

**Workgroup Consultation Responses Summary**  
**GC0163: GB Grid Forming (GBGF) - Removal of Virtual Impedance restriction**

Consultation date: 22 January 2024 - 12 February 2024

Respondent Details				Standard Consultation Questions				Specific Consultation Questions				Themes
Response Number	Organisation	Name	Organisation type	Q1 - Do you believe that the Original Proposal and/or any potential alternatives better facilitate the Applicable Objectives?	Q2 - Do you support the proposed implementation approach?	Q3 - Do you have any other comments?	Q4 - Any alternatives?	Q5 - 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, please state why you believe this to be the case.	Q6 - Does the change impact your business?	Q7 - Do you have experience with virtual impedance vs real impedance control?	Q8 - Do you think the title is a fair reflection of the modification?	Key points
1	Siemens Gamesa	Andrew Roscoe Gabriele Amico John Gillard Thyge Knueppel Frank Martin	Supplier	No response - refer to comments about concerns (Q5)	Yes	No	No	Yes	Yes	Yes	Yes	<p>The Respondents are unsure from the GC0137 GB Best Practice Guide how the performance or pass/fail limits will be assessed, e.g. how the behaviour of a device using virtual impedance will be assessed.</p> <p>The Respondents outline specific examples including questioning frequency ranges for use in assessments and possible damping assessments that they feel require clarity.</p> <p>The Respondents suggest possible effects of virtual impedance such as unwanted negative resistances at frequencies related to bandwidths of controllers implementing the virtual impedance.</p> <p>The Respondent noted that the change would impact their business positively due to increased harmonisation and flexibility.</p>
2	Scottish Power Renewables	Isaac Gutierrez	Generator	a, b, c only	Yes	No	No	No	Yes	No	Yes	<p>The Respondent feels that legal text should be more explicit about allowing the use of virtual impedance.</p> <p>The Respondent notes that their organisation is planning to deploy GBGF-I technology in several projects.</p>
3	National Grid ESO	Antony Johnson	System operator	a, b, c only	Yes	No	No	No	Yes	No	Yes	<p>The Respondent believes the solution would provide greater flexibility and cost savings to developers and manufacturers (efficiencies then leading to cost savings for end users, better competition in the market and facilitate the volume of grid-forming needed for net zero).</p> <p>The Respondent noted the GB Grid Forming Best Practice Guide publication in April 2023 relaxed the need for real impedance between the Internal Voltage Source of a Grid Forming Converter and a Connection Point (permitting virtual impedance).</p> <p>The Respondent noted that the change would support more Grid Forming Converter-based plants, which would reduce system operating costs and accelerate the Grid towards net zero targets.</p> <p>The Respondent noted their experience with virtual impedance being the findings of the GB Best Practice Group.</p> <p>The Respondent felt that the title could be more explicit with a suggestion of 'Clarification of the impedance between the Internal Voltage Source of a GB Grid Forming Converter (GBGF-I) and the Total System'.</p>
4	SMA Solar Technology AG	Thorsten Buelo	Supplier	a, b, c, d only	Yes	Yes	No	No	Yes	Yes	Yes	<p>The Respondent believes that an additional section of the Grid Code should be amended to effect this change - i.e. ECC.6.3.19.3 (v) (b) changed from                      "Operating as a voltage source behind a real reactance" to                      "Operating as a voltage source behind an impedance".</p> <p>The Respondent felt that the change would impact their business by providing more flexibility and clarity for GBGF solutions.</p>