

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:	<i>Please insert your name and contact details (phone number or email address)</i>
Company Name:	<i>Please insert Company Name</i>
Please express your views regarding the Workgroup Consultation, including rationale. (Please include any issues, suggestions or queries)	<p><i>For reference, the Grid Code objectives are:</i></p> <ul style="list-style-type: none"> i. To permit the development, maintenance and operation of an efficient, coordinated and economical system for the transmission of electricity ii. To facilitate competition in the generation and supply of electricity (and without limiting the foregoing, to facilitate the national electricity transmission system being made available to persons authorised to supply or generate electricity on terms which neither prevent nor restrict competition in the supply or generation of electricity) iii. Subject to sub-paragraphs (i) and (ii), to promote the security and efficiency of the electricity generation, transmission and distribution systems in the national electricity transmission system operator area taken as a whole iv. To efficiently discharge the obligations imposed upon the licensee by this license and to comply with the Electricity Regulation and any relevant legally binding decisions of the European Commission and/or the Agency; and v. To promote efficiency in the implementation and administration of the Grid Code arrangements

Standard Workgroup Consultation questions

Q	Question	Response
1	Do you believe that GC0100 Original proposal, or any potential alternatives for change	We believe GC0100 Original Proposal facilitates the Grid Code and discharges the requirement of national implementation of RfG. However, as has

	that you wish to suggest, better facilitates the Grid Code Objectives?	been pointed out in many workgroup meetings, the requirement of FFCI Option 1 and Option 2 are very onerous on the developers. Please see below for further explanation.
2	Do you support the proposed implementation approach?	Yes, we fully support the implementation approach and efforts by the proposer to keep the industry informed.
3	Do you have any other comments?	No
4	Do you wish to raise a WG Consultation Alternative Request for the Workgroup to consider?	<i>If yes, please complete a WG Consultation Alternative Request form, available on National Grid's website, http://www2.nationalgrid.com/uk/industry-information/electricity-codes/grid-code/modifications/forms-and-guidance/ and return to the Grid Code inbox at grid.code@nationalgrid.com</i>

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?	<p>Although I am not fully aware of legal reasoning provided by alternative proposer, we believe any requirements that are existing in the current Grid Code and planned to taken forward with RfG should be thoroughly reviewed and CBA is conducted to verify this.</p> <p>From an Offshore Wind perspective, this is applicable for all the requirements planned to be taken forward for OTSDUW equipment. It is important to note that in an AC connected Offshore Wind Farm, OTSDUW equipment mainly consists of underground and submarine cables, transformers, harmonic filters, STATCOMs etc. Except STATCOMs, all the other equipment are passive equipment and hence their response will be a natural physical response and not a controlled response. In the context of FRT requirement, we are not entirely sure on whether or not this requirement will be applicable for all the transmission system such as TO equipment of overhead lines, transformers, underground cables built by NGET, SP, SSE etc. In addition, it is important to note that the mandate as per RfG (Requirements for Generators) and HVDC covers the requirements for generators and HVDC and not OTSDUW equipment. This is also not</p>

		<p>covered in Workgroup Terms of Reference.</p> <p>As already mentioned in the workgroup report by the Proposer, due to the way RfG is drafted, Offshore Wind Industry is losing options of where compliance for FRT can be proven, and more stringent requirements are applied than what they are now. In addition, if all the OTSDUW requirements are carried, it will be onerous for offshore wind developers in terms of compliance.</p>
2	Are you comfortable with using the EU definition of Maximum Capacity instead of the GB definition of “Registered Capacity”?	At the high level, both these definitions seem interchangeable. However, further investigation may be needed while other EU Network Codes are developing.
	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?	<p>We believe that the issue of <i>fault current injection</i> has not been sufficiently assessed in order to rush for implementing the changes for the ongoing revision of the grid codes.</p> <p>The proposed reactive current injection requirements would exceed today’s industry standards, leading to additional costs related to increasing the current hardware capabilities, R&D, certification, testing and validation costs. It’s worth to mention that specific UK only requirements should not force manufacturers to change their hardware for the rest of the markets as well. Therefore the system operator should consider to incentivise the development of such capabilities under an ancillary services market. We believe that imposing requirements exceeding the industry standards and current technology capabilities must be based on a comprehensive Cost Benefit Analysis. It is critical to have a common understanding of system needs for scenarios today and in the future. European discussions on power system needs with high renewable penetration levels of variable renewable energy sources and power electronics levels have been focusing on aspects with a time horizon beyond May 2018 to prepare necessary frameworks allowing national TSOs to specify minimum technical requirements. This is currently addressed in the ENTSO-E expert group on fast fault current.</p> <p>To avoid unnecessary system costs, the specification of future system requirements must be based on transparent system studies and firmly established system design criteria. It has already been requested in the workgroup meetings that the simulation models</p>

		<p>used for VSM, Option 2 and Option 3 to be shared with the workgroup so that any realistic behaviour from Power Park Units can be incorporated. This will result in a common rationale and technical background for new requirements. The result will also be that potential later adjustments will have a much more robust starting point. In general, a more transparent common rationale will also result in a clearer signal to the industry in order to understand what longer-term developments are needed to support future system security while efficiently integrating renewables.</p> <p>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.</p> <p>In addition, cost of this additional development leads to higher costs of the equipment which may be higher than additional costs for system operation without this facility and hence will be cascaded to higher energy prices for end consumers.</p> <p>We believe Option 3 is the best choice in terms of national implementation of RfG and as NGET recommends an expert group should be formed to look into details of this requirement going forward. In addition, we would like to highlight the FFCI in case of offshore wind farms are provided by each wind turbine based on the voltage seen at its individual terminals. Due to the transient nature of this requirement needing a quick response, and due to the time delay between instructions from park controller and wind turbines, we believe the requirements should be applied with an option to meet at Grid Entry Point or at each WTG terminals.</p>
4	Do you have any alternative fast fault current injection solutions noting that the requirement applies to the Converter not the wider Power System?	Please see above in relation to applicability of FFCI requirement either at the Grid Entry Point or at each Power Park Unit terminals.
5	In considering the three Fast Fault Current Injection options 1, 2 and 3 in paragraph 4.4 do you	Unfortunately, we are unable to provide any details regarding technology readiness, costs etc for the development of VSM type technology.

	have any comments in relation to technology readiness, cost implications, and can they be implemented date within the context of product development timescales?	However, we believe the R&D, implementation, & testing etc of VSM type technology may be significant. In addition, the additional energy storage requirement that comes along with VSM may be prohibitive cost for Offshore wind installation. Similarly, Option 2 will need a bigger power electronic converter to be installed inside the wind turbine. This leads to higher cost not just in terms of electrical equipment but also the civil structure. We believe Option 3, is a more viable option at this stage in terms of costs. Although, there is still a need for R&D, this may be considered to be most economically viable option and supporting the transmission system needs at the same time.
6	Do you have any evidence to support your views?	No. We are not able to provide any evidence at this stage.
7	Do you have any views on the specific costs related to the additional requirements?	Please see above.
8	Is the current proposed wording for the remote end HVDC and DC Connected Power park modules sufficient to facilitate future new technology?	In case of DC Connected Power Park Modules, we believe the requirement for FRT is applicable. However, the requirement for FFCI doesn't seem to be valid as any reactive current produced by Power park units behind HVDC station will be masked by the HVDC providing the reactive current. On the contrary, the reactive current produced by power park units may raise the voltage and hence trigger unwanted control from HVDC. Hence, we believe it is important that simulations and analysis is required to prove the concept before implementation can be done.
	Banding questions	
9	What are the specific costs related to the additional requirements?	
10	Do you have any views on the banding thresholds for the original and those suggest for the possible alternative?	
11	Can you provide any feedback/comments on the associated legal text?	
	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	We support the FRT voltage time curves proposed for various kinds of generation.

	justification for any alternative?	
13	Do you have any specific views about the proposal to modify the stage 2 under voltage protection for distributed generation interface protection?	
	Other questions	
14	Does the Legal drafting contained in annex 2 and 3 deliver the intent of the solution outlined in section 3?	
15	Do you have any information based on the proposed solution in respect of implementation costs?	