Grid Code Workgroup Consultation Response Proforma

GC0100 EU Connection Codes GB Implementation – Mod 1

Industry parties are invited to respond to this consultation expressing their views and supplying the rationale for those views, particularly in respect of any specific questions detailed below.

Please send your responses by **5pm** on **2 October 2017** to grid.code@nationalgrid.com. Please note that any responses received after the deadline or sent to a different email address may not receive due consideration by the Workgroup.

Any queries on the content of the consultation should be addressed to Chrissie Brown at Christine.brown1@nationalgrid.com

Respondent:	*Konstantinos Pierros* *Konstantinos.pierros@enercon.de* *Phone: +44 131 314 0157*
Company Name:	*ENERCON GmbH*
Please express your views regarding the Workgroup Consultation, including rationale. **(Please include any issues, suggestions or queries)**	*ENERCON do not believe that the issue of Fast Fault Current Injection (FFCI) has been sufficiently assessed in order to rush for implementing the changes for the ongoing revision of the Grid Code and relevant documents.* *To avoid unnecessary system costs, the specification of future system requirements must be based on transparent system studies and firmly established system design criteria. Scientific system studies modelling the behaviour of network and connected equipment are essential to define proper connection & operation requirements. However, system studies need to be complemented by simulations and real tests to fully understand the potential behaviour of different technologies under all situations (normal, during and after faults). Not doing so risks an under/over estimation of technology performance during times of system stress.* *As it currently stands, we do not believe that we can support any of the three Options, but if we had to, it would be Option 3. Please see below for rationale.*

Standard Workgroup Consultation questions

Q	Question	Response
1	Do you believe that GC0100 Original proposal, or any potential alternatives for change that you wish to suggest, better facilitates the Grid Code Objectives?	*Please see the answers to the questions with respect to FFCI below.*
2	Do you support the proposed	*We could not find a clear implementation approach.*

	implementation approach?	*Perhaps include it in a separate section?*
3	Do you have any other comments?	*Physical quantities (voltage, current) and the grid-event related terminology (incident that leads to a certain response, fault inception, fault clearance, blocking, etc) must be clearly defined and must not be left open to interpretation. The base of the pu system should be clearly defined and explained through examples.* *There are minor typos in the report that should be corrected before the Workgroup issues the report.*
4	Do you wish to raise a WG Consultation Alternative Request for the Workgroup to consider?	*We are unsure if we should raise a WG Consultation Alternative Request. We you like to see modelled the following, however:* *- FRT voltage against time curves for Type B, C and D (below 110kV) with U_{ret} of 0.05pu and possibly below* *- minimum FFCI in line with or similar to the German VDE AR-N-4120 TAR Hochspannung - a rise time of <30ms and a settling time of <60ms* *- different characteristics for superior FFCI defined by NGET through remunerated FRT System Service*

Specific GC0100 questions

Q	Question	Response
1	Removing More Stringent Requirements' concerns have been expressed by some Workgroup members that applying more stringent requirement on newly connecting parties (that fall within this scope of the EU Network Codes for generation, demand and HVDC systems) maybe incompatible with EU law. Do you have any views on this topic that could assist the Workgroup when they are considering the topic in due course?	*"More stringent" needs to be clearly defined. It seems to stem from legal interpretation of terminology. It seems unreasonable to expect that technical requirements will remain unchanged forever, regardless of the changing technical requirement.*
2	Are you comfortable with using the EU definition of Maximum Capacity instead of the GB definition of "Registered	*We are happy with the proposal.*

	Capacity"?	
	Fast Fault Current Injection questions	
3	What are your views on options 1, 2 and 3 as set out in paragraph 4.4 for Fast Fault Current Injection and which option (if any) would you prefer?	*At different points throughout, the Workgroup Consultation appears to be actively promoting the alleged capabilities of Virtual Synchronous Machines (Option 1 – VSMs). We do not understand how NGET can be proposing an immature technology, since, to our knowledge, equipment carrying such capability (similar really, because there is not consensus about what is meant with the term VSM) have been only tested in controlled conditions, at very small prototype scale, and their performance has not been observed in a real grid. We would also welcome NGET to include in the Workgroup Report references to strict peer-reviewed publications about VSM.* *We believe that NGET should focus on breaking down the necessary characteristics and developing a framework for defining future requirements. Minimum technical specification must be technology neutral. It must not be translated into specific and/or preferred technical solutions like e.g. VSMs. The development of specific technical solutions must be left open for the industry. NGET cannot be in the position to prescribe how a certain performance is to be implemented.* *The alternatives to Options 1 are either currently not easily feasible (Option 2, if we consider that the base of the "pu" is the current corresponding to the rated MVA, we also note that the RfG does not require setting reactive current value beyond 1pu) or outdated (Option 3, the German VDE AR-N-4120 TAR Hochspannung currently requires a rise time <30ms and a settling time of <60ms, making it much faster than Option 3).* *As it currently stands, we do not believe that we can support any of the three Options, but if we had to, it would be Option 3.*
4	Do you have any alternative fast fault current injection solutions noting that the requirement applies to the Converter not the wider Power System?	*Yes. Three-pronged:* *- FRT voltage against time curves for Type B,C and D (below 110kV) with U_{ret} of 0.05pu and below* *- minimum FFCI in line with or similar to the German VDE AR-N-4120 TAR Hochspannung - a rise time of*

		<30ms and a settling time of <60ms *- different characteristics for superior FFCI defined by NGET through remunerated FRT System Service*
5	In considering the three Fast Fault Current Injection options 1, 2 and 3 in paragraph 4.4 do you have any comments in relation to technology readiness, cost implications, and can they be implemented date within the context of product development timescales?	*Option 1 – far from readiness, severe cost implications throughout the product chain, far from implementation* *Option 2 – might require additional (spare) capacity through oversized dedicated converters and/or through ones for energy storage, moderate to high cost, possibility to be implemented within the context of product development timescales* *Option 3 – we are already beyond that point.*
6	Do you have any evidence to support your views?	*We are a wind turbine manufacturer with an in-house production of inverters that are the key component of the vast majority of the 46GW of our worldwide installed capacity.*
7	Do you have any views on the specific costs related to the additional requirements?	*Might be able to provide feedback confidentially.*
8	Is the current proposed wording for the remote end HVDC and DC Connected Power park modules sufficient to facilitate future new technology?	*N/A*
	Banding questions	
9	What are the specific costs related to the additional requirements?	*We can provide feedback confidentially.*
10	Do you have any views on the banding thresholds for the original and those suggest for the possible alternative?	*We suppose that the "original" proposal is the one contained in the RfG and "alternative" contained in page 7. We are happy with the alternative proposal.*
11	Can you provide any feedback/comments on the associated legal text?	*We are happy, but we would like to see the limits with more significant digits and not rounded (0.999MW and not 1MW).*
	Fault Ride Through	
12	Do you support the fault ride through voltage against time curves If not please state why you disagree, what alternative you would recommend and your justification for any alternative?	*Support with one exception:* *NGET should model as well a curve for Type B,C and D (below 110kV) with U_{ret} of 0.05pu and possibly below.* *Justification: technology readiness*
13	Do you have any specific views	*We are happy with the proposal. Facilitation of FRT*

	about the proposal to modify the stage 2 under voltage protection for distributed generation interface protection?	*should be a priority and DNOs must adhere to this.*
	Other questions	
14	Does the Legal drafting contained in annex 2 and 3 deliver the intent of the solution outlined in section 3?	*Annex 2: It appears to be quite convoluted for the time being! Hard to go through it with all the changes. Perhaps introduce a clean version of it for people to comment from scratch.* *We note that a few points appear to be contradictory (not exhaustive);* *- voltage against time curve for Type B, C and D Power Park Modules under ECC.6.3.15.5 have a U_{ret} of 0.15 and then ECC.6.3.15.9 (b) shows a curve with zero retained voltage for 0.140s?* *- voltage against time curves for voltage at different nodes (supergrid vs Grid/User System Entry Point)*
15	Do you have any information based on the proposed solution in respect of implementation costs?	*Depending on the option chosen, we might be able to provide feedback confidentially.*