

## Code Administrator Consultation

# GC0138: Compliance process technical improvements (EU and GB User)

**Overview:** This Modification seeks to update the existing compliance processes to:

- Allow for more efficient delivery of a successful and quick turnaround of final site compliance testing,
- Facilitate developments in generation and HVDC technology while maintaining effectiveness of compliance process
- Strengthen effectiveness of simulations

## Modification process &amp; timetable



**Have 5 minutes?** Read our [Executive summary](#)

**Have 20 minutes?** Read the full [Code Administrator Consultation](#)

**Have 30 minutes?** Read the full Code Administrator Consultation and Annexes.

**Status summary:** The Workgroup have finalised the proposer's solution. We are now consulting on this proposed change.

**This modification is expected to have a: **High impact**** - On owners of generation plant, offshore transmission systems and HVDC Interconnectors Owners (and manufacturers supplying plant)

**Modification drivers:** Transparency of *EU Compliance*

**Governance route** This modification has been assessed by a Workgroup and Ofgem will make the decision on whether it should be implemented

**Who can I talk to about the change?**

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**How do I respond?**

Send your response proforma to [grid.code@nationalgrideso.com](mailto:grid.code@nationalgrideso.com) by **5pm on 3 December 2021**

Contents

**Contents ..... 2**

**Executive summary ..... 3**

**What is the issue? ..... 4**

    Why change? ..... 5

**What is the solution?..... 5**

**Workgroup considerations ..... 5**

    Workgroup consultation summary ..... 8

    Legal text..... 9

**What is the impact of this change? ..... 9**

    Workgroup vote ..... 9

**When will this change take place? ..... 10**

**Interactions..... 10**

**How to respond..... 11**

    Code Administrator consultation questions ..... 11

**Acronyms, key terms and reference material..... 11**

**Annexes..... 11**

## Executive summary

This Proposal enables Users to undertake final testing with a high probability of success and quick turnaround of assessment without the additional burden of having everybody attending site where agreed. To achieve this, it is necessary to set out some additions to test procedures which are currently prepared based on on-site witnessing and to provide standards for the format of any test data sent to The ESO for review. Additionally, changes to technology and scale of technology being employed need to be reflected in the way requirements are fulfilled.

### What is the issue?

The Compliance Processes (GB User) were added to the Grid Code in August 2012 to provide a framework for Users to demonstrate compliance with the Grid Code and Bilateral Connection Agreement. The Compliance Processes (EU User) were introduced into the Grid Code in 2018 following the introduction of the EU Connection Network Codes (Requirements for Generators (RfG), HVDC Network Code (HVDC) and Demand Connection Code (DCC)). Prior to this, the process existed solely in Guidance Notes being updated periodically by National Grid based upon experience.

### What is the solution and when will it come into effect?

#### Proposer's solution:

In the Proposer's view this modification is to update the Compliance Processes and European Compliance Processes sections of the Grid Code (CP & ECP) and Grid Code OC5 detailing Fault Ride Through testing, submission of test data, detailed test requirements and simulations.

#### Implementation date:

The earliest implementation date sought is Q1 2022.

#### Workgroup conclusions:

The Workgroup met on 9 September 2021 to carry out their Workgroup vote. The full Workgroup vote can be found in Annex 5 which is the output of an online voting form used by the Code Administrator. The Workgroup concluded unanimously that the Original better facilitated the Applicable Objectives than the Baseline.

### What is the impact if this change is made?

In the Proposer's view GC0138 will enhance efficiency for delivery of final site testing results reducing requirement for on-site attendance by The ESO and facilitating quicker response times. This adds flexibility and provides logistical benefits to all parties.

In the Proposer's view this modification will facilitate new technologies (e.g. HVDC-based advances) in contributing to the GB Grid and will deliver a more robust approach to testing simulations including assurances that required simulations are more appropriately reflective of real-world operational scenarios which may occur.

In the Proposer's view it will provide a greater degree of confidence for affected parties that their technologies and solutions are compliant and will enhance visibility of the associated processes for both The ESO and Users.

## Interactions

The Compliance Processes include offshore wind farms within their scope. Where offshore wind farm transmission networks are transitioned to OFTO ownership before a Final Operational Notification has been issued STCP19-5 applies rather than Grid Code. Therefore, to give consistency regardless of ownership changes some changes to STCP19-5 with regard to voltage control testing procedures and test data submission format would be desirable.

These changes are being proposed in conjunction with those of [GC0141](#) – which contains proposed changes to how data and models are exchanged.

## What is the issue?

### Overview

The Compliance Processes (GB User) were added to the Grid Code in August 2012 to provide a framework for Users to demonstrate compliance with the Grid Code and Bilateral Connection Agreement. The Compliance Processes (EU User) were introduced into the Grid Code in 2018 following the introduction of the EU Connection Network Codes (Requirements for Generators (RfG), HVDC Network Code (HVDC) and Demand Connection Code (DCC)). Prior to this, the process existed solely in Guidance Notes being updated periodically by National Grid based upon experience.

With changes in the industry and associated technologies, the ESO is looking to allow Users more flexibility in scheduling final site testing, ensuring that sufficient tests to demonstrate compliance are completed first time and that the recorded results, when submitted, facilitate a quick turn round of assessment. Technological developments mean that Factory Acceptance Testing (FATs) to facilitate larger Power Park Units and HVDC Systems / Plant should also be added to the Grid Code along with adjustments to the simulation studies specified.

### On-Site Attendance Requirements

Currently the specifications of testing included in the Grid Code do not include all the tests which the ESO have found necessary through the experience of attendance at site. In order to enable Users to demonstrate compliance without on-site attendance by the ESO these tests (currently custom and practice and included in guidance) should be included in the Grid Code.

### Methods of Demonstrating Compliance

The growth in size of power park units particular to use offshore, means that traditional methods of field testing for fault ride through are becoming impractical. Therefore, it is desirable for the Grid Code to include the option of factory testing of these larger power park units. This will become a bigger problem soon, as manufacturers are currently developing the next generation of 10MW+ wind turbine generating units for use in Offshore Wind Farms.

These units will require Fault Ride Through Type Testing to comply with the Grid Code. National Grid ESO has been approached by suppliers concerned that the Grid Code does not allow this method of demonstrating compliance for newer technologies which therefore jeopardises market development.

Currently HDVC systems are commonly assembled and subjected to factory acceptance testing prior to shipment to the final site. The practice is for these factory acceptance tests to form part of the demonstration of compliance and may allow a reduction in on-site testing. This practice of factory acceptance testing should be included in the Grid Code.

## **Why change?**

### **Appropriateness of Required Simulations**

Concerns have been raised that Fault Ride Through Type Testing simulations specified in the Grid Code are not representative of operational scenarios which may occur, particularly in large wind farms. As this was an issue identified by Ofgem in relation to the 9 August 2019 power disruption incident, this has been considered separately under the GC0141 workgroup.

## **What is the solution?**

### **Proposer's solution:**

The Proposer has suggested a number of separate changes to the Grid Code for the industry to consider against the BEIS/Ofgem actions to make the compliance and modelling processes for generation more robust. GC0138 seeks to update the Compliance Processes and European Compliance Processes sections of the Grid Code (CP & ECP) and Grid Code OC5 detailing Fault Ride Through Testing, submission of test data, and detailed test requirements and simulations.

In the Proposer's view if approved, the changes proposed will facilitate demonstration of compliance for final testing without on-site attendance required the ESO. The changes are intended to be pragmatic enough such that a high probability of success and quick turnaround of confirmation may be achieved, while providing the necessary reassurance of compliance for all affected parties.

In the Proposer's view the core changes will be achieved by making some additions to test procedures which are currently prepared based on site witnessing and setting some agreed standards for the format of test data to be sent to the ESO for review purposes. The manner in which test requirements are to be fulfilled is intended to be reflective of the type and scale of technology being utilised to do so compared with earlier iterations of such requirements within the Code.

The draft legal text can be viewed as Annex 3.

## **Workgroup considerations**

The Workgroup convened six times to discuss the perceived issues, detail the scope of the proposed defect, devise potential solutions, and assess the proposal in terms of the Applicable Code Objectives.

The first meeting related only to GC0138, with the following four being combined with GC0141 due to identical defects, being attended by largely the same workgroup attendees, and some overlapping areas of discussion which the workgroup agreed would be better served by combined workgroup meetings.

## **Approach taken to assessing workgroup feedback on the Original Proposal**

In order to drive initial conversation in the workgroup, the proposer shared his initial legal text and thinking around the modification and invited comment from workgroup members on the proposed changes and wording.

The workgroup spent time scrutinising the initial proposal and legal text and the workgroup had several opportunities to provide comment on the text produced by the proposer. This feedback was taken onboard with responses issued to the workgroup and discussed at subsequent meetings, and amended legal text was issued incorporating as much of the workgroup's feedback as possible.

The Code Administrator chairing the sessions addressed workgroup concerns regarding the comments and feedback provided being addressed in the development of the original solution. The workgroup attributed a RAG (red/amber/green) status to comments made and the ESO took an action away to address these comments and develop a draft version of the Original solution.

The workgroup was advised on the process of raising alternative solutions which could potentially become Workgroup Alternative Grid Code Modifications. The workgroup was asked to consider if there were any discrepancies between their understanding of the modification's objectives and the changed proposed in the original solution. Were that to be the case, they should consider whether alternative solutions should be raised - however none have been raised for GC0138.

## **Key Areas for Discussion**

There are five key subject areas being considered within the legal text changes, which have been the focus for discussion with the workgroup.

## **Compliance Process Technical Changes**

Workgroup members identified some issues with the technical changes and additions to the testing required. These centred around the differences between the EU Code and Grid Code requirements. Reactive power testing was a particular issue. Workgroup members expressed a preference towards the GB Grid Code requirements, but as the EU Code requirements are enshrined in GB legislation, they take precedence.

Workgroup members suggested that the testing requirements were unclear in relation to HVDC importing and exporting power. The proposer acknowledged the concerns and amended the drafting to improve this.

The proposer has also corrected the terminology where workgroup members identified mistakes particularly regarding EU / GB Code terms.

## **Detailed changes on Test Procedures**

### **On-Site Presence**

The proposer noted that the reduction in ESO attendance at on-site testing is to promote efficiency and logistical practicality. However, concerns were raised by multiple workgroup members regarding the ESO not being present for tests. For example, such tests may require assembling ESO representatives, generation owners, manufacturers, and



consultants. In the case of a wind farm, this may all fall on a day of low wind which could render the testing non-viable or inadequate, requiring the test day be rescheduled. As such, the changes facilitate the option of not requiring on-site attendance for all tests and provide an easier process for Users to complete key tests themselves where appropriate. The proposer reiterated that while it may still be useful for the ESO to attend in certain circumstances, for example to witness factory acceptance tests of HVDC converters or to see a specific test on a wind turbine or for particularly significant/sensitive sites, it is not necessary to insist on this in all circumstances.

The workgroup also discussed whether it would be advantageous to have an independent engineer involved in site testing where the ESO would not attend. The workgroup concluded that this would not be essential because it would add to the turnaround time of results and the decision on acceptance remains with the ESO.

Multiple workgroup members noted that while the flexibility is appreciated, if results are queried or require further testing, Users may have to remobilise meaning additional costs and delays. It is felt that having an ESO representative on site is highly valuable given their experience with the required tests and the ability to get immediate feedback on the success or otherwise of the testing. Members of the workgroup also noted that there had been experience with the ESO reviewing a scheduled test remotely allowing virtual witnessing to occur and valued this as an alternative to site witnessing in some cases. Members of the workgroup suggested that if tests are to be reviewed off-line, the Grid Code should set a reply period following receipt of test data. The ESO explained that this could be done if Users carried out the tests and submitted the data on a pre-agreed date. However, as the workgroup agreed, this does not give the user the flexibility to do the test when convenient. The proposer updated the drafting to suggest Users ask the ESO for estimated turnaround time when submitting test results so there is more certainty but flexibility for all parties remains.

### **Factory Testing**

During workgroup discussions, the proposer stated that turbine suppliers have advised the ESO that fault ride-through testing of “next generation” large wind turbines using portable on-site testing methods is impractical. The workgroup was generally supportive of this view.

HVDC interconnectors have demonstrated some aspects of compliance in a factory environment before shipping plant to a site (which allows for some reduction of work on-site). The workgroup was generally in agreement with this view and suggested some changes to the detail of the wording.

Discussions also considered that facilitating the alignment of models with FAT tests would enable more accurate offline simulation studies to be conducted. It was suggested that more extensive FAT tests to pre-empt on-site tests would be beneficial. When combined with the enhanced data and models exchange proposals within GC0141, this would enable better demonstration of compliance ahead of commissioning.

### **Detailed changes on Simulations**

Enhanced fault ride through simulation proposals were originally included in GC0138 and duplicated in GC0141 as the main driver for the addition was to address concerns raised by Ofgem following 9<sup>th</sup> August power disruption incident. For clarity these enhancements to Fault Ride Through simulations are now being considered under GC0141.

## **Format for data submission**

The workgroup discussed the use of standard templates for submission of test results where the ESO has not attended site to witness tests. Some concern was expressed on the columns where data not relevant to the test appeared to be requested. The proposer explained that many columns were marked as not required and could be left blank but that it was important for efficiency of assessment that data always came in in a similar format if users want a faster response. In addition, queries were raised by a workgroup member regarding the sampling frequency of different columns in the template (e.g. the wind speed and wind direction are recorded at much lower sampling rates vs the electrical quantities recorded at higher sampling rates).

## **Consideration of other options**

No alternative solutions have been raised at this time.

## **Workgroup consultation summary**

Six Workgroup consultation responses were received, which echoed the points in the Proposal. No new material or alternatives were raised as part of the Workgroup Consultation. Workgroup Consultation responses can be found in Annex 4.

## **Post-Workgroup Consultation**

After the Workgroup Consultation, the workgroup discussed the legal text for the proposed original solution for GC0138. The workgroup was given time to feed in further thoughts on this.

## **Workgroup consultation summary**

Seven Workgroup consultation responses were received, which echoed the key points outlined in the Proposal. No alternatives were raised as part of the Workgroup Consultation. Workgroup Consultation responses can be found in Annex 4.

- The respondents were all supportive that the Original solution better facilitates the Grid Code Objectives. It has positive impacts on objectives a (permitting development, maintenance, and operation of an efficient, coordinated, and economical system), b (facilitating competition in generation and supply of electricity), and c (promoting security and efficiency of the electricity systems). These positive impacts are achieved by providing additional obligations and methods to demonstrate test results and compliance, and by facilitating the entry of larger wind turbines to enter the offshore market.
- One respondent felt that tests should not be carried out on larger generators and also felt that there should be some reference/alignment with the LVRT tests in IEC 61400-21.
- Another respondent commented that the changes should not alter the existing ability of the host Transmission Owner to attend tests or participate in the compliance process.
- A respondent commented that even though the number of scenarios to simulate could be large, the specifics of the FRT simulations contingencies could be agreed per project in the BCA but a baseline should be defined in the GB Grid Code.



- A respondent highlighted that currently there is a government CfD auction and implementing the changes prior to the CfD deadline will affect the cost of the projects. They believe that a grace period should be included in the implementation of these new changes to the Grid Code and that none of the new proposed changes to the Grid Code in GC0138 should be applied retrospectively.

## Post-Workgroup Consultation

After the Workgroup Consultation, the workgroup discussed the legal text for the proposed original solution for GC0138. The workgroup was given time to feed in further thoughts on this.

## Legal text

The legal text for this change can be found in Annex 3

## What is the impact of this change?

- Enhanced robustness of testing processes
- Quicker turnaround/success of testing due to no on-site attendance required
- More reflective of current technology for testing
- Cost/resource savings for affected parties
- Facilitation of larger wind turbines entering the market

## Interactions

The Compliance Processes include offshore wind farms within their scope. Where offshore wind farm transmission networks are transitioned to OFTO ownership before a Final Operational Notification has been issued STCP19-5 applies rather than Grid Code. Therefore, to give consistency regardless of ownership changes, modifications to STCP19-5 with regards to voltage control and reactive capability testing procedures and test data submission format may be desirable.

## Workgroup vote

The Workgroup met on 9 September 2021 to carry out their Workgroup vote. The full Workgroup vote can be found in Annex 5 which is the output of an online voting form used by the Code Administrator. The Workgroup concluded unanimously that the proposed original solution was the best option.

The Applicable Grid Code Objectives are:

Grid code

- a) To permit the development, maintenance and operation of an efficient, coordinated and economical system for the transmission of electricity
- 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);

- 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;
- 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
- e) To promote efficiency in the implementation and administration of the Grid Code arrangements

The Workgroup concluded unanimously that the Original better facilitated the Applicable Objectives than the Baseline.

Option	Number of voters that voted this option as better than the Baseline
Original	14

When will this change take place?

Implementation date:

Within 10 days of the decision from the Authority.

Date decision required by:

The decision is required from the Authority as soon as reasonably practicable.

Implementation approach:

This modification does not impact on any industry systems.

Interactions

The Compliance Processes include offshore wind farms within their scope. Where offshore wind farm transmission networks are transitioned to OFTO ownership before a Final Operational Notification has been issued STCP19-5 applies rather than Grid Code. Therefore, to give consistency regardless of ownership changes some changes to STCP19-5 with regard to voltage control testing procedures and test data submission format would be desirable.

These changes are being proposed in conjunction with those of [GC0141](#) – which contains proposed changes to how data and models are exchanged.

## How to respond

### Code Administrator consultation questions

- Do you believe that GC0138 Original proposal better facilitates the Applicable Objectives?
- Do you support the proposed implementation approach?
- Do you have any other comments?

Views are invited on the proposals outlined in this consultation, which should be received by 5pm on **3 December 2021**. Please send your response to [grid.code@nationalgrideso.com](mailto:grid.code@nationalgrideso.com) using the response pro-forma which can be found on the [modification page](#).

*If you wish to submit a confidential response, mark the relevant box on your consultation proforma. Confidential responses 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.*

## Acronyms, key terms and reference material

Acronym / key term	Meaning
Baseline	The code/standard as it is currently
CP	Compliance Process
ECP	European Compliance Process
FATs	Factory Acceptance Tests
HDVC	High Voltage Direct Current
OC5	Grid Code – Operating Code 5
OFTO	Offshore Transmission Owner
STCP19-5	System Operator Transmission Owner Code Procedure 19-5 “Offshore Transmission System Compliance Process and Testing”
RfG	Requirements for Generators

### Reference material:

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/industry-information/codes/grid-code-old?code-documents=>

2. GC0141 Grid Code Modification

<https://www.nationalgrideso.com/industry-information/codes/grid-code-old/modifications/gc0141-compliance-processes-and-modelling>

## Annexes

Annex	Information
Annex 1	GC0138 Proposal form
Annex 2	GC0138 Terms of reference

Annex 3	GC0138 Draft Legal Text
Annex 4	GC0138 Workgroup consultation responses
Annex 5	GC0138 Workgroup vote