












Grid Code Modification Proposal Form		At what stage is this document in the process?												
<p>GC0137: <i>(Code Administrator to issue reference)</i></p> <p>Mod Title: Minimum Specification Required for Provision of Virtual Synchronous Machine (VSM) Capability</p> <p><i>This section is mandatory for the Proposer to complete.</i></p> <p><i>This should be short and clearly identify the topic the modification relates to.</i></p>		<table border="1"> <tr> <td>01</td> <td>Proposal Form</td> </tr> <tr> <td>02</td> <td>Workgroup Consultation</td> </tr> <tr> <td>03</td> <td>Workgroup Report</td> </tr> <tr> <td>04</td> <td>Code Administrator Consultation</td> </tr> <tr> <td>05</td> <td>Draft Grid Code Modification Report</td> </tr> <tr> <td>06</td> <td>Final Grid Code Modification Report</td> </tr> </table>	01	Proposal Form	02	Workgroup Consultation	03	Workgroup Report	04	Code Administrator Consultation	05	Draft Grid Code Modification Report	06	Final Grid Code Modification Report
01	Proposal Form													
02	Workgroup Consultation													
03	Workgroup Report													
04	Code Administrator Consultation													
05	Draft Grid Code Modification Report													
06	Final Grid Code Modification Report													
<p>Purpose of Modification: This modification proposes to add a non-mandatory technical specification to the Grid Code, relating to what is referred to as Virtual Synchronous Machine (“VSM”) capability. The detail pertaining to its creation may be found in Section 3 “Why Change?” but the high-level overview is that the specification will enable applicable parties (primarily those utilising power electronic converter technologies e.g. wind farms, HVDC interconnectors and solar parks) to offer an additional grid stability service which will provide the opportunity to take part in a commercial market-based system.</p>														
	<p>The Proposer recommends that this modification should be:</p> <p>Subject to the standard governance route and assessed by a Workgroup</p> <p>This modification was raised on 4 December 2019 and will be presented by the Proposer to the Panel on 19 December 2019. The Panel will consider the Proposer’s recommendation and determine the appropriate route.</p>													
	<p>High Impact: National Grid ESO – successful implementation of this specification and subsequent launch of a commercial market would result in the provision of additional stability services. Consequently, the likelihood would be a net-positive in terms of ESO’s ability to balance the GB electrical grid and respond to unplanned interruptions to electricity supply.</p>													

	Medium Impact Generators – successful implementation of this specification and subsequent launch of a commercial market would provide generators with a potential new revenue stream. In order to take part in such a market, generators may need to amend/modify their plant, or potentially amend or incorporate new software to enable them to satisfy the requirements of the specification.
	Low Impact None.

Contents		 Any questions?
1	Summary	4
2	Governance	5
3	Why Change?	6
4	Code Specific Matters	6
5	Solution	7
6	Impacts & Other Considerations	7
7	Relevant Objectives	8
8	Implementation	9
9	Legal Text	9
10	Recommendations	9
11	Modification guidance and using this template	10
Timetable		 grid.code@nationalgrideso.com
<i>The Code Administrator will update the timetable.</i>		 telephone
The Code Administrator recommends the following timetable: <i>(amend as appropriate)</i>		Proposer: Matt Baller
Initial consideration by Workgroup	dd month year	 matt.baller@nationalgrideso.com
Workgroup Consultation issued to the Industry	dd month year	 07866197575
Modification concluded by Workgroup	dd month year	National Grid Representative: Insert name
Workgroup Report presented to Panel	dd month year	 email address.
Code Administration Consultation Report issued to the Industry	dd month year	 telephone
Draft Final Modification Report presented to Panel	dd month year	

Modification Panel decision	dd month year
Final Modification Report issued the Authority	dd month year
Decision implemented in Grid Code	dd month year

Proposer Details

Details of Proposer: (Organisation Name)	National Grid ESO
Capacity in which the Grid Code Modification Proposal is being proposed: (e.g. CUSC Party)	The Company
Details of Proposer's Representative: Name: Organisation: Telephone Number: Email Address:	Matt Baller National Grid ESO 07866 197 575 Matt.baller@nationalgrideso.com
Details of Representative's Alternate: Name: Organisation: Telephone Number: Email Address:	Robert Wilson National Grid ESO 07799656402 Robert.wilson2@nationalgrideso.com
Attachments (Yes/No): If Yes, Title and No. of pages of each Attachment: Appendix A, outlining the VSM specification to be added to the Grid Code.	

Impact on Core Industry Documentation.
Please mark the relevant boxes with an “x” and provide any supporting information

BSC	<input type="checkbox"/>
CUSC	<input type="checkbox"/>
STC	<input type="checkbox"/>
Other	<input type="checkbox"/>

As this specification would be applicable to all generators wishing to take part in a VSM commercial market regardless of whether connected to the transmission or distribution networks, no impact is expected on any other industry codes.

Any company seeking to take part in a VSM commercial market will be bound by a contractual arrangement with National Grid ESO. Such contracts will refer to the VSM specification within the Grid Code as the minimum mandatory requirement, and thus we believe there should be no additional changes required to any other codes.

However, this is open to discussion and we welcome wider views - particularly possible implications for the Distribution Code.

1 Summary

***Mandatory for the Proposer to complete** Please provide a summary of the modification proposed – i.e. **what** is the identified defect/change in the existing code that needs to be rectified, **why** this change needs to be made, and **how**.*

Defect

There is currently no minimum VSM specification within the Grid Code. This is a barrier to implementing commercial arrangements for procurement of VSM capability.

What

A new section will be added to the Grid Code outlining the minimum specification. It is neither anticipated nor expected that other areas of the Code will require additional or amended content.

Why

Codifying a minimum specification on which to base any contractual agreements pertaining to future market participation will ensure a level playing field in terms of entry requirements. This in turn will promote competition, ensuring a range of high-quality service options are available while allowing flexibility.

While parties may in theory choose to go above and beyond the minimum requirements, other prospective participants will have confidence that they cannot be “undercut” by competitors winning commercial contracts by offering a lesser service.

How

The text of the specification is shown as Appendix A to this proposal, but as of 4 December 2019 (and as attached) it is still at draft stage. We are currently working on refining the specification further in order to facilitate broader participation in any commercial market(s) which result. An updated draft specification is expected for circulation in early January 2020.

2 Governance

Justification for Normal Governance Procedure

It is the expectation that the Standard Governance process should apply for this proposal.

As it implements a minimum specification, adherence to which is a prerequisite to participation in any future commercial market-based service offering, the VSM specification will discriminate between different classes of Grid Code parties.

It will therefore potentially have a material impact on future electricity stakeholders and customers. Any commercial market which forms as a direct or indirect result of this specification is highly likely to encourage competition between generators of electricity. Consequently, the specification is likely to impact on manufacturers as their customers look to work with them to identify, understand, and implement the most effective and efficient method of offering a VSM specification.

If implemented successfully, any-such commercial arrangements are highly likely to also impact on the operation of the National Electricity Transmission System. The aim of widescale uptake of VSM capability is to reinforce the stability of the GB electricity network - by offsetting some of the inertia (and other capabilities) lost as a result of shifting from largely synchronous generation to asynchronous generation (as outlined in Section 3).

This additional security of supply will impact positively on the Grid and assist the ESO in maintaining a balance of supply and demand – arguably its key responsibility. Any-such added security/stability also contributes to keeping future cost increases to a minimum for the consumer.

With the above considered, the expectation is that OFGEM will need to have the final say on the approval of this proposed modification.

Requested Next Steps

This modification should be assessed by a Workgroup.

3 Why Change?

As traditional fossil-fuelled power plants are decommissioned and replaced with rapidly growing volumes of renewable generation, ensuring balance and stability of the GB grid proactively via a variety of solutions is of paramount importance.

While traditional mechanically connected power generation is “synchronous” with the wider grid (in that any rotating mass coupled through a two-pole synchronous generator operates at 3,000 revolutions per minute – or RPM – and therefore generates power at 50Hz), most renewable sources are “asynchronous” as they are controlled via other means, such as power electronic converters.

Consequently, the inherent inertia of traditional power generation (due to the kinetic energy of a rotating mass) is effectively absent, and thus any generation which trips off in response to (for example) a fault on the grid such as a significant weather event, could result in a rapid fall in system frequency.

In a high-inertia system the fall in system frequency would be slower, allowing ESO greater opportunity to restore balance through the provision of slower-acting frequency response. VSM capability will contribute to mitigating this risk.

This modification seeks to implement a minimum specification for generators wishing to offer VSM capability – in that the affected plant responds more like traditional plant. Such plant would react to unplanned events/faults in a manner which does not result in such a severe drop in frequency; its reaction will be more measured, allowing for balancing and response services to correct the drop in frequency in a more timely and predictable manner.

The intention is that VSM capability will operate as a commercial, market-based service and thus an opportunity for additional revenue streams for parties seeking to offer it. The commercial details are to be discussed and agreed at a later date; this modification only sets out the minimum specification to be written into the Grid Code and provides an important ingredient for the development of a future market. It should therefore be noted that this modification does not incorporate any mandatory requirements except as applicable to those parties choosing to partake in any commercial market as above.

4 Code Specific Matters

Mandatory for the Proposer to complete. Please provide any specialist information (that is Code-specific), such as technical skillsets required and any reference documents.

Technical Skillsets

1. Understanding of the Grid Code: its structure, format, and purpose – in order to identify where to insert the VSM specification without disrupting any existing elements of the Code and operation of the Grid.
2. Detailed understanding of the technical elements which form the VSM specification, in order to assess its suitability for its intended purpose.

Reference Documents

Appendix A outlines the specification itself but is currently at initial draft stage and is attached primarily for context.

5 Solution

To fully implement this modification, the text included in Appendix A outlines the minimum specification required by participants in order to be classified as offering a VSM capability.

The result will be a commercial market of some form, which is to be discussed at a later stage and does not directly form part of this modification.

The text will be inserted into the Grid Code and used as the basis for any bilateral service agreements between National Grid ESO.

6 Impacts & Other Considerations

So far, it is understood that there should be no impact on any other codes. However, there remains the potential for this piece of work to be a combined Grid Code/Distribution Code modification. As the system continues to evolve, greater volumes of generation are connected to DNO networks - which are not immune to the issues identified and therefore it is considered that a combined approach would be appropriate.

This requires further discussion, as it may be rendered moot by the inherent requirement for a bilateral contract between the prospective participant and National Grid ESO prior to any VSM service being active.

While subsequent commercial arrangements may impact on several areas within National Grid ESO, this proposal relates only to creation and implementation of the minimum specification itself. Thus, the impact is only applicable to ESO's Electricity Market Change Delivery teams as they will be required to amend the existing Code to incorporate the specification.

Does this modification impact a Significant Code Review (SCR) or other significant industry change projects, if so, how?

None expected.

Consumer Impacts

None expected.

7 Relevant Objectives

Mandatory for the Proposer to complete.

Impact of the modification on the Applicable Grid Code Objectives:

Relevant Objective	Identified impact
(a) To permit the development, maintenance and operation of an efficient, coordinated and economical system for the transmission of electricity	None
(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);	Positive
(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;	Positive
(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	Positive
(e) To promote efficiency in the implementation and administration of the Grid Code arrangements	None

The principle benefit of the proposed changes within this modification is that it will provide the basis for the formation of a new market-based commercial arrangement (to be discussed at a later date). With the VSM specification being relatively high-level as a

minimum entry point, it will mean a broader range of prospective participants will find themselves presented with a new potential revenue-source to consider.

Cost to ESO should be kept to a necessary minimum, as the financial incentives for participants should drive the market to settle at its natural economically balanced point.

Beyond these commercial considerations, a strong uptake of provision of VSM capability will add to the stability of the Grid through effectively replacing some of the traditional inertia with a viable and relatively future-proofed alternative.

This, in turn, will enable ESO to continue discharging its licensing obligations to maintain the frequency of the Grid within the required parameters.

8 Implementation

Implementation of this modification will be low cost as it will only require additional text within the Grid Code.

Timescales will depend heavily on how swiftly an agreeable final specification can be created and sent to OFGEM for review and final approval.

It is the intention of the proposer to see implementation of this modification from Q3 2020.

9 Legal Text

See Appendix A.

Text Commentary

Please note that the draft in its current form is still in draft. It is currently undergoing amendments further to feedback already received from industry via other channels. As such, any reading of the specification in its current form should take this into consideration, as an updated version is likely to be circulated in January 2020.

That said, all feedback is of course welcome at this early stage, so that we may ensure the most robust and appropriate approach to codifying a minimum specification.

10 Recommendations

Proposer's Recommendation to Panel

Panel is asked to:

- Agree that Normal Governance procedure should apply
- Refer this proposal to a Workgroup for assessment

11 Modification guidance and using this template

Grid Code Development Forum

Prior to raising a formal modification, we encourage Proposer's to bring their modification to the Grid Code Development Forum to gain industry views on the Proposal and enable the modification to be developed prior to being formally submitted.

If you would like more information, please contact The Code Administrator at Grid.Code@nationalgrideso.com

Code Administrator Support

The Code Administrator is available to help and support Proposers with the drafting of any modifications, including guidance on the completion of this template and the wider modification process.

The Code Administrator offers a service of informally reviewing draft modifications prior to them being formally submitted. This designed to assist individuals writing their modification proposal.

Completing this form

Please complete all sections unless specifically marked for the Code Administrator. Green italic text is provided as guidance and should be removed before submission.