

Workgroup Consultation Response Proforma

GC0137: Minimum Specification Required for Provision of GB Grid Forming (GBGF) Capability (formerly Virtual Synchronous Machine/VSM Capability)

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 **30 April 2021**. Please note that any responses received after the deadline or sent to a different email address may not receive due consideration by the Workgroup.

If you have any queries on the content of this consultation, please contact Kavita Patel Kavita.patel@nationalgrideso.com or grid.code@nationalgrideso.com

Respondent details	Please enter your details
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For reference the Applicable Grid Code Objectives are:

- To permit the development, maintenance and operation of an efficient, coordinated and economical system for the transmission of electricity*
- 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);*
- 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;*
- 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*
- To promote efficiency in the implementation and administration of the Grid Code arrangements*

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

Standard Workgroup Consultation questions		
1	Do you believe that the GC0141 Original	Cannot comment on GC0141. Should this be a reference to GC0137?

	Proposal better facilitates the Applicable Objectives?	
2	Do you support the proposed implementation approach?	Yes
3	Do you have any other comments?	Please refer to the 26 comments in Appendix 1 below.
4	Do you wish to raise a Workgroup Consultation Alternative Request for the Workgroup to consider?	No
Modification Specific Workgroup Consultation questions		
5	Do you believe it is appropriate specify GB Grid Forming as a non-mandatory requirement in the Grid Code and be accessed by future market arrangements rather than as a mandatory requirement?	Yes
6	Do you believe the current proposal is sufficiently flexible and facilitates a range of technologies? If not, please state why you feel this to be the case and what type of technologies have been excluded?	Yes
7	Do you believe the proposal will result in excessive equipment costs? This excludes development costs whilst recognising plant can be also be de-loaded?	No
8	Do you believe the proposed Grid Code proposals sit better in the Planning Code, Connection Conditions / European Connection Conditions and Compliance Processes / European Compliance Processes bearing in	No comment

	mind the proposals are non-mandatory or do you think it would be better to have a new standalone section	
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Appendix 1

Comments on legal text document GC0137:

Comment 1:

Page 2/26, Grid Forming Unit definition "...Unit. with a...", remove full stop.

Comment 2:

Page 2/26, Real Inertia Power definition, 2nd paragraph, definition is not correct for a HVDC system where the active power is provided by the remote station rather than the "...energy storage capability of the Internal Voltage Source."

Comment 3:

Page 3/26, Peak Current Rating definition, the first two bullets identify the "additional" current but not the total current. Suggest the definition in these two bullets is amended to say "Registered maximum steady-state current plus...."

Comment 4:

Page 6/26, Damping Factor definition, For better clarity it could be further stated that the damping factor refers to the damping of a specific oscillation mode that is associated with second order system created by the power to angle transfer function as show in Figure ECC.6.3.19.3.2.

Comment 5:

Page 6/26, CC.6.3.5 Additional test includes "...with a with a..."

Comment 6:

Page 9/26, ECC.6.3.19.3 (vi), 2nd paragraph, suggest that the last sentence is modified to say "...decays within two cycles of oscillation **to within the settling band.**"

Comment 7:

Page 9/26, ECC.6.3.19.3 (vii), 2nd paragraph, text says "...shown in Figure ECC.6.3.19.2 (a) or Figure ECC.6.3.19.2 (b)....". This implies that GBGF-I plant should either be capable of supplying droop based power or damping power, where ECC.6.3.19.3 (iv) presumably requires both features simultaneously.

Comment 8:

Page 9/26, ECC.6.3.19.3 (vii), 2nd paragraph. Note that the options presented here of "...may use their own design.." is not reflected in ECP.A.3.9.6

Comment 9:

Page 10/26, Figure ECC.6.3.19.3.1, for clarity it would be useful to indicate the “Grid Entry Point” on the diagram as the point between Xin and Xtr.

Comment 10:

Page 10/26, Figure ECC.6.3.19.3.2 (b) legend says “..This figure does not add damping...” but damping is indicated in the figure?

Comment 11:

Page 11/26, Table ECC.6.3.19.3.1, By “rated angle” does this refer to the angle across Xin for rated power? See figure ECC.6.3.19.3.1.

Comment 12:

Page 11/26, Table ECC.6.3.19.3.1, Rated voltage should be “pu” rather than “1pu”.

Comment 13:

Page 11/26, Table ECC.6.3.19.3.2, “Maximum continuous rating” Should this be “Maximum Registered rating”?

Comment 14:

Page 12/26, Table ECC.6.3.19.3.2, “For a GBGF-I Plant the inverters maximum Internal Voltage Source (IVS) for the worst case condition”, What is meant by worst case condition? Is it meant to state the maximum output voltage that GBGF-I plant can produce under any situation?

Comment 15:

Page 13/26, Equation1, Suggest referencing ECP A.3.9.4 for duration of inertia response, i.e., energy needs.

Comment 16:

Page 16/26, ECC.6.3.19.5.11, Should it be “retained balanced voltage” or “unbalanced voltage”, noting that the word retained is normally associated with a balanced quantity.

Comment 17:

Page 16/26, ECC.6.6.3.2 (iv), 1MHz seems too high?

Comment 18:

Page 17/26, ECP.A.3.9.4 (ii), Should the reference to “full load” be changed to “Registered load”

Comment 19:

Page 18/26, ECP.A.3.9.4 (iii), “...This **is** repeated when ...”

Comment 20:

Page 18/26, ECP.A.3.9.4 (iv) (g), Does this imply that in tests ii) and iii) Plant can “saturate”?

Comment 21:

Page 18/26, ECP.A.3.9.4 (v), In case supplier declares rated phase jump angle rating to be higher than phase jump angle limit, shouldn't there be a corresponding test for that?

Comment 22:

Page 19/26, ECP.A.3.9.4 (vii) (a), "...all control actionsdisabled", It is presumed that current limitation will still be active.

Comment 23:

Page 19/26, ECP.A.3.9.4 (vii) (d), To confirm - FFCL is meant to be disabled for the first iteration of step (a)-(c)

Comment 24:

Page 20/26, ECP.A.3.9.4 (iii), Does "all control actions disabled" Include FFCL as in ECP.A.3.9.4 vii)

Comment 25:

Page 21/26, ECP.A.3.9.6, Note, in clause ECC.6.3.19.3 (v).f.(vii) the vendor is also permitted to use their own model

Comment 26:

Page 21/26, ECP.A.3.9.6 (iii), It is not understood what overshoot and decay mean in the context of a harmonic disturbance.