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Response by the Nuclear Industry Association to the National Grid initial consultation on Operating the Electricity Transmission Networks in 2020

The Nuclear Industry Association (NIA) welcomes the opportunity to contribute to this consultation as on the future of the electricity transmission networks which are vital to the UK economy.

NIA is the trade association and information and representative body for the civil nuclear industry in the UK. It represents over 170 companies operating in all aspects of the nuclear fuel cycle, including the current and prospective operators of the nuclear power stations, the international designers and vendors of nuclear power stations, and those engaged in decommissioning, waste management and nuclear liabilities management. Members also include nuclear equipment suppliers, engineering and construction firms, nuclear research organisations, and legal, financial and consultancy companies.

In responding to this consultation we have confined our comments to areas in which we have expertise. In particular we have deliberately for the most part avoided commenting on other forms of generating technology as those sectors will be making their own submissions and have more experience in their own technologies than we do (although there are areas in which the interaction between technologies is important and there we have commented).

Section 5. Developments in Electricity Generation and Demand

Question 1: How do National Grid's observations align with your experience or modelling of wind generation?

No comment.

Question 2: Are we correct in assuming that wind generation is controllable enough to assist in operating the networks?

No comment.

Question 3: Should National Grid assume that Supercritical Coal generators will provide some flexibility in operation which will assist in operating the networks?

No comment.

Question 4: Should we assume that Nuclear generators will continue to concentrate on base-load operation?

While modern pressurised water reactor designs have a greater load following capability than was exhibited in the past, this is not the most efficient way to operate them and there would need to be a very strong price signal to encourage operators to operate them this way.

Question 5: Is it likely that Carbon Capture plant will impose material restrictions on the operation of electricity generating plant?

No comment.

Question 6: Are there other aspects of tidal or marine technologies that we should consider further at this stage?

No comment.

Question 7: Are there other restrictions we should consider in developing a view on gas fired generator flexibility?

No comment.

Question 8: What is your view of future electricity demand growth and how would you quantify any uncertainty around this?

The scenario set out seems to be extremely optimistic. While energy efficiency has increased over the preceding years the average electricity consumption has steadily increased as households acquire more electronic equipment. Coupled with the increased demand from transport and heat pumps the total demand is bound to rise considerably. As pointed out in the consultation this will to a certain extent be offset by embedded generation but firstly due to its variability and secondly due to the fact that it is not likely to increase sufficiently by 2020, it is likely that the peak load will increase markedly. The one measure that is most likely to alleviate this is demand management rather than embedded generation.

Question 9: Are there other developments which will change the way that electricity will be consumed in 2020 that we should consider?

This ignores the existing arrangements for interruptible supplies for large consumers. There is potential for developing this further and bringing a larger range of users into this regime. Of course the smart metering/devices allow consumers to nominate specific devices for an interruptible supply as discussed in the next section.

Question 10: Do you share our view that distribution companies, suppliers, aggregators and ourselves will all value and compete for demand side services?

We agree these facilities will be valued but we are not sure how competition would work for these services.

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

We believe the assumptions on the number of electric cars are reasonable. However we would question some of the analysis. If a significant number of electric vehicles are on the road and routinely charging overnight then this will become part of the baseload and so it won't be the marginal plant that is providing the power supply for this.

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?

Yes the use of smart grid and metering technology will be essential for smoothing out the load across the day to prevent increased peak loads. However to increase the take up of electric cars the consumer will need to be assured when they plug their car in it will charge up. Using the example given in the consultation document you have assumed the battery is half charged so can easily charge up in the minimum demand period indicated. However the motorist needs to be assured that if their car has a flat battery it will be charged by the next morning so there needs to be a way for them to over ride the demand management system on occasions. If this is not the case there is a danger that they will have confidence in buying electric vehicles.

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

We think the assumptions made here are very optimistic (as also stated under question 8). It seems imprudent to plan on such an extreme case rather than a more central scenario.

Section 6. Reserve and Operating Margin

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

No comment.

Question 15: Do you have any views on our projected Short Term Operating Reserve requirement under 'Gone Green'?

These projections would seem to us to be appropriate.

Question 16: Do you have any views on our projected volumes, prices and costs for STORR under 'Gone Green'?

These projections would seem to us to be appropriate.

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?

It is certainly important to consider low wind speed events in considering margins, particularly as wind's capacity increases. While a supply interruption for a short period of time means little in financial terms for generators; for consumers it is a major event and will have profound consequences. While it is right to be prudent in considering these margins it is correct to assume that in future with a greater spread of wind generation and a lower concentration in percentage terms in Scotland that such extreme capacity drops in percentage terms are less likely however in absolute terms. However they will be as great in absolute terms due to the increased capacity. That said we believe the 15% assumption to be a prudent one.

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

While the current levels assumed for nuclear seem reasonable (if conservative) based on current experience it should be noted that the Magnox fleet has on average lower availability than AGR and lower again than the existing PWR so as the older plant closes this availability for older plant may well increase again. The assumptions for new plant would seem correct based on worldwide experience. However the use of the term availability could be confusing as for some this may seem to be equated to the load factor which may be true for nuclear but not for some of the other technologies.

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?

Question 21: Are there further technical solutions for maintaining operating margins which we have not mentioned here?

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?

We have chosen to answer questions 19-22 together because as noted in the consultation document they relate to the same set of issues. It is clear that under the gone green scenario there is a strong potential for ether power outages due to demand outstripping supply or to filling this gap with fossil fuel (presumably gas) generation which would lead to emission rises. In our view there is a clear case for demand side controls in addition to addressing supply side pressures as it will be essential to manage peak demand better than at present. With regard to the view that grid has taken as to the likely rise in demand, it is certainly true that demand has risen broadly in line with economic growth in the past, however government policies for decarbonisation of transport mean that regardless of energy efficiency measures (which are also very necessary) it is likely that this link will be broken between now and 2020 (and beyond).This is because the rapidly growing electrical vehicle fleet and a fully electrified railway network will greatly increase demand.

Therefore total demand will outstrip economic growth (albeit that the peaks and troughs can be better smoothed by demand management).

Question 23: Are our assumptions regarding the level of electricity demand during the minimum demand periods reasonable?
Question 24: Are our generation availability assumptions for minimum demand periods reasonable?
Question 25: Is our central assumption regarding wind generation bid prices related to ROCs reasonable?

As in the previous response we have combined our responses to questions 23-25. The assumptions of availability would seem reasonable but we think that to assume that the summer months will continue to be the demand minimum is questionable. Certainly the experience of warmer countries in Southern Europe would not support this. As the UK both warms and becomes more affluent we would expect the growth of air conditioning (unless checked by government intervention which may be politically difficult to deliver) to increase the minimum summer demand. In future the minimum demand is more likely to be in the Autumn/Spring and be at a higher level (especially given the increased transport demand as detailed above).

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?

Wind generation can be brought back faster than a nuclear station operating at reduced power so if curtailment of nuclear generation is used then you may need to fill the gap with additional fossil fuels. While it is true that this is likely to be more cost effective and beneficial in environmental terms we do not accept the scenario set out. It postulates no growth in demand from 2020 to 2025 while assuming the changes in generation set out in the document, which simply is not credible. For example the use of electricity for transport is not likely to be confined to purely electric vehicles. Some use of hydrogen (using electrolysis to generate it) and increased electrification of the rail system is also highly likely. Also we believe the minimum demand is much more likely to occur in the Autumn/Spring period and this is the normal time for refuelling outages for nuclear stations which will also reduce available capacity at these times.

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, it is inevitable that with more unpredictable variation in generation that greater action will be required to keep the grid in balance.

Question 28: Do you agree with National Grid's view that ramping effects will impact on operation of the networks?
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?
Again we have answered questions 28 and 29 together as they are grouped. We agree with the facts set out in the consultation in this matter and it is clear that a new approach will be needed by 2020 which could be via generation or demand control or a mixture of the two although be believe the emphasis should be on demand control as this will be easier and cheaper to achieve.

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?
Given the scenarios set out in the consultation paper (even given our reservations about the summer minimum assumptions) there is no reason to assume the flexibility will not be available. Although we note that the gone green scenario in this case requires extra use of fossil fuels above that which might otherwise be required.

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?
This would seem to us to be a sensible approach. Certainly we think it is preferable to taking the more conservative line and paying for extra balancing services if this can be avoided as this would be unacceptable to the consumer.

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?
For embedded micro wind and PV generation it should be possible to model the effect this will have if the grid knows how much generation exists in which areas. For example if distribution operators were obliged to report when their customers installed any embedded wind capacity and where it was then in the same way that National Grid models the likely performance of large scale wind farms the likely performance of embedded generation could also be modelled. However for micro-CHP schemes it may be much more difficult to model their performance because their output also depends on the way in which individual consumers choose to operate them.

Question 33: Are there additional options that National Grid should consider to maintain a Black Start capability?

While nuclear stations have separate on site generators they can't technically meet Black Start requirements due to the time required to come up to full power. We will therefore not comment further on this question.

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?

Assuming that the projects which are in progress deliver by 2020 then yes. However it is clear that they will not make up the full shortfall (or indeed anything close to it). It also has to be remembered that the UK National Grid tends to need these services at times of high or low demand and at these times the grids to which the interconnectors are attached are often experiencing similar demands. While the interconnectors are small this is less significant but if they become larger then the chances of them not being able to carry out the demands asked of them, due to balancing action on the connected grids, is consequently greater.

Question 35: What is your view on the potential of electric vehicles to provide balancing and other energy services?

Electric vehicles certainly have a great potential in this regard (more so than smart grid/appliance technology in the timeframe to 2020). We agree the potential revenue benefits of providing balancing services is unlikely to be and incentive to people to purchase such technology. Indeed if the charging cycles are interrupted in such a way as to make vehicle range each morning unpredictable then it will act as a counter incentive. Therefore this will have to be introduced carefully but given the potential it is imperative it is implemented rapidly before the electric vehicle fleet grows very large and we are in the situation of having to either retrofit or wait for vehicle system replacement as we are with domestic appliances.

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?

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?

We have answered questions 36 and 37 together. We think that the 75% figure quoted is exceedingly optimistic given the different timings of when they may be available for demand management. For example it would be reasonable to assume air conditioning would not be available at all for this purpose during the winter peak so the only point at which 75% could be achieved would be when absolutely everything else was available which is highly unlikely at any one time. We agree that large industrial users are a well established mechanism for demand management on a significant scale and strongly agree that we need long term stable energy prices if we are to attract them to the UK in any sort of significant numbers.

Question 38: Are there further aspects of storage or other storage technologies we should consider when looking forward to 2020?
The potential of electric vehicles has been mentioned but the potential of hydrogen vehicles has not. It is possible the government could go for widespread use of hydrogen powered vehicles in which case they are unlikely to want that hydrogen to be produced from methane. It is likely that in the short term electrolysis would be favoured. Electrolysis plants located next to nuclear stations or large wind farms could produce this hydrogen with very low carbon emissions. This would give these plants the ability to reduce the amount of electricity supplied to the grid flexibly diverting it to the electrolysis plant in times of low demand. One could even construct a hydrogen burning generator on site if you also wanted the plant to be able to boost power at peak demand.

Question 39: What are the prospects for the provision of Balancing Services from new OCGTs or other 'Back-Up' generation?
While this is technically possible the increased carbon emissions make this unattractive if sufficient other balancing services are available.

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?
Question 42: What period should a long term Balancing Services Requirement statement cover?
We have answered questions 41 and 42 together. Yes it is useful to industry to have a clear view of what the National Grid is looking to procure some distance ahead. However given long lead times for planning (both internally and through the formal planning process) Grid should certainly be looking to provide this at least 10 years ahead (greater would be ideal for industry planning purposes but we appreciate that in such a rapidly changing system this is likely to lead to a forecast which is highly speculative.

Question 43: What changes to the current reserve products would better encourage the provision of reserve services?
Question 44: What actions would ensure that procurement of reserve services does not impact adversely on the efficient operation of the wholesale energy markets?
We have answered questions 43 and 44 together. We support the view that a diversity of balancing services is the best guarantee of stable supplies and a stable grid. We also understand that new technologies will always require financial support to make them initially viable as financial markets are unlikely to take the risk of supporting their development. The wholesale markets are inevitably influenced by the very existence of balancing services. Balancing services could be operated by simply turning off sections of the grid at times of excess demand and

not procuring the reserve. This could likely lower the wholesale cost of electricity but it would be unacceptable in costs to the economy as a whole or to the public at large. National Grid should concentrate on providing balancing services that meet the national need. This will inevitably have market effects but this should not be the principle concern of National Grid, it should be for Ofgem as directed by Government to determine the market rules.

Nuclear Industry Association
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