDE RESPONSE

Introduction and Key Points

Efficient energy use, and particularly the ability to flex the time at which some electrical energy is consumed, will play a very important role in the transition to a low carbon economy. Achieving this without impacting on industrial competitiveness or consumer comfort requires appropriate market design as well as upgraded technical infrastructure. Given appropriate attention to these matters, the costs of providing secure low carbon electricity supplies will be more manageable and hence will present a lower risk to Britain's economic recovery.

The IET therefore welcomes the attention being paid by Ofgem to this subject and the comprehensive survey of work currently in progress by the Regulator, Distribution Network Operators and many other bodies which this consultation document describes.

Demand side response, i.e. customers responding to a signal to change the amount of energy they consume and when, will become fundamental to the feasibility and costs of integrating renewables onto the grid if we are to avoid incurring large standby generation commitments and we are to maximise the utilisation of power network infrastructure.

The IET agrees that the preconditions identified in para 3.2 usefully structure the debate:

- **Industry parties** need to be **confident** that there is value for them in demand-side response to justify the investment
- The **value** of demand-side response services needs to be effectively **signalled** to customers
- **Customers** need to be **aware** of the opportunities to provide demand-side response, able to readily **access** information on options and able to **act**.

The IET also agrees that the key challenges identified in para 3.19 of the consultation document are particularly significant. We would slightly re-phrase these as:

- Revealing the **full (whole system)** value of demand side response (DSR)
- Securing delivery of demand side response (i.e. having sufficient confidence that DSR will be supplied when needed)
- Clarifying interactions between industry parties

While this consultation approaches the subject from a market design perspective, there are also significant engineering aspects which we believe need to be taken into account at an early stage in policy development and we have tried to draw these out in our answers.

QUESTIONS

Precondition 1: Industry parties need to be confident that there is value for them in demand-side response to justify the investment

Question 1: Are there any additional key challenges associated with revealing the value of demand-side response across the system? If so, please identify and explain these challenges.

The IET has identified the following additional challenges:

Variability in marginal energy costs

Since the electricity system was privatised, the costs of energy from various types of generation have been of a broadly similar order of magnitude. The system inherited overcapacity from the CEGB and many generating assets are fully written down. Operators have not had to consider building new capacity that would be used for only a few hours per year.

In comparison with the present situation, by 2030 we can expect to see a greater variability in seasonal demand, as a greater proportion of the load will be heating. The diurnal cycle of net demand could be at least as marked as today and will be increased by PV generation that is not available during the morning and evening peak periods in winter. In addition, the system will be exposed to periods of near-zero wind across the whole of GB, which occur every few years, last for a week or two and would affect around 30% of the installed generating capacity.

These factors will result in a much greater variability in energy costs. The load on a windy day in summer could be supplied almost entirely by renewable energy, with near-zero running costs[1]. Providing capacity for the evening peak during a winter anticyclone could involve construction of fossil fuel or biofuel plant (either reciprocating engines or gas-turbines) that is required for only a few hours a day for a couple of weeks every other year. Thus the marginal cost of generation could vary from almost nothing to more than £100/kWh.

Logically, demand-side load management should result in prices that reflect the marginal costs of energy production. This could result in energy prices during an abnormal winter peak several orders of magnitude higher than those in the summer. It is difficult to see how these would be politically acceptable. However, without high peak tariffs, there will not be an incentive for consumers to install the load management systems necessary to flatten load peaks. [2]

If demand response is to be facilitated in Britain, the no-wind situation referenced above must be addressed to prevent significant quantities of 'reserve' generation being installed to assure supply security. This would be costly and carbon intensive, and would detract from the focus on establishing a strong national demand response capability. Alternatives to installing reserve generation could include (i) increasing interconnectors to other countries (i.e. beyond the expected anti-cyclonic area), (ii) provision of electricity storage (centralised, community and household, including electric vehicles which might eventually be able to feed back in to the grid), and (iii) development of a balanced portfolio of generation sources that includes, for example,

[1] This does not mean zero costs for electricity, as a return will of course need to be earned on the investment. However paying off the investment is a fixed cost and the electricity generated would not be expected to have daily or seasonally varying costs.

[2] We are however aware that a dynamic Critical Peak Price tariff trial is currently being conducted with some 1,100 domestic consumers as part of UK Power Networks' Low Carbon London LCNF Tier 2 project. This day-ahead price-notified tariff operated by EDF Energy contains very strong price signals which do reflect the marginal costs of energy production that would be typical of generation fleet with a high contribution from intermittent generation. We understand that early results show that ordinary domestic consumers with no 'smart' appliances are making significant changes to their electricity usage behaviour simply through day-ahead planning.

nuclear, thermal with carbon capture, bioenergy, waste, marine and tidal generation. Hydrogen may also play a part in providing energy storage and supply security.

The Capacity Assessment modelling process

It is particularly important that the correct availability data for generating plant is utilised in Ofgem and DECC's modelling of electricity capacity to avoid incentivising the overbuilding of plant, which will drive demand response out of the market. Discussions in recent months have identified different opinions about the appropriate data sources to utlise here.

The ability of different customer groups to participate:

Rewards will be required by consumers if they are to be incentivised to change their personal habits and engage with home energy management systems, and the arrangements for these must be practical, simple and comprehensible.

It will be important that all customers are empowered to engage actively in demand response. It would be regrettable if barriers to entry (such as the purchase and installation costs of home equipment) prevented some groups from gaining the benefits of participation, especially vulnerable customers and those in fuel poverty.

Question 2: Can current regulatory and commercial arrangements provide the means to secure demand-side response being delivered? If not, what will regulatory and commercial arrangements need to deliver in future?

The electricity system in 2030, envisaged by the Committee on Climate Change (CCC) report on the 4th Carbon Budget, would require reducing average emissions from current levels of around 500g CO_2/kWh to around 50g CO_2/kWh. Because substantial fossil fuel generation would still be required to deal with the winter peaks, this implies that, at periods of low demand, the electricity system would be fed almost entirely by low carbon generators (principally nuclear and renewables) with low marginal costs. A market in which energy (as opposed to capacity) has almost zero cost of production was not envisaged within the current regulatory and commercial arrangements. Notwithstanding proposals under EMR for FITs with CfD's, the Capacity Market, and recently announced strike prices for various types of generation, it is not entirely obvious how the market structure would operate.

As discussed in response to Question 1, the present regulatory and commercial arrangements make it difficult, if not impossible, for a DNO to manage MV and LV circuit loading. It is difficult to see how a market based round national energy retailers could be sufficiently "granular" to allow effective demand response at the postcode level.

In general, the most straightforward commercial arrangements are likely to result in the most effective and responsive load management. A complex system, such as Figure 2 in the consultation document, requires several different bodies to be involved in what should be a simple commercial relationship which is unlikely to produce a responsive system. This needs real thought in the near future. Either a solution is needed that allows suppliers and network operators to collaborate in managing load at a highly granular level, or the distribution network operator and electricity supplier functions need somehow to be combined. Both of these would have significant implications for the industry.

At the domestic level, there will be a need for sophisticated tariffs and new partnerships with customers, which are against the current direction of travel. The evidence suggests that time-varying tariffs need to be simple in the first instance, while customers get used to them. It is unrealistic to expect adoption of real-time pricing, with associated risk, for a while yet[3].

[3] … evidence from LCNF projects; Irish smart meter TOU trials; Thorsnes, Williams and Lawson (2012) Consumer responses to time varying prices for electricity. Energy Policy 49, 552-561. Darby, SJ, and Pisica, I (2013) *Focus on electricity tariffs: experience and exploration of different charging schemes.* Paper 8-318-13, European Council for an Energy-Efficient Economy summer study, Hyères, June 3-7, 2013

Question 3: Is current work on improving clarity around interactions between industry parties sufficient? If not, what further work is needed to provide this clarity?

Not answered.

Precondition 2: The value of demand-side response services needs to be effectively signalled to customers

Question 4: Are there any additional key challenges associated with effectively signalling the value of demand-side response to consumers? If so, please identify and explain these challenges.

Not answered.

Question 5: Do you agree that signals to customers need to improve in order for customers to realise the full value of demand-side response? Does improving these signals require incremental adaptation of current arrangements, or a new set of arrangements?

Many customers will expect this to be taken care of through their supply contract or potentially through ESCO arrangements, and will not want to take personal charge of their own energy economy. Engaged customers (we would suggest probably a small percentage of the total) would need effective signalling to inform behaviour. This could come through what has been specified already in the smart meter specification.

Question 6: To what extent can current or new arrangements better accommodate cross-party impacts resulting from the use of demand-side response?

There are significant system control concerns that could arise, notably in the uncoordinated actions of thousands or potentially tens of millions of control loops acting across the power system. These could range from individual response of consumers' appliances to price signals to (for example) software controlling the dynamic loading of overhead distribution circuits. The risk of system instabilities thus arising needs further investigation. We are encouraged to see the work now starting under the Smart Grid Forum WS7 and we will be pleased to integrate the thinking from the IET's expert group, the 'Power Network Joint Vision' initiative.

For larger consumers, the provision already exists for Distribution Network Operators (DNOs) to contract for DSR either directly or through commercial aggregators for DSR services. The issue at stake here however is that such bilateral arrangements (or tripartite where the consumer also contracts to provide a reserve service such as STOR or, in future, Demand Side Balancing Reserve) if carried out at scale, would leave electricity supply companies susceptible to imbalance charges. Ultimately the arrangements should embrace and reconcile the impact (beneficial or otherwise) of DSR on all affected parties. The objective would be to maximise available synergies whilst minimising potential conflicts. In so doing the true value of DSR would be reflected in the market and hence its potential would be more easily exploited.

Whist a capacity mechanism might be a means to trade DSR and hence its market value reflected by its marginal cost value to individual market participants, the concern would be as expressed above, i.e. that the arrangements should not preclude a DSR resource concurrently providing more than one service (i.e. where the risk of conflict is assessed and found to be small compared with the benefit in terms of avoided costs of alternative measures).

At the domestic/SME level, the ENA/EnergyUK discussion paper referred to in the consultation provides some useful insights into how the current industry supplier hub-based structure might

adapt to provide a more workable market for DSR, reconciling the needs of both suppliers and DNOs.

However, the question remains open as to how incentivised or indeed empowered suppliers are to introduce more complex time-of-use tariffs; and even then what incentive they have to reflect any time-of-use DUoS (distribution use of system) price signal in their charges to consumers.

Precondition 3: Customers need to be aware of and able to access the opportunities

Question 7: Are there any additional key challenges associated with customer awareness and access to opportunities around demand-side response? If so please identify and explain these challenges.

Consumers' awareness of DSR, or indeed the rationale for time-of-use tariffs, is currently low. The rollout of smart metering provides a clear opportunity for consumer engagement and a limited opportunity to introduce the concept of energy pricing and the potential advantages (to consumers) of time-of-use tariffs enabled by smart meters.

However, wide-scale awareness, let alone acceptance, of time-of-use pricing will require a well-considered and sustained campaign of consumer awareness, focusing on the benefits in terms of costs and carbon reduction.

An essential first step is that the industry needs to regain consumer trust, raise awareness, and then generate consumer interest. It is noticeable that consumers involved in individual trials show positive responses and attitudes but these consumers are to an extent self-selected.

Automated energy management systems are likely to be too complex and costly for most domestic consumers but more practical for small commercial use in the first instance.

The involvement of third parties such as commercial aggregators may improve public confidence but it is highly desirable for them to use a common agreed technical specification for connection of white goods to the HAN in order for manufacturers to have the incentive to provide compatible appliances.

The introduction of electric vehicles provides a good opportunity to explain to the public that quick charging at a peak time of day is much more expensive to provide than slow charging over night or over the middle part of the day. It follows that this issue should not be glossed over for early adopters but used as a mass educational opportunity. This will require co-operation on policy with the Department for Transport.

Question 8: Is any additional work needed to explore the role of third parties in helping customers to access and assess demand-side response offerings?

Commercial aggregators have already made a significant impact in the market – particularly in the ancillary services market. It remains to be seen whether they or other third party intermediaries (TPIs) will perceive an opportunity on the back of smart metering to extend their portfolios to domestic and SME consumers. The concept of a virtual power plant operator is not new and might therefore be a model that becomes more widely explored once the smart meter mass rollout begins.

What will be important, however, is that TPIs are not unreasonably excluded from accessing Smart Metering DCC services, provided they are able to demonstrate requisite levels of data privacy and security. Access by TPIs to smart meter auxiliary switches to control specific types of demand might also be necessary and hence there will be a need to reconcile any security conflicts with multiple parties potentially having access to common devices and hence transmitting 'critical' messages through the DCC.

Chapter 4: Conclusion

Question 9: Are there additional preconditions for delivering the right environment for demand-side response? If so, please explain what these are and why they are important, as well as attaching a priority relative to those challenges we have already identified.

The consultation describes the key preconditions for markets to enable effective deployment of DSR. But of equal importance is

a) the necessary physical infrastructure in the UK smart metering infrastructure and
b) major attention to public acceptability.

Smart metering infrastructure:
We would emphasise the need to ensure that the national smart metering programme creates the necessary enabling structure for DSR at domestic and SME level. In particular, failure to ensure interoperability between suppliers' interim (pre-SMETS2) and final solutions will potentially diminish the scope for DSR, as might an ineffective HAN solution (e.g. one which was unable to support the required messaging or price signalling for dynamic time-of-use tariffs). As stated previously, ensuring access by TPIs to the smart metering system (subject to meeting the requirements of the Smart Energy Code) will also be important for ensuring competition and innovation. A further requirement will be ensuring that suitable security-accredited smart appliances are able to communicate with the smart metering system.

Looking ahead, it is likely to be of great benefit to customers if entrepreneurial activity can flourish in the area of demand side management; practical experience across many sectors shows that SMEs can be among the leaders in such situations. However, we caution that the institutional, market and data security arrangements could result in entry barriers for small players and we recommend that attention is given to ensure third party accessibility. We would assign this a high priority, as it is likely to be hard to implement once the die is cast.

Question 10: Do you agree with the priority and timing we have attached to addressing each of the key challenges identified above?

Subject to our answer to Question 9 above, we agree with the list of challenges and priorities for market development and, broadly agree with the suggested relativity between priorities, though timings do not seem to be mentioned in the main, which needs correcting. However we emphasise the ultimate importance (even if it is not regarded as currently the highest priority) of addressing potential cross-party conflicts and/or failures to leverage DSR synergies between parties and for different system purposes.

This response has been developed by the IET's Energy Policy Panel and takes into account feedback received from the wider IET membership.

If the IET can be of any further assistance on these issues, please let me know.

Yours sincerely

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