Workgroup Consultation Response Proforma

GC0163: GB Grid Forming (GBGF) - Removal of Virtual Impedance restriction

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 to grid.code@nationalgrideso.com by **5pm** on **12 February 2024**. Please note that any responses received after the deadline or sent to a different email address may not receive due consideration.

If you have any queries on the content of this consultation, please contact Jonathan Whitaker Jonathan.whitaker@nationalgrideso.com or grid.code@nationalgrideso.com

Respondent details	Please enter your details	
Respondent name:	Andrew Roscoe Gabriele Amico John Gifford Thyge Knueppel Frank Martin	
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Phone number:	Click or tap here to enter text.	
Which best describes your organisation?	☐Consumer body ☐Demand ☐Distribution Network Operator ☐Generator ☐Industry body ☐Interconnector	☐Storage ☒Supplier ☐System Operator ☐Transmission Owner ☐Virtual Lead Party ☐Other

I wish my response to be:
(Please mark the relevant box)　　　☒Non-Confidential　　　☐Confidential

Note: A confidential response will be disclosed to the Authority in full but, unless agreed otherwise, will not be shared with the Panel or the industry and may therefore not influence the debate to the same extent as a non-confidential response.

For reference the Applicable Grid Code Objectives are:

a) *To permit the development, maintenance and operation of an efficient, coordinated and economical system for the transmission of electricity*

b) *Facilitating effective 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);*

c) *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;*

d) *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*

e) *To promote efficiency in the implementation and administration of the Grid Code arrangements*

Please express your views in the right-hand side of the table below, including your rationale.

Standard Workgroup Consultation questions		
1	Do you believe that the Original Proposal better facilitates the Applicable Objectives?	Mark the Objectives which you believe the Original solution better facilitates:
		Original ☐A ☐B ☐C ☐D ☐E
		See section 5
2	Do you support the proposed implementation approach?	☒Yes ☐No
		Click or tap here to enter text.
3	Do you have any other comments?	Click or tap here to enter text.
4	Do you wish to raise a Workgroup Consultation Alternative Request for the Workgroup to consider?	☐Yes ☒No
		Click or tap here to enter text.

Specific Workgroup Consultation questions		
5	Do you have any concerns with the proposal to remove the requirement mandating the use of a real impedance in a GB Grid Forming Converter? If so,	☒Yes ☐No
		It is not yet clear how the performance and pass/fail will be assessed, in terms of compliance with "Grid Forming". While the GC0137 GB Best Practice Guide discusses many techniques, it does not yet clarify exactly how the performance or the pass/fail limits will be assessed. For example in the GC0137 GB Best Practice Guide Table 2

	please state why you believe this to be the case.	(Section 2.4) it is not clear how the behaviour of a device using a virtual impedance will be assessed. This will need to be clarified, since the behaviour of the converter using a virtual impedance scheme will include controllers with bandwidths far above the original "5 Hz" concept.
		So the behaviour of the converters will need to be assessed across a frequency range extending up to ? hundreds ? of Hz, with some kind of damping or negative-resistance assessment for frequency components that are not fundamental.
		In terms of the inclusion of a virtual impedance technique, there are possible effects far from fundamental, for example unwanted negative-resistances at frequencies related to the control bandwidths of any controllers that implement the virtual impedance. These might be tens or hundreds of Hz removed from fundamental, lying on or between harmonic frequencies. It is, as mentioned above, not clear exactly what the grid code requirements are in terms of such frequency dependent properties and therefore which pass/fail criteria to apply, or whether this is considered design freedom for the OEMs and the developers.
6	Does the change impact your business?	☒Yes ☐No
		Positive due to increased harmonisation and design flexibility
7	Do you have experience with virtual impedance vs real impedance control?	☒Yes ☐No
		Click or tap here to enter text.
8	Do you think the title is a fair reflection of the modification?	☒Yes ☐No
		Click or tap here to enter text.