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Dear Neil,

**BWEA Reponse: Scottish Grid Code Review Panel Consultation SA/2004 -
Consultation on Technical Requirements for Windfarms**

This document is the BWEA response to Scottish Grid Code Review Panel Consultation SA/2004 and has been compiled with support from Econnect who, as you will be aware, have worked with BWEA on previous Grid Code consultations.

BWEA was established in 1978 and is the representative body for companies active in the UK wind energy market. Its membership has grown rapidly in recent years and now consists of 330 companies including all grid-connected wind energy and every company with a lease to develop offshore.

Wind energy is widely recognized as an abundant energy resource indigenous to the UK. Most commentators accept that wind is likely to represent at the very least half of the Government's '10% by 2010' target because of the maturity and low cost of wind powered generation relative to other forms of renewable electricity generation technologies. Continued growth of installed wind energy generation capacity beyond this 10% 2010 baseline is almost guaranteed.

BWEA notes that there has been substantial development of these proposals since they were first published a over a year ago. BWEA welcomes the commitment made by transmission companies to debate these proposals with BWEA and representatives of the wind industry.

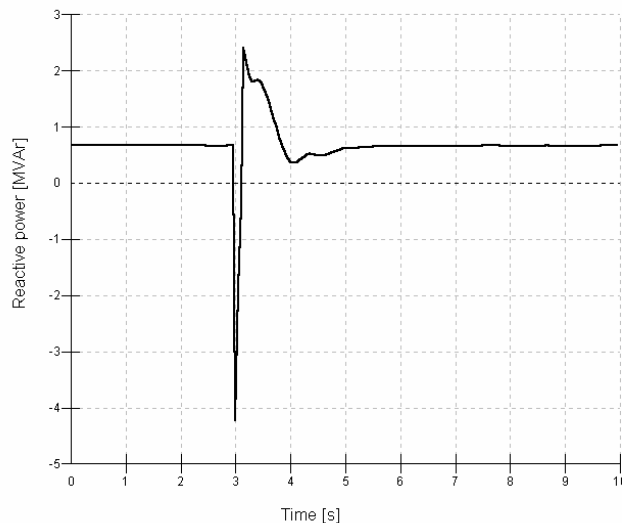


Response by Clause

In the Background to the first Consultation there is a statement that “Experiences of other Grid Operators have shown that there can be significant problems with a large penetration of wind technology”. The BWEA would ask for this statement to be removed or qualified with relevant research papers.

The statement in Changes since previous proposals that “Generators should not draw MVar from the network during faults” should also be removed as it is not consistent with the Connection Conditions, and is extremely difficult to achieve in practice, as Figure 1 showing the reactive power response to a fault of a fixed speed induction wind generator illustrates. The response of a doubly fed induction generator is similar though less extreme, however such a fault would still result in MVar being imported from the network.

Figure 1: Dynamic performance of a 2MW FSIG wind turbine to a voltage disturbance



BWEA asks whether Clause 1.6 in the Introduction, which allows that some generating units have inherent characteristics that do not allow compliance with all aspects of the connection conditions, is also being considered for inclusion in the GB Grid Code post-BETTA.

Clauses 4.3.1(a) (iii) & (iv) currently read “Point C is equivalent to –5% of rated power output” and “Point D is equivalent to 5% of rated power output”. This should be changed to “Point C is equivalent to –5% of MVar range at rated power output”, and “Point D is equivalent to +5% of MVar range at rated power output”, respectively.

Clause 4.3.1(a) (x) which asks for an extension to the MVar characteristic beyond the minimum requirement should be removed in the BWEA’s opinion as the code should only specify the minimum requirements for compliance, allowing any extension to be driven by market requirements.

The term ‘Pro-rata’ in Clause 4.3.1(b) ‘Active power output should be decreased by not more than ‘pro-rata’ with frequency’ should be defined for clarity using a ‘droop’ characteristic, i.e. a chart showing maximum power reduction per unit frequency, with

an allowance for the variability of the mechanical input power of intermittent power sources.

The phrase “unless the need is clearly identified by the company at the time of connection” in Clause 4.3.1 (c) should be removed as it contradicts the stated aim of the changes, i.e. “treating such a large volume of individual applications on a case by case basis is not transparent and is potentially discriminatory”.

The table in Clause 4.3.1 (e) should be amended to include both maximum ramp rate per minute and over a ten minute average as below: -

Ramp Rate Restrictions for Power Stations which contain Non-Synchronous Generating Units		
Power Station Registered Capacity (MW)	Maximum Power Ramp Rate (MW per minute)	Maximum Power Ramp Rate (Ten minute average)
<15	No limit	No limit
15 – 150	1/5 registered capacity	2/3 Registered Capacity
>150	30	100

This clause should also state that these ramp rates do not apply to reductions in output, and that this clause would become redundant once BETTA is implemented.

The fault ride through characteristic in Clause 4.3.1 (f) requires further clarification, as the voltage duration profile specified in Figure 3 (Figure CC.A.1.1 in Appendix 1) indicates that voltage ‘dips’ may last up to three minutes, represented by the shaded ‘Part 2’, and that short circuit faults should be cleared within 140ms, represented by the unshaded ‘Part 1’. This is in line with assurances that were given to the BWEA at the recent Grid Code forums, that all faults that resulted in a 0% retained voltage would be cleared and the supergrid voltage recovered to 90% within 140ms. However Figures CC.A.1.2a) and b) in Appendix 1 show the supergrid voltage returning to an unspecified level, 120ms and 140ms after the fault respectively, and the voltage level not returning to 90% until some unspecified ‘time’ in the future

There is also no mention of what the requirement would be in the scenario described in Figure 2 below where the supergrid voltage has not recovered to 90% within 500ms of the fault occurring.

The characteristic in Figure 2 is within the voltage duration profile specified for which a power park module should remain connected, however considering the situation below at 500ms after the fault, surely it would be better for a power park module to disconnect than continue to draw MVar from the system and further depress system voltage, or alternatively, avoid having to provide significant voltage compensation equipment to remain connected under such a scenario.

Supergrid
Voltage Level

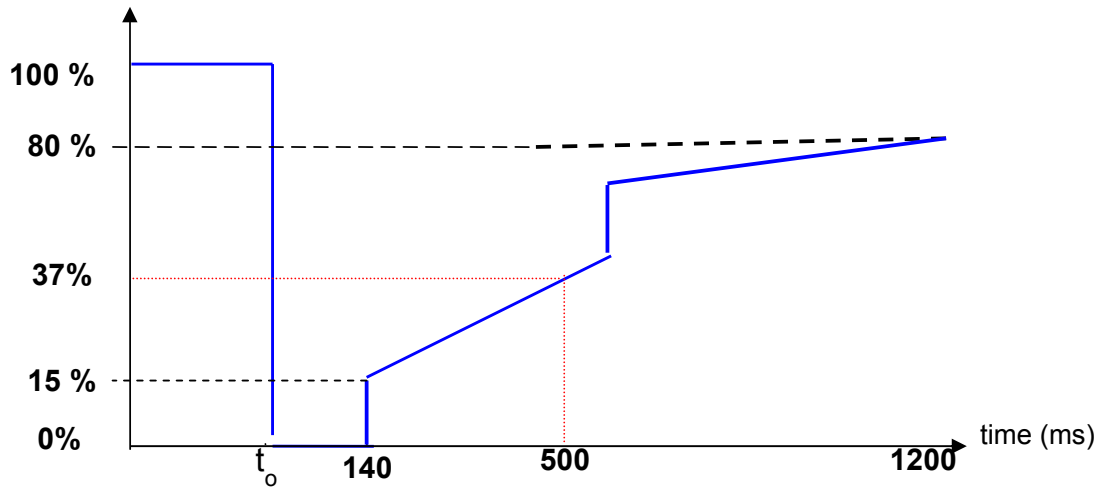


Figure 2: Possible voltage duration profile for which power park module should remain connected under Grid Code proposals.

Stating in Clause 4.3.1(f) (i) that total fault clearance times will be specified in the Connection Agreements, will require a site specific analysis of the protection settings on the supergrid, which is reasonable for a 100MW project, but completely unreasonable for a 5MW project, with the only alternative, to design the project to follow the boundaries of the voltage duration profile. This is completely contrary to the assurances provided at the Grid Code forums where the Transmission Operators stated that this was not how Figure 3 (CC.A.1.1) was to be interpreted.

BWEA maintain that the provisions of Clause 4.3.1(f) for fault ride through of both short circuit faults AND voltage dips (represented by Parts 1 and 2 of Figure 3 (CC.A.1.1)), should not apply to Power Park Modules operating at less than 20% of their rated output or with more than 50% of their turbines shut down for whatever reason. At the stated 5% of registered capacity the winds would be very light indeed, such that cessation of output due to falling windspeed is at least as likely as shut down due to a grid fault. The windspeed required for 20% of registered capacity, would mean that the generation capability is considerably more dependable.

In Clause 4.3.1(f)(v) the phrase "Active Power output shall be restored to at least 90% of the maximum available level within 1 second of restoration of the Supergrid voltage" should be changed to "Active Power output shall be immediately restored to at least 90% of the maximum available level following restoration of the Supergrid voltage" to align with Clause 4.3.1(f)(iii).

The term 'in proportion' in Clause 4.3.1(f)(v) "shall provide active power output at least 'in proportion' to the retained balanced Supergrid voltage" should be defined for clarity using an example such as "90% of active power output will be provided for a retained Supergrid voltage of 90%, with an allowance for the variability of the mechanical input power of intermittent power sources".

Clause 4.3.1(f)(vi) potentially negates the rest of Clause 4.3.1(f) as there is no definition of "a close up phase to phase fault" or its duration and required compliance profile. Therefore the BWEA would ask for this section to be removed.

In Clause 4.3.2(b), 30MW is too low a capacity for the provision of frequency control as with an average output of 10MW and an assumed 10% control band, only 1MW of frequency response would be utilizable. It is inconceivable that the System Operator would call up response of this level at this stage in the development of wind energy.

There are no speed governors fitted to stall regulated wind turbines and hence the phrase 'where fitted' should be added where the requirements for speed governors are mentioned in Clause 4.3.2(b).

On load control of Reactive Power should be required on Power Stations, not generating units as specified in Clause 4.3.2(d) to allow for the fact that in power park modules the reactive compensation equipment may not be on the generating units themselves.

Clause 4.3.3 should only apply to Synchronous generating units.

BWEA would ask for a justification of the requirement for a manned control point at each sub-30MW power station between the hours of 08:00 and 18:00 in Clause 4.5.1. if the System Operator is happy to go through the other fourteen hours of everyday without having such immediate access.

BWEA would ask for justification of the requirement to provide 'rotor power co-efficient versus tip speed ratio curves for a range of pitch angles' as part of the detailed planning data for non-synchronous generating units (Section 5.3).

BWEA seek to understand why there is no clause dealing with the requirement for active power output reduction for high frequency by non-synchronous machines in the consultation document, as there is in Clause CC.A.3.3 of National Grid's 'Grid Code changes to incorporate new technologies and DC interconnectors' consultation document. This capability can be provided by wind energy with no practical operational cost.

In the existing code all paragraphs are either numbered or numbered and lettered. Some sections have been added without following this precedent and should be numbered and lettered accordingly. This will be particularly important in communicating the relevant sections of the code to users in future guides.

Definition Amendments

There is no definition of a 'DC Owner' to match the definition of a 'Generator' as a person who owns such plant. Users in the code are all persons and defined terms. The application of the code to DC owners as a class of persons is therefore unclear and is inconsistent with the drafting and design of the code to date.

The definition of a 'Power Park Module' as a collection of non-synchronous generating units joined together by a system with a single electrical point of connection to the Transmission system may not include offshore wind farms, which potentially may have more than one electrical point of connection to the transmission system.

The defined list of possible entities that could connect at a 'User System Entry Point' should also include the defined term 'Power Station'.

If you have any questions please feel free to contact me at any time.

Yours sincerely,

Richard Ford

Richard Ford
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