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12th January 2017

Dear Sir/Madam,

Consultation Response: A smart, flexible energy system

We are pleased to provide our response to the consultation on the UK's energy system.

ABB is a leader in power and automation technologies that enable utility, industry, transport and infrastructure customers to improve their performance while lowering environmental impact. The ABB Group of companies operates in roughly 100 countries and employs about 135,000 people, including around 3,200 in the UK.

We provide a number of products, systems and solutions across the energy, transport and manufacturing sectors. Much of our business is focused on the combined challenges of improving energy efficiency, increasing network flexibility and facilitating the development of a sustainable low carbon energy system. Our business offering is diverse and includes a full range of transmission and distribution solutions providing flexibility and including; battery storage systems, building automation systems, network management and optimisation software, network and microgird control solutions, power electronics solutions to maintain power quality and stability and EV charging systems.

Our response covers the sections on Roles and Responsibilities and Innovation. We do not have the detailed service provider level of knowledge, or evidence, of the day to day operation of the market to comment on the questions raised in other sections. However we would like to make the following general points;

- Any future policy should consider the total energy system, rather than being limited to the electrical system. The consideration of gas and heat systems will need to be fully integrated with the electrical network.
- The policy on storage should cater for the full range of storage technologies and consider storage at each point in the system from transmission to behind the meter storage.
- The market arrangements must have built in flexibility to remove barriers for new entrants and developing technologies, allowing them to compete on a level playing field.
- New policies should support the diversity in local and regional circumstances that will arise. Effective coordination between all of the parties involved is essential and will require the availability of transparency of real time data for all relevant parties.
- New digital technologies, that are already available and operating successfully, do provide an enormous opportunity to improve the operation and efficiency of the

network. The ability to interconnect systems and devices across the whole network to optimise energy flows in real time has the potential to reduce the required generation capacity significantly. ABB has estimated that if every motor in the world was operated smartly, which from a technology point of view is now feasible, then the capacity saving would equate to the output from the World's largest 1000 power plants.

Should you have any questions or clarification requirements please do not hesitate to contact me using the contact details above or my email: dai.richards@gb.abb.com

Yours faithfully,

Dai Richards
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Roles and responsibilities

Question 43: Do you agree with the emerging system requirements we have identified (set out in Figure 1)? Are any missing?

ABB broadly agrees with the emerging system requirements outlined in the document. However, we would also urge a greater focus on the broader energy system, rather than an assessment merely from an electricity system perspective. While this is alluded to in the document (section 5.1, paragraph 3), this will need to be a key consideration in the design of new systems, frameworks, and policies.

It is worth emphasising that innovative, practical, working technologies in this space are available now and have enormous potential to deliver cost savings and efficiencies. ABB deployed one of the world's first large scale energy storage systems over 10 years ago with a capacity of 46MVA in Fairfax Alaska. The scheme continues to deliver value to Golden Valley Electric Association (GVEA)

For the effective rollout of these technologies to occur, one of the key emerging system requirements that needs to be prioritised is clarity on revenue streams. There is unlikely to be significant success in progressing new technologies where there is difficulty in understanding and quantifying the business case.

Question 44 - no response

Question 45: With regard to the need for immediate action:

a) **Do you agree with the proposed roles of DSOs and the need for increased coordination between DSOs, the SO and TOs in delivering efficient network planning and local/system-wide use of resources?**

b) **How could industry best carry these activities forward? Do you agree the further progress we describe is both necessary and possible over the coming year?**

c) **Are there any legal or regulatory barriers (e.g. including appropriate incentives), to the immediate actions we identify as necessary? If so, please state and prioritise them.**

a) The DSO/SO/TO roles must allow flexibility as well as true and unrestricted innovation across the whole energy system in order to achieve maximum efficiency, security of supply and lowest cost outcomes for customers. Achieving this flexibility will require greatly increased coordination across all elements of the energy system supporting all activities from long term planning to 'real time' system optimisation.

Flexibility is especially important where DSO/SO/TO boundaries are concerned – these should be evidence-based in design, and should be geared towards enabling the most innovative and efficient outcome to customers rather than initially defined by traditional roles and responsibilities.

b) We would advocate a modular approach with an emphasis on learning from experience. Pilots, for example, could involve regulatory barriers being suspended in a controlled geographical area. This would allow the most robust, efficient and secure engineering solutions to come forward from industry – and for regulation and boundaries

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to be designed and tailored to suit these solutions and foster competition to achieve the best outcomes. Such pilots should be established with clearly defined objectives and measurable outcomes, along with specific timescales, so that the lessons from the pilots are clear and built into future thinking.

c) A pilot approach, where regulatory barriers are suspended in a controlled geographical area, would help to clarify how well individual regulations and incentives are working and where there are barriers to the most cost-effective and efficient system design.

Question 46: With regard to further future changes to arrangements:

- **a) Do you consider that further changes to roles and arrangements are likely to be necessary? Please provide reasons. If so, when do you consider they would be needed? Why?**
- **b) What are your views on the different models, including:**
  - **i. whether the models presented illustrate the right range of potential arrangements to act as a basis for further thinking and analysis? Are there any other models/trials we should be aware of?**
  - **ii. which other changes or arrangements might be needed to support the adoption of different models?**
  - **iii. do you have any initial thoughts on the potential benefits, costs and risks of the models?**

a) Any future model needs to have sufficient flexibility designed into the arrangements to allow the most efficient energy network to emerge through innovation, rather than trying to innovate within a defined boundary system. For example, it should cater for community and local energy schemes within regional energy grids, which may go across currently defined boundaries, yet enabling the realisation of local balancing. Future full exploitation of digital technologies, interconnecting everything from smart appliances up to network management and planning systems, may suggest exploring an integrated system operator model, such as exists in some other countries.

We may learn from certain models in Europe, particularly Germany, where many Community Energy Schemes have developed in relatively small, contained geographies – i.e. local communities rather than larger districts or regions.

In Germany, significant community energy system ownership exists, owing much of its growth to technical and commercial developments as well as the “peer-to-peer” trend and its inherent advantages in terms of engaging with the community and customers directly.

Very significant levels of renewables in Germany are community owned, currently community-owned energy in the UK is negligible in comparison.

ABB would also suggest that some thought should be given to the idea of DSOs having a coordination role not merely over the electricity supply, but the whole energy supply. Such a co-ordinated approach to energy system planning would maximise the efficiency of multi vector energy supply and infrastructure, whilst optimising infrastructure investment.

b) The proposed models provide a selection of operating arrangements and this principle of ‘optionality’ will be required to support the breadth of different requirements that will

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occur across the system. Building flexibility into future arrangements and the evolution of new models built on experience from pilot schemes (that we have described in our response to question 45) would allow new models to emerge if required. Any operating model will require full transparency and availability of relevant system data to the market participants. From a purely engineering perspective, our broad comment is that there must be extremely low latency in pricing signals to ensure system stability in real time.

Innovation

Question 47: Can you give specific examples of types of support that would be most effective in bringing forward innovation in these areas?

The current OFGEM Network Innovation Competition process has realised significant innovation to 'business as usual' opportunities in UK DNOs and TOs and clear cost reductions have been identified whilst allowing more flexible future networks to operate

ABB believes that more could be done to allow third party suppliers to be more directly involved in the Network Innovation Competition (NIC) process. Proven innovations are available in this space, but have had difficulty moving forward due to the existing codes and standards and the resource overhead involved for innovation submissions.

Furthermore, third parties should be provided with more visibility and detailed information on the major network issues being faced by DSOs, to enable innovative solutions to be developed in order to meet current challenges. Transparency of information in this regard is absolutely vital to allow innovation to flourish.

New York state has recently taken this on board, with utility companies being required to publish a Distributed Systems Implementation Plan (DSIP), setting out the system information needed by third parties to plan for effective market participation. Furthermore, as part of the plan, utility companies must demonstrate how they are working with, and intend to further stimulate the involvement of, current and would be market participants.

Whilst this is carried out to a limited extent currently by UK DNOs and TOs with Long Term Development Statements and 10 Year Statements, New York State appears to require very high levels of transparency coupled with 5 year plans which are open for public consultation.

Question 48: Do you think these are the right areas for innovation funding support? Please state reasons or, if possible, provide evidence to support your answer.

These are good areas to focus support, but they need to be expanded in order to explore new models of network topology where the potential for innovations and cost savings are greatest. The understanding of the effectiveness of technologies to support local balancing is a key area for innovation.

The clearest way of doing this would be a major local energy trial, which could involve a number of different technologies across the whole energy system (e.g. battery storage, vehicle-to-grid and regional coordination of gas generation). Importantly, this should

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involve local balancing, so that the potential of ensuring security of supply by balancing locally can be assessed.

In order to innovate in this space, it is hugely important that a controlled area is allowed to temporarily remove perceived Regulatory and market barriers and trial the technology in a coordinated way. If successful, the potential savings from more flexible, multi-vector, localised systems will be quantified and give more confidence to the final energy system design.

Campus projects such as Keele University's proposed Smart Energy Network Demonstrator (SEND) are good examples of how such a trial could work at scale.

Response ends

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