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Delivering the UK's wind, wave and tidal energy

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Dear Sir/Madam,

Operating in 2020 consultation – BWEA response

BWEA is delighted to respond to National Grid's consultation "Operating the Electricity Networks in 2020". Overall we would like to commend National Grid on an excellent job in both the ENSG work and in this complementary and important area of system operation. BWEA is heartened that National Grid is willing and able to pick up the challenge of operating the system with increasing volumes of variable generation. We agree with the general outlook of this report: namely that the challenge will necessitate some changes in the way National Grid operates its network and interacts with network users.

We also agree with National Grid that there will be costs associated with this, but that this can be partly mitigated and managed by careful planning, innovation and learning through National Grid's and other System Operators' experiences. We also believe that the scale of the cost is acceptable when compared to the benefits for the environment and security of supply, and in protecting against the significant potential for increases in fossil-based wholesale energy costs.

Our comments in response to the consultation questions are as follows:

Section 5: Developments in electricity generation and demand

- **Wind forecasting (Q1)**

The consultation focuses on National Grid's own observations and experience in forecasting wind power on its system, asking for feedback. There are few details on the forecasting methods employed by National Grid and hence it is difficult to provide detailed comment. The data presented in Figure 4 is for a "persistence" forecast which is interesting but which is really a benchmark against which more sophisticated forecast models should be compared.

Paragraph 5.16 notes that "*forecast errors are higher with higher wind outputs*", which may be true for a simple persistence forecast. However, as National Grid alludes to later

on in Section 6, there is also evidence that forecasts for the aggregated output of geographically diverse wind farms can have lower forecast errors.

BWEA would note that there are a variety of wind forecast providers and methods – the most appropriate for National Grid's purposes will depend on whether it has access to real-time wind farm data, the required resolution of forecasts (area-based or individual wind farms) etc.

BWEA would be more than happy to facilitate contact with specialist expertise in this area. BWEA would also like to extend an invitation to National Grid to attend BWEA's wind resource group, where these issues can be debated in detail[1].

We would also note that there is a wealth of UK and international experience and documentation on this subject and, if National Grid has not already done so, we would very much encourage a thorough review and exchange of experiences with other System Operators.

- **Flexibility and controllability (Q2)**

National Grid's summary of the technical capabilities of modern wind turbines is fair and we agree that, when the wind is blowing, the technology will assist National Grid. Indeed, that is what it has been designed to do.

BWEA agrees that system inertia will decrease if modern variable speed wind turbines replace more conventional machines. Power electronic converter turbines could potentially be programmed to behave and look to the system as if they have more inertia than they really have. Such a 'ghost inertia' function has been demonstrated in simulation[2].

- **Smart(er) Grids (Q10)**

BWEA agrees that smartening our grid networks, demand response and other similar measures will be an integral part of adapting to and meeting the challenges of 2020. We think it is essential that DNOs, suppliers and others work together with National Grid on this and it would be productive to see some input from these constituents – hopefully via National Grid's consultation and through the ENSG smart grids Working Group.

The financial incentives on network owners, network operators and suppliers are central to achieving a smarter grid. There will need to be financial reward for innovation, which may mean, for instance, framing business targets around smarter operation rather than simple delivery of electricity.

We do not think smart networks, customers and appliances will develop without some changes in the market, and in the way that network companies are regulated. For instance, suppliers are currently forced by the Regulator to promote energy efficiency. With some sophisticated regulation and/or market development, suppliers might evolve into Energy Service Companies (ESCOs), where they would compete for customers on the strength of their energy saving services.

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[1] The group is chaired by Anabel Gammidge of SKM, who can be contacted at agammidge@skm.co.uk.

[2] Jenkins N, Dynamic performance of DFIGs and system support. IEA Annex XXIII, meeting Manchester, UK, 12-13 September 2005.

BWEA would also note that smart meters will have a greater impact when combined with smarter tariffs. These will need to be designed in such a way as to be effective in promoting the desired response, be that reduced or smoothed energy demand, or other.

- **Growth in Embedded Generation (Q13)**

It is quite difficult to unravel the underlying assumptions on embedded generation on the Gone Green scenario. However, the consultation notes that by 2020 there will be 15GW of embedded generation, split into:

- 4.5 GW in total of wind, biomass, wave, tidal and hydro;
- 3.5GW of solar PV;
- 7 GW of CHP.

4.5GW of embedded wind, biomass, wave, tidal and hydro by 2020 is quite modest, especially if it includes generation connected to the distribution system but which is visible to National Grid. The consultation also omits wave energy from this list in some places and so for the avoidance of doubt BWEA believes that both wave and tidal should be making a contribution by 2020.

By contrast the solar PV penetration seems optimistic, from a virtually zero base. The forthcoming feed-in tariff will provide for generation of up to 5MW and could promote a mix of micro-generation (including solar PV) as well as a proliferation of wind turbine clusters, small hydro projects and community biomass schemes.

Section 6 – Reserve and Operating Margin

- **Wind forecasting (Q14)**

BWEA agrees with National Grid that wind forecasting will play an important role in cost-effective and efficient system operation, and specifically that improvements in wind forecasting accuracy will mitigate reserve requirements. We would also refer you to our previous comments on Section 5, under “Wind Forecasting”.

- **Reserve levels and costs (Q15, Q16)**

It is natural that as the penetration of variable energy sources increases, there will be a need to understand their reliability. The focus of the consultation is on wind energy, which is natural given that it is at present the dominant new technology on the system. However, tidal and wave power – also variable – will gradually make an increasing contribution. Their contribution will diversify the technology mix with benefits to security of supply and also to variability in some timescales. To that end we would refer you to a study commissioned by BWEA which examines these issues[3].

A process of developing and refining practices for carrying reserve for wind energy (in combination with other generation) is entirely appropriate and one that BWEA supports.

The cost of doing so is not simply attributable to wind energy – it is the cost of changing over to a low carbon energy mix. As technologies and practices develop and improve, this initial ‘Gone Green’ cost estimate should form a useful benchmark. There are also some questions to be asked of the existing market for balancing services, such as:

- Are there unit cost reductions to be gained with higher volumes of balancing services?
- Should there be capacity payments for plant dedicated to providing balancing services? Poyry highlights this point in its report on future markets.

[3] Redpoint Energy, 2009. “The benefits of marine technologies within a diversified renewables mix.” http://www.bwea.com/pdf/marine/Redpoint_Report.pdf

- Should prices be regulated where there is increased visibility of imminent need, to prevent previously observed price spikes? Or will increased competition in the UK and via interconnectors mitigate this?

- **Periods of low wind (Q17)**

BWEA agrees that of course National Grid should factor in infrequent low wind events, just as it would do so for other infrequent low generation events. Unlike the sudden loss of generation due to technical failure, low wind events should be reasonably predictable in so far as they are driven by large high pressure weather systems. Co-operation with neighbouring markets could prove especially valuable in both tracking and responding to these events.

Analysis of the "availability" of wind capacity at times of peak (paragraph 6.40) is, strictly speaking, about output at times of peak (as opposed to technical availability – see below). BWEA would note that as experience is gained and there is more wind on the system, National Grid may develop probabilistic tools for estimating the likelihood of output at different times. In the future, this may or may not be driven by peak demand periods.

Finally there are some clear deficiencies in National Grid's analysis – Figures 9 and 10 – being based on met mast data uncorrected for hub height. We agree that the data may give some indication of weather patterns, but the data presented is absolute wind speeds, and as such the uncorrected data could be quite misleading. We would find it helpful if this analysis was improved upon.

- **Operating margin and generator availabilities (Q18)**

"Availability" here is assumed to refer to a wind farm's its technical availability to generate i.e. it does not factor in any dependency on the wind for output. Therefore availabilities of 85-95% are in the right ballpark but may be a little low – we would suggest these numbers are kept under review. BWEA agrees that it would be prudent to assume a lower number for offshore wind farms in the short-medium term given lower levels of access, though this should also be kept under review since the long-term level that can be achieved is not clear yet.

- **Operating margin assessment (Q19-22)**

BWEA has no major comments on the analysis presented here, which in general terms looks sound.

- **Operating at minimum demands (Q23-26)**

BWEA agrees that it is reasonable to assume that wind generation is curtailed in preference to nuclear, given the current expectation that nuclear plant is inflexible. We also agree that under market conditions wind generators will seek to recover their lost ROC revenues. £100/MWh is a reasonably high lost opportunity cost, and incorporates a 'green' value that is not realised for the consumer if wind power is curtailed. This should act as a strong signal to actually generate when the wind is blowing, promoting investment in storage capabilities rather than curtailing the wind generation.

Section 7 – Operating the networks

- **Interaction with energy balancing (Q27)**

The focus of the consultation here is whether participants will continue to balance their energy positions under the BSC arrangements, and how this will affect National Grid's role as a "residual" balancer.

The consultation Summary in Section 2 states that National Grid "*will continue to be reliant on this market participant action to operate the transmission networks efficiently, increasingly so as installed wind capacity increases. It is important though that market*

participants give us their views on whether the necessary operational capacity and flexibility will be available to us." And that "*we expect there to be further debate over our assumption that markets will balance*"

It is fair to say that wind farms will find it more difficult to balance positions on a half hourly basis, as prescribed by the BSC. This might become more apparent as more wind farms connect and make up an increasing proportion of BSC notifications.

National Grid's assumption is that as wind penetration increases, system imbalance volumes (Net Imbalance Volume, NIV) will increase in the direction of spill onto the system. The consultation also assumes that a higher volatility in NIV will result in more instructions to generators to alter their positions – this is based on an extrapolation of experiences today.

BWEA considers these to be not unreasonable assumptions. However, we would note that BSC notifications are driven by financial drivers, which are designed to incentivise generators to contract in advance. They may not be perfect at doing so, especially as the generation mix evolves. BWEA considers that incentives placed on generators to balance their positions should be commensurate with what is technically possible, and relevant to system balancing. There is arguably a case for examining the BSC rules and testing them against future 2020 scenarios in this respect.

Furthermore, whilst it seems reasonable to use current experiences as a guide, we would hope to see some adaptation to conditions which now might be quite challenging. Whilst NIV may become more variable, this is not strictly the same as it being more unpredictable. National Grid may become better at managing the variability as time goes on.

Finally, there does seem to be a lack of clarity in the consultation on where ultimate responsibility lies for securing sufficient long-term balancing services from the market. Whilst BWEA accepts that generators can and should signal their capabilities, we would assume that National Grid has ultimate responsibility for securing, or not, those capabilities. If this is not the case, then this is clearly an area that needs to be resolved.

- **Ramping (Q28-29)**

Again, the analysis presented seems reasonable, but we would caution against direct extrapolation from current experiences.

- **Generator flexibility (Q30)**

See earlier comments on Section 5 under "generator flexibility".

- **Network Management (Q31)**

BWEA agrees that the circumstances against which National Grid will need to secure will change. National Grid's analysis of the future challenges seems very sensible. We also agree that more frequent, probabilistic-based analysis will be more appropriate to these changing circumstances.

- **Embedded Generation – system operation implications (Q32)**

National Grid states that its ability to manage the system would be improved by better information on embedded generation. BWEA accepts this view and agrees that this will become more important as the penetration of embedded generation increases. We would, however, note that there are a number of avenues by which this could be resolved, including, but not limited to, National Grid having direct access to, and control of, embedded generation.

Suppliers and DNOs have obligations to National Grid and if these systems are not working, then an alternative would be to improve these information flows, rather than

bypass them. Conversely, if National Grid is seeking direct access to information from embedded generators, then one might question the value of continuing to provide certain information via suppliers or DNOs.

In general, BWEA would like to keep contractual relationships manageable. We have always favoured a DNO or other aggregator-type model for embedded generators' interactions with National Grid. This would seem to minimise the bureaucracy and cost for embedded generators. It could facilitate aggregation of output for wind forecasting, notifications, etc., where this provided a better and more useful solution. It would also allow optimisation of services such as reactive power, rather than placing the requirement on each and every generator.

The consultation talks about an "alignment" of grid code frequency obligations for embedded generators. BWEA would note that there are two separate kinds of obligation, namely tolerance to a frequency disturbance, and the provision of frequency response. The former is a candidate for mandatory standards, the latter is more suited to market-based provision of services.

We believe that it is essential for DNOs to take a pro-active interest in the active management of embedded generation and the interfaces with National Grid's network. This is not something that can be solved by National Grid alone, and we would very much support a collaborative effort going forward.

- **Black Start (Q33)**

BWEA agrees that it is prudent to consider novel providers of black start capability, but would presume that a simple replacement of conventional providers is likely to prove more economic for the foreseeable future.

Section 8 – Balancing Services

- **Interconnectors (Q34)**

BWEA agrees with National Grid that interconnectors can make a very important contribution to system balancing requirements. This view is widely supported – for instance the European project "Tradewind" notes that "*European grids need to be reinforced and better interconnected for higher system security and a more economical dispatch of power that ensures low wholesale electricity prices EU-wide. Moreover, when a greater amount of wind is added to the mix, the grid also needs to be able to guarantee an efficient transportation and exchange of power across national borders, so that the wind blowing in one spot, however remote or far offshore, can provide power far and wide. Grid reinforcement and an adapted power market design are essential if the EU's 2020 targets are to be met and surpassed.*"[4]

Poyry's market integration report also says that "*… interconnectors cannot be the "golden bullet" to solve the challenges of intermittency, although they are extremely important in helping it work.*"

BWEA thinks that it would be wrong to assume that new interconnectors will naturally attract finance in a timely fashion, to be complete in time to meet balancing needs. This will need some thought and, quite possibly, deliberate signalling of future needs to the market, and to the European Commission Trans European Energy Networks programme. The latter will provide financial support to infrastructure that is in support of the renewable energy grid integration aims of Member States.

[4] "Integrating Wind: Developing Europe's power market for the large-scale integration of wind power", p7. http://www.trade-wind.eu/fileadmin/documents/publications/Final_Report.pdf

- **Meeting new balancing service requirements (Q41-44)**

The consultation talks about National Grid making its contribution to, for instance, future operating margins, by providing information on future patterns of generation and demand. Whilst this is of course very important, National Grid's role in actually contracting for services is pretty crucial in stimulating investment. If requirements are uncertain, investors might be expected to look to cover their risks through long-term contracts.

Therefore we agree with National Grid when it says that "*Developers may hence ask for some form of commitment on revenue streams from National Grid to initiate the commercialisation of the services*." BWEA considers it entirely appropriate to ask deeper questions around whether current practices for signalling and procuring balancing services will promote the long-term investments that may be required, especially for new services. BWEA would also suggest a National Grid-sponsored programme of testing and demonstration of new technologies. This could perhaps be facilitated through Regulatory allowance for these kinds of investments, in a similar vein to the RPZ and IFI scheme allowances for DNOs.

BWEA agrees wholeheartedly that demand-side measures have a lot to offer, and that this is a potentially huge growth area for new providers. This is an area where demand-side incentives have a very strong role to play, and is perhaps an area where Ofgem and Government should take a lead or co-ordinating role.

Finally, BWEA would add that OFTOs responsible for HVDC connections for offshore wind farms could potentially offer new balancing services to National Grid.

I hope you find these comments useful. If you would like to discuss any aspect of this response, please don't hesitate to contact me.

Yours sincerely,

Dr Gordon Edge, Director of Economics & Markets, BWEA