

Code Administrator 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 04 October 2021**. 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 Kavita Patel Kavita.patel@nationalgrideso.com or grid.code@nationalgrideso.com

Respondent details	Please enter your details
Respondent name:	Gert Andersen, Tusitha Abeyasekera
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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:

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

Standard Code Administrator Consultation questions		
1	Do you believe that the GC0137 Original Proposal better facilitates the Applicable Objectives?	Yes, it does, however with some further amendments
2	Do you support the proposed implementation approach?	Further consultations with OEMs, developers and affected stakeholders are needed towards finalising a minimum set of essential requirements
3	Do you have any other comments?	<p>Some comments are as below for clarification:</p> <p>general comment:</p> <p>grid forming control should not be limited to a certain method (e.g VSM) but open to be chosen by the OEM.</p> <p>1- LVRT requirements: how should the converter respond for a classical LVRT - same V and t requirements as now?</p> <p>2- FFCI in 5ms What should be the rise time and settling time ? a diagram to show the reaction time and trise and tsettling would be useful</p> <p>3 - is the FFCI required in LVRT mode (or also during usual V dips)?</p> <p>4 - limitation of <5Hz response bandwidth:</p> <ul style="list-style-type: none"> - recommend to be for linear operation and allow bandwidth >5 Hz for non-linear issues as current limits as those events natural require fast reaction - recommend to describe a forbidden band of frequencies, e.g 5-10 Hz (control of synch machines AVR, Power system stabilisers in the grid etc...), to allow for higher bandwidth operations in the converter like harmonic damping

	<ul style="list-style-type: none">- recommend to allow for VSM0H (fast response) allowing existing grid connected systems to inherit grid forming and operating without hardware change.. (non-discriminatory approach)- recommend FFCI of 1.5pu to specify time duration and specification of the voltage level. If this requires hardware changes to current state-of-the-art grid connected systems then the requirement shall be discriminatory- recommend real inertia support to be within the hardware limits of state-of-the-art converters, to be non-discriminatory- recommend to have phase jump requirements with current limit limit for <5 deg. Recommend the current limit be allowed for any phase jump as this is dependent on WTG pre-conditions e.g temporary power-boost at power-speed curve knee point.- Nichols chart: recommend further studies within the expert group to propose a suitable method especially considering the power electronics rich systems to be non-linear a full EMT-base analysis may be required
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