

## Response to National Grid – Operating the Electricity Transmission Networks in 2020

Response by Swanbarton Limited, Pinkney, Malmesbury, Wiltshire, SN16 0LJ

Thank you for the opportunity to respond to this consultation. Swanbarton Limited is a consultancy business which concentrates on the application and use of electrical energy storage. We therefore have a keen interest in the topics raised in this consultation. Our responses follow the questions listed in the consultation document.

### Section 5

*Question 1: How do National Grid's observations align with your experience or modelling of wind generation?* National Grid has approached this in an open way and we agree with your observations.

*Question 2: Are we correct in assuming that wind generation is controllable enough to assist in operating the networks?* Although in theory, wind generation might be sufficiently controllable to assist in network operation there are two factors that will influence this in practice.

First, the cost of wind generating plant is high, and therefore owners will typically wish to run plant at its maximum output for maximum energy sales and maximum revenue from ROCs or other renewable incentives. Therefore retaining some use of the wind generating output may not be financially attractive. Secondly, with the potential for surplus wind generation, the use of storage associated with renewable generation acting as reserve plant for system control will create the opportunity for storage plant to assume this role.

*Question 3: Should National Grid assume that Supercritical Coal generators will provide some flexibility in operation which will assist in operating the networks?* This will depend on economic factors. There may be lower cost ways to provide operational control than changing the output of base load generation.

*Question 4: Should we assume that Nuclear generators will continue to concentrate on base-load operation?* We offer a similar answer to question 3

*Question 5: Is it likely that Carbon Capture plant will impose material restrictions on the operation of electricity generating plant?* Carbon Capture plant can offer increased opportunities for flexible operation if the carbon separation and storage processes are separated from the generation processes, thereby allowing variations in net plant output by varying all three components of the system according to hour by hour requirements of the overall system.

*Question 6: Are there other aspects of tidal or marine technologies that we should consider further at this stage?* No

Question 7: *Are there other restrictions we should consider in developing a view on gas fired generator flexibility?* Not known

Question 8: *What is your view of future electricity demand growth and how would you quantify any uncertainty around this?* Predictions of demand are difficult at best. Although energy efficiency is generally reducing demand, the increased number of electrically powered items is substantially counteracting any savings. The net effect of social change, in terms of lifestyle, movement of people, employment etc is not easy to predict.

Question 9: *Are there other developments which will change the way that electricity will be consumed in 2020 that we should consider?* The economics of variable pricing may tend to flatten prices for some periods as moveable demand can be time shifted, but extremes in supply, may still cause significant price spikes which may have a negative effect on balancing supply and demand at critical times.

Question 10: *Do you share our view that distribution companies, suppliers, aggregators and ourselves will all value and compete for demand side services?* This will create some interesting business models for demand side services. Consumer inertia may resist effective implementation of competitive demand side services. There will need to be many changes in the industry before this is implemented.

Question 11: *Are our assumptions around the number of electric vehicles in 2020 reasonable?*

The planning figures are likely to be over-estimates. The adoption rate for new electric vehicles will depend much on the installation of new electrical infrastructure as well as social acceptance.

Question 12: *Is it valid to assume that electric vehicle charging will be co-ordinated via a smart grid or something similar and will react to price signals?* In the initial phases of roll out, EV charging will be independent of the time of day, especially if the conventional domestic 13 A socket is used. Much will depend on how supply companies market the service to their customers and communicate the benefits to their customers. The amount of energy for a half charge of a typical electric vehicle is comparatively low, which indicates that unless there are significant incentives, timeshifting is unlikely to be adopted purely for consumers' economic reasons.

Question 13: *Do you foresee a greater or lesser role from embedded and distributed generation than we have assumed?*

## **Section 6. Reserve and Operating Margin**

Question 14: *Is our anticipated improvement in wind forecasting performance at 4 hours ahead achievable?*

Question 15: *Do you have any views on our projected Short Term Operating Reserve requirement under 'Gone Green'?* We agree that the demands for STOR are likely to increase, given the uncertainties in generation profile, demand profile and other operational circumstances.

Question 16: *Do you have any views on our projected volumes, prices and costs for STOR under 'Gone Green'?* The projected volumes show a marked increase. Given the reduction in plant that will be able to meet the requirements of STOR, it is reasonable to assume increased costs for providing this service. Plant that is installed solely for STOR will be expected to be remunerated from the service, and will therefore incur higher costs than for plant which is already remunerated by other income streams and offers STOR solely as a back up or optional service.

Question 17: *Is National Grid's current view that 'low wind' events across Great Britain need to be considered when evaluating electricity operating margins reasonable?* Yes.

Question 18: *Are our generator availability assumptions reasonable for application to analysis of future operating margins?* Yes

Question 19: *We would welcome comments from market participants on how they expect to manage periods of low wind generation output and whether this is an important consideration for them.*

Question 20: *Are we correct to highlight the importance of wider European issues in electricity operating margin analysis?* Yes.

Question 21: *Are there further technical solutions for maintaining operating margins which we have not mentioned here?* Storage can and should be considered - this is discussed later in the document.

Question 22: *Do you think National Grid's view of future operating margins is useful and do you have views on how this should be presented?* Yes – a useful view.

Question 23: *Are our assumptions regarding the level of electricity demand during the minimum demand periods reasonable?* Yes

Question 24: *Are our generation availability assumptions for minimum demand periods reasonable?*  
Yes

Question 25: *Is our central assumption regarding wind generation bid prices related to ROCs reasonable?* Yes – there is strong evidence to suggest that the economics of renewable generation are set by the policy on ROCs. Similar pressures will arise when Feed in Tariffs are introduced for small scale renewables.

Question 26: *Is it reasonable to assume that minimum demand periods will be managed using Interconnectors and Wind Generation in preference to the curtailment of Nuclear Generation?*

Yes – it is unlikely that high cost capital intensive generators such as nuclear will seek to reduce output in preference to alternative operating strategies. (The role of storage, including electric vehicles and direct thermal storage may become important here.)

### **Section 7. Operating the Networks**

Question 27: *Do you agree with National Grid's view of increased balancing activity in the future due to variation in market length?* Yes

Question 28: *Do you agree with National Grid's view that ramping effects will impact on operation of the networks?* Yes

Question 29: *Do you believe that a new approach is required in the development of System Operator to generation or demand control point interfaces for 2020?* As the system becomes more complex, particularly with more “smart” interfaces which may have complex operating algorithms, automatic control, will be necessary.

Question 30: *Are there any specific factors which suggest that adequate flexibility will not be available to National Grid for use in operating the networks in 2020?* As an island system, GB is vulnerable to disruptions in primary fuel supply as well as disruptions to the interconnectors. Man-made disruption and natural events may cause isolated, but significant problems in the operation of a resilient system.

Question 31: *The combined challenge of:*

*a) ensuring the networks are operated safely and securely against a background of generation variability; whilst*

*b) getting more from existing infrastructure;*

*suggests to us that control, communication and information systems have a greater part to play in controlling flows across the transmission networks.*

*Are there alternative approaches which should be considered?*

An alternative approach is to reduce the size of the system by separating it into discrete operating areas, which could be treated as autonomous, self healing networks. As the drive for local sustainability increases, local communities may wish to isolate themselves from large networks and depend more on their own resources. This policy is unlikely to be implemented on a widespread basis, but it is foreseeable that towns (such as new “greentowns”) may go in this direction.

Question 32: *What criteria should National Grid use in developing any requirements for information regarding embedded generators? Are there other ways of obtaining this information?*

Question 33: *Are there additional options that National Grid should consider to maintain a Black Start capability?* Energy storage is a relatively simple technical solution to providing black start, and encouraging the energy storage market by offering this service would assist in its commercial development in other areas of energy provision.

## Section 8. Balancing Services

Question 34: *Are we correct in assuming that new interconnectors will be able to meet some of our Balancing Services requirement?* Yes – some, but not all. The cost of new interconnectors will have to be recovered from their use during operations, and the economics may suggest that using interconnectors for balancing services may not be financially viable.

Question 35: *What is your view on the potential of electric vehicles to provide balancing and other energy services?* There is clear potential for this, although the timescales to implement this strategy should not be underestimated. Electric vehicles, by themselves will not provide the complete solution, but may make a contribution to the additional requirement for more network services.

Question 36: *How much of the electricity demand in Great Britain do you think could be regarded as discretionary or deferrable and hence available for use as a Balancing Service or other energy service?* Somewhat less than the 11 GW shown in chapter 8.

Question 37: *What specific actions should National Grid take to facilitate Balancing Services from demand-side providers while maintaining the required quality and volume of service?*

Question 38: *Are there further aspects of storage or other storage technologies we should consider when looking forward to 2020?*

Pumped storage: there is potential for new pumped storage to be developed in GB, although the headline costs would be high. Sites were identified in the 1960's & 1970's and most of these are still viable today. Pumped storage would provide a significant large scale storage resource for bulk energy applications. Modern pumped storage is highly efficient and flexible in both the pumping and generating modes.

Large scale CAES has been considered for GB, but its use has not been considered mainly because better value is obtained from using caverns for natural gas storage rather than air. Small scale (mini and micro CAES) are emerging technologies which may well have potential in the distributed generation sector.

There are numerous types of battery storage, and volumes could be written on this topic. Table 12 indicates power ratings of a number of systems, the energy rating is also important. It is worth noting that battery systems of more than 30 MW / 220 MWh are currently in service. Some battery technologies are at the demonstration stage, others are available under full commercial terms.

Flywheel systems are now being installed for frequency response services at Multi MW size.

There are also new developments in electro mechanical / thermal storage using efficient heat engines as the power conversion mechanism.

Energy storage devices can provide all types of balancing services, subject to matching the operating parameters with the requirements of the service. For several storage types, the storage system can provide more than one service, making the device more attractive to the owner / operator. The

premise is that using storage, recharged from renewable generation, is of lower environmental cost than using less efficient peak plant for reserve duties.

Storage devices are of most value balancing supply and demand over short time spans (minutes to hours). However low cost, bulk energy storage, which can balance the system over periods of hours to days will be of greater strategic value, as the proportion of renewable, stochastic generation increases. However, as the analysis shows, this may only be used for a few days each year, meaning that balancing the economics may be more difficult than balancing the system.

Question 39: *What are the prospects for the provision of Balancing Services from new OCGTs or other 'Back-Up' generation?* In many instances, energy storage devices could be as cost effective as OCGTs used at low load factors.

Question 40: *Is our mapping of technology to Balancing Services reasonable?* Yes

Question 41: *Is a statement of National Grid's view of its long term Balancing Services requirement useful to industry stakeholders?* Yes

Question 42: *What period should a long term Balancing Services Requirement statement cover?*  
In most instances, a minimum time of 5 years is required for serious project development, so the 5 – 10 year time frame is appropriate.

Question 43: *What changes to the current reserve products would better encourage the provision of reserve services?* Whilst recognising the potential role of National Grid as the sole or largest customer of some technologies capable of providing reserve services in GB, it may be useful in opening up the market for these technologies if there was a simpler comparison with reserve services in Europe (UCTE, Nordel, and All Ireland) which would mean a reduction in costs for specialising equipment for the GB market.

Recent proposals by National Grid to offer longer term contracts and indexation of contracts is welcomed.

Question 44: *What actions would ensure that procurement of reserve services does not impact adversely on the efficient operation of the wholesale energy markets?*

These services are linked, and so there will naturally be crossover of value between the two markets.