Grid Code Modification Proposal Form	At what stage is this document in the process?
# GC0141: ## Mod Title: Compliance Processes and Modelling amendments following 9th August Power Disruption	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

Purpose of Modification: ***The Government (BEIS) and the Regulator (Ofgem) investigated and reviewed the incident on 9th August 2019 when some 1 million customers lost their electricity supply as a consequence of unexpected losses of Generation following a correctly cleared fault event on the Transmission System. The modifications included in these proposals are to address the concerns raised in Action 3 of the Ofgem Report and Action 2 of the BEIS report.***

The Proposer recommends that this modification should be:

This proposal will impact on all Generators and HVDC Interconnector Owners. Given the scope it is likely to require a Workgroup

This modification was raised *14 March 2020* and will be presented by the Proposer to the Panel on 26 March 2020. The Panel will consider the Proposer's recommendation and determine the appropriate route.

High Impact:

Generators and HVDC Interconnector Owners

Contents

Timetable

The Code Administrator will update the timetable.

The Code Administrator recommends the following timetable:
(amend as appropriate)

Initial consideration by Workgroup	dd month year
Workgroup Consultation issued to the Industry	dd month year
Modification concluded by Workgroup	dd month year
Workgroup Report presented to Panel	dd month year
Code Administration Consultation Report issued to the Industry	dd month year
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

Any questions?

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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)	N/A
Details of Proposer's Representative: Name: Organisation: Telephone Number: Email Address:	Mark Horley Electricity Connection Compliance Team, NGESO 01926 655465 Mark.Horley@nationalgrideso.com
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Attachments (Yes/No): **If Yes, Title and No. of pages of each Attachment:**	

Impact on Core Industry Documentation.

Please mark the relevant boxes with an "x" and provide any supporting information

BSC	
CUSC	
STC	X
Other	

This change relates to the Grid Code Planning Code (PC), Connection Conditions (CC), European Connection Conditions (CC), Compliance Processes (CP), European Compliance Processes (ECP) and Data Registration Code and may require subsequent update to STC Section K and STCP19-5 for consistency.

1 Summary

Defect

The BEIS report (Action 2) and Ofgem Report (Action 3) asked that the compliance processes and modelling processes for new and modified generation connections, particularly complex arrangements, should be reviewed and improved.

What

Considering the events of 9th August 2019, National Grid ESO has identified the following areas of the Grid Code which may be considered as defective:

i) Since the Grid Code was modified in June 2005 through modification (H/04) to cover convertor based technology (including HVDC plant) there has been a huge growth of this plant and apparatus connected to the transmission system with increasingly complex connection arrangements. The current Grid Code provisions relating to the submission of shaft data from new Synchronous Generation to allow torsional interactions (SSTI) to be studied are also causing delays to the connection of new power sources as data is needed from existing Generators.

   The current Grid Code obligations for supplying and disseminating controller/converter modelling information provisions are also considered inadequate to ensure secure operation of the power system particularly with regard to Sub-synchronous Controller Interaction (SSCI).

ii) The definition of Users obligations to ride through fault events on the transmission systems remaining in operation after fault clearance may not be considered to be clear.

iii) While Users consider each minor modification in isolation, it may not be apparent that the overall performance of the Plant and Apparatus has changed over its lifetime as a result of the accumulation of these small changes. The consequence is that older plant may not perform as expected when subjected to one of the rare severe events which can occur on the transmission system and the models used by National Grid ESO are no longer correct.

iv) Convertor based technologies are often installed in complex networks which may be subject to different configurations during commissioning and the lifetime of the site when individual plant items are out of service. The Grid Code does not specifically require Users to study and demonstrate that these “non-standard” connection arrangements comply with fault ride though requirements. This defect has also been raised under Grid Code Modification GC0138.

v) Concerns were raised by Ofgem that there is no independent involvement in the compliance process.

Why

The events of 9 August 2019 unfolded when a transmission circuit faulted and clearance caused unexpected losses of User's Plant and Apparatus. The consequence of this high level of generation led to the first stage of the low frequency demand disconnection scheme operating which then led to one million customers losing their electricity supply. Subsequent investigations by BEIS and Ofgem recommended that the processes for demonstrating compliance of new and long term Users with the Grid Code and the modelling information from Users should be improved.

How

National Grid ESO is proposing that the following areas of Grid Code should discussed for modification:

i) The Planning Code should be updated to require shaft data from all Synchronous Generation. National Grid ESO recognises that there will need to be a time period to allow Users to supply this information. The Planning Code should also be updated to specify the plant and apparatus models to be submitted to National Grid ESO. This will cover the format of the model information required Root Mean Square (RMS) and Electromagnetic Time domain (EMT), use of industry standard software model templates with site specific parameters as options and how the models maybe be shared to allow industry to perform necessary studies while protecting intellectual property rights.

ii) Update the wording of the Connection Conditions and European Connection Conditions describing Fault Ride Through to ensure the requirements apply during and after the fault.

iii) The proposal is to update the Compliance and European Compliance Processes sections of the Grid Code to oblige Users to confirm their Plant and Apparatus is compliant at regular (5 year) intervals during the life of the asset. This is consistent with European legislation "Requirements for Generators" (Article 41 paragraph 2) for regular re-evaluation of User compliance with the Grid Code.

iv) Update the Compliance and European Compliance Processes simulation sections of the Grid Code (CP & ECP) to oblige Users with complex networks to provide simulations for reasonably anticipated operating conditions.

v) Update the Compliance Processes simulation sections of the Grid Code (CP & ECP) to require Users developing offshore transmission systems to have the simulation studies reviewed and signed off by an independent engineer or test body prior to submission to National Grid ESO.

2 Governance

Normal Procedures

Given the impact on Generators and HVDC System owners, standard governance procedures should be followed.

Requested Next Steps

This modification should:

- be assessed by a Workgroup

3 Why Change?

The BEIS report (Action 2) and Ofgem Report (Action 3) asked that the compliance processes and modelling processes for new and modified generation connections should be reviewed and improved.

4 Code Specific Matters

Technical Skillsets

Understanding and experience of the methods for practical demonstration of compliance of various generation and Interconnector technology with the Grid Code.

Reference Documents

1) Guidance Notes covering the demonstration of compliance for Power Park Modules, Synchronous Generators and HVDC Interconnectors under both EU Code and GB Code can be found on the National Grid ESO website under Grid Code, Associated Documents

   https://www.nationalgrideso.com/codes/grid-code?code-documents

2) Commission Regulation (EU) 2016/631 of 14 April 2016 and Commission Regulation (EU) 2016/1447 of 26 August 2016.

   https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R0631&from=EN

   https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R1447&from=EN

3) 9th August 2019 Power Outage Report published by Ofgem dated 3rd January 2020.

   https://www.ofgem.gov.uk/system/files/docs/2020/01/9_august_2019_power_outage_report.pdf

4) GB Power System disruption on 9 August 2019, Energy Emergencies Executive Committee (E3C) Final Report published by Department for Business, Energy and Industrial Strategy, published January 2020.

https://www.gov.uk/government/publications/great-britain-power-system-disruption-review

5 Solution

Proposed Code Changes

(i) Improvement to Model Submission

PC

Remove the wording relating to a Completion Date of 01 April 2015 in the wording of PC.A.5.3.2(g) to require all synchronous generators to supply shaft stiffness data to allow Sub Synchronous Torsional Interaction studies to be carried out. Add a sentence to allow this information to be shared with other relevant Users (eg. HVDC Convertor stations, large convertor based wind farms) to enable the User to carry out such studies.

Add a new section (PC.A.9) to give detailed RMS and EMT Model requirements including scope, technical description, performance, validation, documentation and sharing. This is consistent with recent updates to modelling practices internationally based on power disruption incidents.

(ii) Clarify wording on Fault Ride Through

To add further clarity on the interpretation of FRT requirements, it is proposed to add a new sentence on the first paragraph of the CC fault ride through compliance requirement. This new sentence explains the circumstance of how long the generator or HVDC System would be expected to remain connected and stable after a transmission fault. The format of the ECC is different so a change of words in three clauses is required.

CC

Amend the wording of CC.6.3.15 to include an additional sentence
"For the avoidance of doubt, **Generating Units**, **Power Park Modules**, **DC Converters** and **OTSDUW Plant and Apparatus** are also required to remain stable, connected and fulfil the requirements of CC.6.3.15 ~~remain stable, connected~~ during and immediately after any disturbance."

ECC

Revise the wording of ECC.6.3.15.2 as follows:
"Each **Power Generating Module**, **Power Park Module**, **HVDC Equipment** and **OTSDUW Plant and Apparatus** is required to remain connected and stable ~~for~~ during and immediately after any balanced and unbalanced fault where the voltage at the **Grid Entry Point** or **User System Entry Point** or (**HVDC Interface Point** in the case of **Remote End DC Converter Stations** or **Interface Point** in the case of **OTSDUW Plant and Apparatus**) remains on or above the heavy black line defined in sections ECC.6.3.15.2 – ECC.6.3.15.7 below."

Revise the wording of ECC.6.3.15.9.2.1(a)(i) as follows:
"remain transiently stable and connected to the **System** without tripping of any **Synchronous Power Generating Module** ~~for~~ during and immediately after any balanced **Supergrid Voltage** dips and associated durations on the **Onshore Transmission System** (which could be at the **Interface Point**) anywhere on or above the heavy black line shown in Figure ECC.6.3.15.9(a) Appendix 4 and Figures EA.4.3.2(a), (b) and (c) provide an explanation and illustrations of Figure ECC.6.3.15.9(a); and,"

Revise the wording of ECC.6.3.15.9.2.1(b)(i) as follows:
"remain transiently stable and connected to the **System** without tripping of any **OTSDUW Plant and Apparatus**, or **Power Park Module** and / or any constituent **Power Park Unit**, ~~for~~ during and immediately after any balanced **Supergrid Voltage** dips and associated durations on the **Onshore Transmission System** (which could be at the **Interface Point**) anywhere on or above the heavy black line shown in Figure ECC.6.3.15.9(b). Appendix 4 and Figures EA.4.3.4 (a), (b) and (c) provide an explanation and illustrations of Figure ECC.6.3.15.9(b); and,"

(iii) Repeat Confirmation of Compliance

Create a new section "Compliance Repeat Plan" within both the CP and ECP. This new section will require Users to confirm compliance with their Grid Code obligations to National Grid ESO every 5 years.

The 5 years will be from the date of issue of the latest Final Operational Notification which maybe after a user has completed the initial connection compliance process (EON/ION) or the compliance process following a change or defect (LON).

The section would set out a process for National Grid ESO to contact the User not less than 3 months before the date when compliance confirmation is required.

The section would set out that in order to confirm compliance, Users will be required to submit:

- a Compliance Statement and a User Self Certification of Compliance;
- a complete set of Planning Code data (both Standard Planning Data and Detailed Planning Data);

The section would set out that if a User is unable to confirm compliance or recognises that changes have been made which may have impacted on performance then the Limited Operational Notification (LON) process would be started. This is the mechanism acknowledged in CP.8.1(i) and ECP.8.1(i).

CP

Amend the wording of CP.7.4 to include an additional sentence
"the **Final Operational Notification** will be subject to Compliance Repeat Plan no later than 5 years from the date of issue."

Insert the new section in the CP after Final Operational Notification (CP.7) and before Limited Operational Notification. As a consequence, renumber sections Limited Operational Notification to CP.9, Processes Relating to Derogations to CP.10 and Manufacturers Data & Performance Report to CP.11 and update all cross referencing.

Revise the wording of CP.8.5.6(e) as follows:
"a~~n~~ ~~interim~~ final **Compliance Statement** and a **User Self Certification of Compliance** completed by the **GB Code User** (including any **Unresolved Issues**) against the ~~relevant~~ Grid Code requirements including details of any requirements that the **Generator** or **DC Converter Station** owner has identified that will not or may not be met or demonstrated; and"

so that a condition of receiving a Final Operational Notification following a Limited Operational Notification clearly includes full confirmation of compliance.

ECP

Amend the wording of ECP.7.4 to include an additional sentence
"the **Final Operational Notification** will be subject to a Compliance Repeat Plan no later than 5 years from the date of issue."

Insert the new section in the ECP after Final Operational Notification (ECP.7) and before Limited Operational Notification. As a consequence, renumber sections Limited Operational Notification to ECP.9, Processes Relating to Derogations to ECP.10 and Manufacturers Data & Performance Report to ECP.11 and update all cross referencing.

Revise the wording of current ECP.8.5.6(e) as follows:
"a~~n~~ ~~interim~~ final **Compliance Statement** and a **User Self Certification of Compliance** completed by the **User** (including any **Unresolved Issues**) against the ~~relevant~~ Grid Code requirements including details of any requirements that the **Generator**, **HVDC System**, **Network Owner** or **Non-Embedded Customer** owner has identified that will not or may not be met or demonstrated; and"

so that a condition of receiving a Final Operational Notification following a Limited Operational Notification clearly includes full confirmation of compliance.

(iv) Additional Fault Ride Through Simulations

The following have already been proposed under GC0138 but are also directly related to the E3C Actions.

CP

CP.A.3.5 Additional FRT studies for different loading/commissioning scenarios. Additional paragraphs requiring Power Park Modules to carry out FRT studies for a fair

representation of a depleted network and commissioning scenarios eg. export cable and/or primary transformer outages.

ECP

ECP.A.3.5 Additional FRT studies for different loading/commissioning scenarios. Additional paragraphs requiring Power Park Modules to carry out FRT studies for a fair representation of a reasonable depleted network and commissioning scenarios eg. export cable and/or primary transformer outages.

(v) Independent Engineer

CP

CP.A.3.5 Additional wording requiring that all reports are reviewed by an independent engineer or independent test body prior to submission to National Grid ESO and explaining the extent of the independent engineer's or independent test bodies responsibilities.

ECP

ECP.3.2.1 Additional wording requiring that all reports are reviewed by an independent engineer or independent test body prior to submission to National Grid ESO and explaining the extent of the independent engineer's responsibilities.

6 Impacts & Other Considerations

Offshore Networks are designed in conjunction with the design of offshore generation so there maybe the need to update STC Section K and STCP19-5 to align with the Grid Code proposals.

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

None Identified

Consumer Impacts

Improvement to security of supply

7 Relevant Objectives

Mandatory for the Proposer to complete. Please delete the Grid Code Objectives that is not applicable.

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);	None
(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 – to address concerns raised by Ofgem and BEIS
(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 proposed changes will increase confidence in User compliance to the Grid Code whilst enhancing network security to the benefit of consumers and Regulators

8 Implementation

A working group involving Generators, Transmission Owners, owners of offshore transmission, HVDC Convertor station owners, and HVDC System Owners would be useful to ensure the proposals are suitable for the wider industry whilst improving security of the electricity supply.

9 Legal Text

Draft Legal Text is proposed in the attached Annex

10 Recommendations

Proposer's Recommendation to Panel

Panel is asked to:

Agree that standard governance procedures should apply

- Refer this proposal to a Workgroup for assessment. These proposals might be added to the terms of refence of the Workgroup for GC0138.

