nationalgrid

Stage 02: Workgroup Consultation

Grid Code

GC0102:

Modification Title: EU Connection Codes GB Implementation – Mod 3

What stage is this document at?

01	Proposal Form
02	Workgroup Consultation
03	Workgroup Report
04	Industry Consultation
05	Report to the Authority

Purpose of Modification:
This modification (3/4) will set out within the Grid Code and Distribution Code the following compliance obligations in the EU Connection Codes:

1. Set the System Management parameters, as set out in RfG and HVDC
2. Set the Compliance requirements, as set out in RfG, DCC and HVDC

This document contains the findings of the Joint Grid Code and Distribution Code Workgroup which formed in July 2017 to develop and assess the proposal. Any interested party is able to make a response in line with the guidance set out in Section 11 of this document.

Published on: **19 October 2017**

Length of Consultation: **15 working days**

Responses by: **9 November 2017**

High Impact:
High Impact: Developers of: New generation schemes (800 Watts capacity and up), new HVDC schemes (including DC-connected Power Park Modules), and new Demand schemes; GB NETSO; Distribution Network Operators

Medium Impact:
Medium Impact: Transmission Owners (including OFTOs); Operators of existing generation, HVDC or Demand schemes considering modernisation;

Low Impact:
None identified

Contents

Any questions?

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Timetable

Timetable following Workgroup Consultation (January Panel date to be confirmed)

Workgroup Consultation issued to the Industry	19 October 2017
Modification concluded by Workgroup	5 December 2017
Workgroup Report submitted/presented to the Grid Code Review Panel	6/14 December 2017
Code Administration Consultation Report issued to the Industry	14 December 2017
Draft Final Modification Report presented to the Grid Code Review Panel	TBC January 2018
Grid Code Review Panel Recommendation Vote	TBC January 2018
Final Modification Report issued the Authority	February 2018
Decision implemented in the Grid and Distribution Codes	March 2018

About this document

This report contains the discussion of the Workgroup which formed in July 2017 to assess and develop the proposal. The report seeks the views of Grid Code and other interested parties in response to issues raised by the Original GC0102 Grid Code Modification Proposal and subsequent discussions.

Document Control

Version	Date	Author	Change Reference
0.1	19 October 2017	Code Administrator	Workgroup Consultation

1 Summary

1.1 This report outlines the initial Proposal, the Proposer's Solution, Alternative Solutions and corresponding Workgroup Discussions. There is also additional material for justification and to aid understanding.

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1.2 GC0102 was raised by National Grid Electricity Transmission (NGET) and presented to the Grid Code Review Panel (GCRP) for their consideration on 21 June 2017.

1.3 The GCRP supported the establishment of a Workgroup to assess and develop the proposed modification against the Grid Code Applicable Objectives (refer to Section 9).

1.4 The DCRP supported the establishment of the Workgroup to undertake the development of the modification to include the necessary Distribution Code changes.

1.5 Section 2 (Original Proposal) together with Sections 3, 4 and 5 (setting out the Proposer's solution) are sourced directly from the Proposer. Statements or assertions made in these four sections have not been altered, substantiated, supported or refuted by the Workgroup. Section 6 of the report provides a summary of Workgroup discussions on the Proposal and the potential solution.

1.6 The Grid Code Review Panel detailed the scope of work for the GC0102 Workgroup in the Terms of Reference. The Terms of Reference are currently being amended following discussions with the Grid Code Panel with regards to removing the Demand Connection Code Articles from the scope; therefore these are not attached but will be added to the Workgroup Report following consultation.

2 Original Proposal

This Section (2) (The Original Proposal) is sourced directly from the Proposal. Any statements or assertions have not been altered or substantiated or supported or refuted by the Workgroup. Section 6 of the Workgroup Consultation Report outlines the subsequent discussions held by the Workgroup on the Proposal, the Solution and alternatives.

What

Full sections of the Grid Code, for example the Connection Conditions (CCs), Compliance Processes (CPs) and Operating Code, will need to be extended to set out the new EU standards to which affected users will need to comply with. Similarly, Section DPC7 of the Distribution Code and EREC G59 and EREC G83 will need modifying to implement the EU Network Code requirements.

This will be a combination of completely new requirements inserted into the Grid and Distribution Codes, or adjustments/continuation of corresponding existing GB requirements to line up with equivalents in the new EU codes.

Why

Guidance from BEIS and Ofgem was to apply the new EU requirements within the existing GB regulatory frameworks. This would provide

accessibility and familiarity to GB parties, as well as putting in place a robust governance route to apply the new requirements in a transparent and proportionate way.

This modification needs to be undertaken in timely manner to ensure affected users are aware of their compliance obligations - particularly in relation to procurement of equipment, compliance testing and operational requirements. This modification is also therefore, critical to facilitate/demonstrate Member State compliance to these three EU Network Codes.

How

With the support of the industry, we will use this modification to finalise proposals to apply the EU Connection Codes requirements, before consulting with the wider industry and submitting to Ofgem for a decision.

Previously, Grid Code and Distribution Code issue groups were formed (GC0048, GC0090, GC0091) to:

1. Comprehensively review the code to form a local interpretation of the requirements;
2. Undertake a mapping between the EU and GB codes to understand the gaps and the extent for possible code changes;
3. Form proposals, which will now be taken forward as formal modifications.

3 Proposer Solution - Background

The following text details the Proposer's solution for implementing the System Management requirements into the Grid Code and Distribution Code from two of the European Connection Codes: Requirements for Generators (RfG) and High Voltage Direct Current (HVDC). This *Section 3 (Original Proposal) is sourced directly from the Proposer. Any statements or assertions have not been altered or substantiated or supported or refuted by the Workgroup. Section 6 of the Workgroup Consultation Report outlines the subsequent discussions held by the Workgroup on the Proposal, the Solution and alternatives.*

Background

As mentioned, GC0102 covers implementation of the System Management and Compliance activities of the RfG and HVDC Codes. The System Management and Compliance activities for the Demand Connection Code (DCC) will be treated under a separate consultation due to the additional implementation time frames, however it should be noted due to the similarity of the codes, many of the System Management and Compliance aspects will follow the same approach as that for the RfG and HVDC Codes.

On 3rd October 2017, National Grid hosted a webinar training session outlining the requirements in RfG relating to GC0102 and the current GB requirements in relation to these. The webinar was recorded and the reader may find it useful to watch this video[1] prior to reading the report for additional context and understanding. The slides are also available separately (Annex 12).

This consultation should be seen as one of the fundamental building blocks of the EU Connection Code implementation process. The reader is therefore encouraged to be aware of Consultations GC0100 and G0101 which are covered in references [1] and [2]. When these consultations are combined with this Grid and Distribution Code consultation (GC0102) this will complete the proposers approach to implement the RfG and HVDC

1

GC0102 Webinar/Teach In Session-20171003 1000-1

Tuesday, October 3, 2017

12:00 pm | GMT Summer Time (London, GMT+01:00)

Play recording (56 min)

Recording password: (This recording does not require a password.)

requirements in the GB Codes, with GC0104 finalising the Demand Connection Code.

Note also that because the Grid Code and the Distribution Code have subtly different legal governance requirements with Ofgem, it will be necessary to undertake the final consultations formally separately, with the Grid Code and Distribution Code administrators making separate submissions to Ofgem. At this point the progress of the modifications will effectively split into two. This is currently envisaged to occur around the time of the conclusion of the Code Administrator consultation, early in 2018

With all these consultations (GC0100, GC0101 and GC0102) the following principles below have been adopted. It is also proposed to adopt the same approach for GC0104 when that is published.

i) Retain the same structure and format as the current GB Grid and Distribution Codes
ii) Retain the current requirements of the GB Grid and Distribution Codes unless there is good reason not to do so – for example there is either a conflict between the EU Codes and the GB codes or the EU Code requires additions to the GB Codes.
iii) Ensure that the revised GB Codes are easy to understand and use by those parties affected by them.
iv) Ensure consistency between the Grid and Distribution Codes and associated industry documents.

To achieve these objectives, there will be a new section of the Grid Code Connection Conditions called the “European Connection Conditions” (ECC’s). This will apply to new Users caught by the requirements of the European Codes and ensure consistency between the GB Code and European Code without Users having to refer to two separate documents (i.e. the GB Grid Code and EU Connection Codes). Whilst notwithstanding the requirements of GC0104, when GC0100, GC0101 and GC0102 are combined it will be possible to form a fully formed version of the ECC’s and ECP’s.

3.1 **Grid Code**

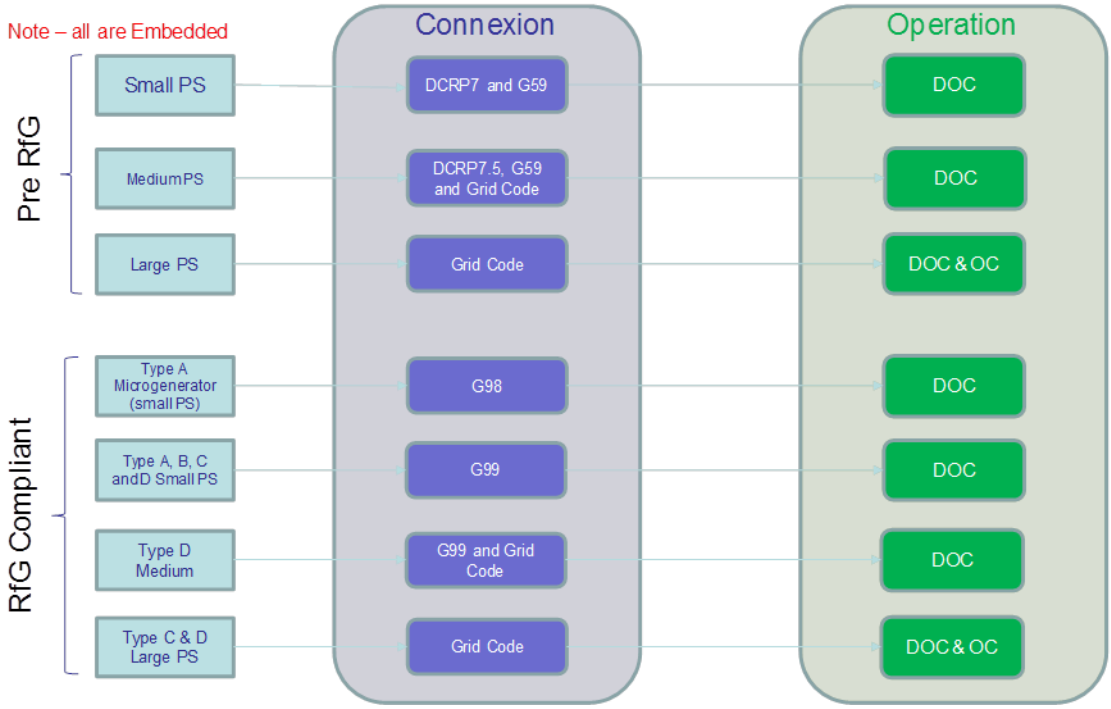
GC0102 is split into two parts – System Management and Compliance. The System Management aspects will be introduced into the ECC’s to form a complete set of Connection Conditions.

So far as the Compliance process is concerned, it is proposed to duplicate the “Compliance Processes” section of the Grid Code to form the ECP’s. This will cover the Compliance Process, Testing and Simulation requirements for New Generators and HVDC installations caught by the RfG and HVDC Codes. OC5 as currently drafted in the GB Grid Code will remain unchanged and would continue to apply only for existing Generators and existing DC Converter Station owners.

For the purposes of this proposed solution, it should be assumed that, unless specifically stated, the original Grid Code text will be used and the solutions described below highlight only the exceptions from the CCs that need to be addressed (i.e. they either don't currently exist in Grid Code or where there are conflicts). For example, if "no change required" is stated, the requirements in CC are aligned to the ECC's.

3.2 **Distribution Code**

New generating plant that is required to be RfG compliant will be directed by the Distribution Code to either G98 (for Type A microgeneration power generating modules) and G99 (for all other power generating modules) for their connexion compliance requirements. Existing power generating modules will continue to be bound by G83 and G59 for their connexion compliance requirements. All power generating modules, existing and new, will need to comply with the Distribution Operating Codes in the Distribution Codes in terms of ongoing system management requirements. The relationship is shown in the following diagram:



This GC0102 consultation includes the full legal text of the Distribution Code and G99. The nearly complete text of G98 was included in GC0100 and GC0101 consultations. . The version of G98 that is included in this consultation has been modified in the light of feedback from those two previous consultations.

Therefore this GC0102 includes the following:

- The Distribution Code
- G98 (for type tested microgeneration – updated from GC0100/101 consultation)
- G99 – for all other embedded generation

Stakeholders have so far been engaged in a debate about the best disposition of requirements for various sizes and types of generation between G98 and G99. G98 between them need to cater for:

a) Domestic micro-generators, as defined by EN 50438. These are within the RfG band for type A.

b) Domestic micro-generators, also defined by EN 50438, but where a developer/installer is installing several in close geographic proximity. There are slightly different legal requirements on the connexion process under ESQCR. These are also RfG Type A

c) Type A generators larger than micro-generators (ie >16A and not bound by EN 50438)

d) Type B generators

e) Type C generators

f) Type D generators

In addition to the divisions above, there is the prospect that any of the above generators could have manufacturers' Equipment Certificates, as defined in the RfG, or other manufacturers' information that obviates the needs for site testing.

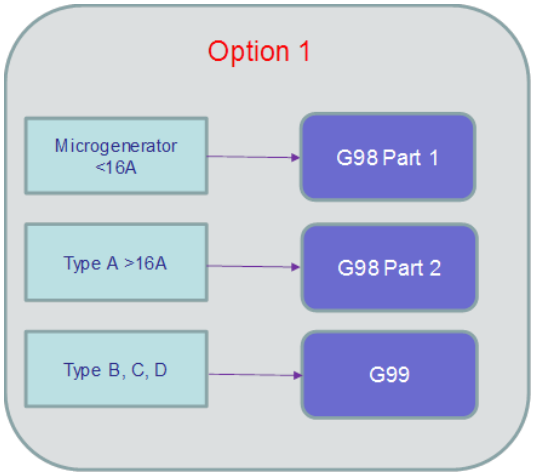
There seem to be three obvious options to map the types above into a helpful split of requirements.

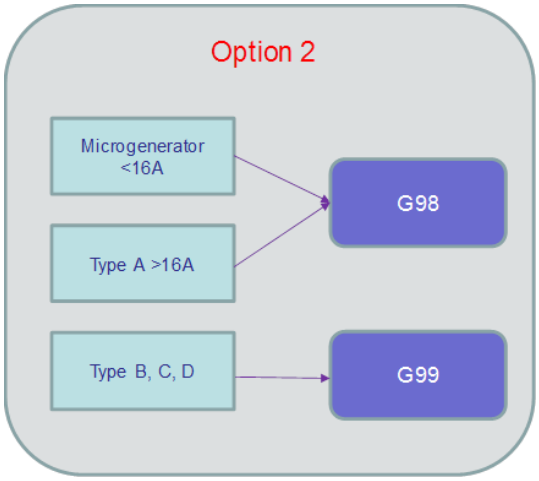
Option 1 – has a separate document (G98 Part 1) for micro-generators, one for other Type A generators (G98 Part 2) and another document for the remaining embedded generators (G99).

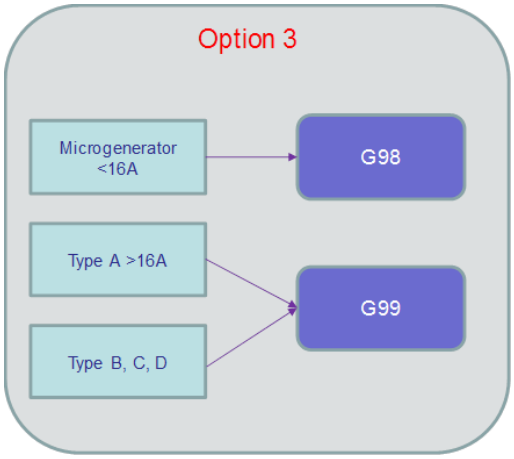
Option 2 – combines all the type A requirements into G98 and puts the requirements for all other embedded generation into G99

Option 3 – treats the micro-generators that comply with EN 50438 separately in G98 and all other embedded generation is covered in G99 (this is the option drawn above).

Of these three Options 2 and 3 seem to be the most favoured. Option 2 has the benefit of having a very clear demarcation between Type A requirements and those of other Types. However much of the connexion process and non-RfG GB requirements would need to be repeated in G98 and G99 (and be of little relevant to microgeneration in G98). In Option 3, the GB process and non-RfG requirements exist only in G99 (noting that the microgeneration connexion process in G98 is substantially simpler). These options are illustrated diagrammatically below:

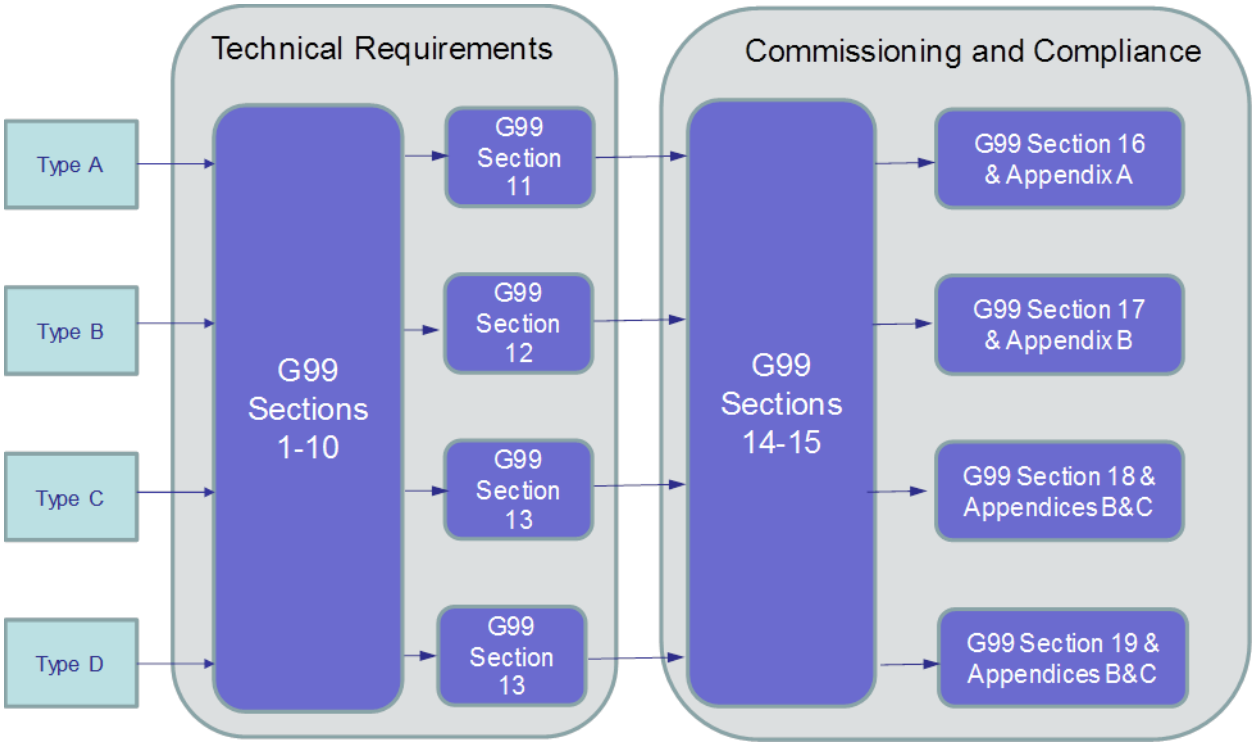






The drafting of G98 and G99 included in this GC0102 consultation follow Option 3 above. However we would welcome further views on this point.

At this point it is appropriate to point out the structure of G99. It has been created to try to follow the approach in the following diagram:



The intent is that there is a body of common requirements, and then those requirements that differ according to type are drafted into separate sections. Again views on both the suggested approach, and how effectively it has been achieved in the drafting, would be very welcome.

Please see Question 5 and 7 in the Consultation questions:

Do you have any comments on the structure of the proposed relationship between the D Code, G59 and G83, and G98 and G99? In particular which of the three options in Section 3.2 of this consultation do you support and why?

Do you agree with the current view of how the Grid and Distribution Codes (and G98 and G99) will be applied to installations where new PGMs are installed alongside existing pre-RfG equipment?

3.3 Large, Medium and Small Power Stations

Article 5 of RfG sets that power-generating modules must comply with the code's various technical requirements on the basis of their connection voltage and maximum capacity. RfG classifies four Bands (Types "A-D") which define the technical requirements new Generators must adhere to. The details of these banding levels and the proposed thresholds between them are covered in Consultation GC0100 (Reference [1]).

In GB, the technical requirements have been defined in terms of Large, Medium and Small Power stations. It is however important to note that the concept of Large, Medium and Small Power Stations not only defines the technical requirements but also the Connection Process (ie the process of a Generator seeking to use the Transmission System) and the Licensing requirements. It also has implications for those Generators who are required to trade in the wholesale electricity market.

The process and industry codes that encompass the process for Generators are shown in Figure 1. Some will reference Large, Medium and Small.

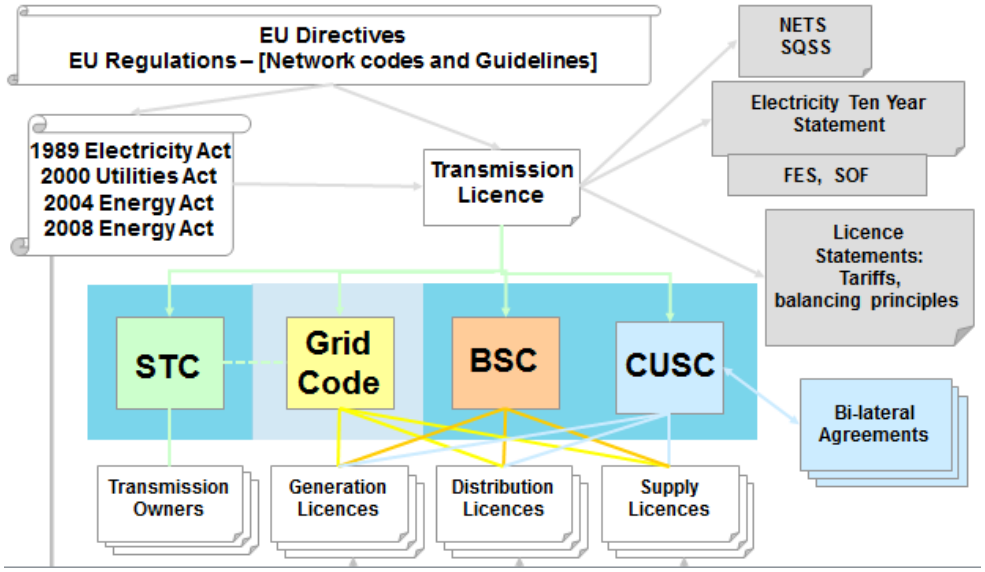


Figure 1

Figure 2 below illustrates the difference between Large, Medium and Small Power Stations and Type A – D Power Generating Modules.

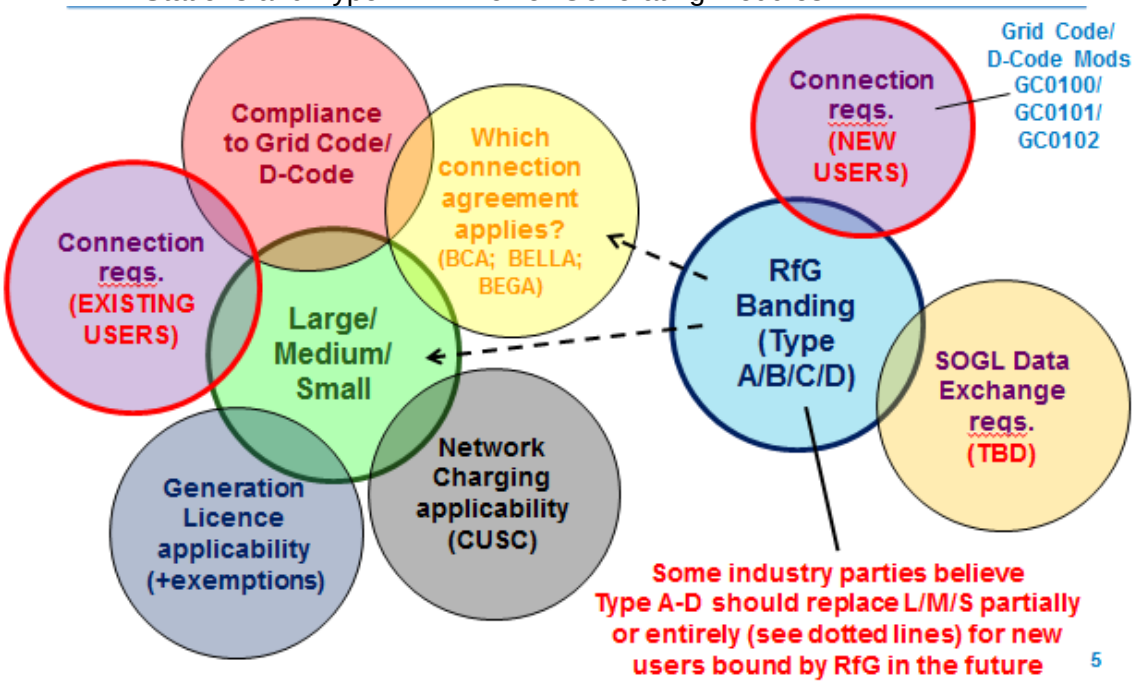


Figure 2

Implementation of the EU connection codes relates only to the technical requirements, it does not relate to issues such as market participation, the connection application process, charging or the licensing arrangements. That said, as an output of this EU Connection Code work, it will ensure that the technical requirements (e.g. frequency range, reactive capability, voltage range, fault ride through etc.) incumbent on Type A, B, C or D Power Generating Modules will be the same across GB. The only impact the regional difference on Small, Medium and Large then has is in relation to the connection process and whether or not National Grid has a contract with that Generator.

As these issues are outside the scope of the EU Connection Code implementation work it is proposed that the concepts of Large, Medium and Small Power Stations are retained as they are, and the technical requirements are then based solely around Generator Type as per RfG. So for example, a Large Power Station in England and Wales would be 100MW or more but could comprise of Power Generating Modules of Type A, Type B, Type C or Type D. The technical requirements under the EU codes would then apply to the Type of Power Generating Modules within that Power Station with the remaining elements such as to whom the party has a Connection Agreement, which industry codes apply, charging arrangements and whether or not that Generator needs to be party to the wholesale electricity market being subject to the existing GB Connection arrangements.

3.3.1 Distribution Code

A consequence of the current Large Medium and Small regime is that the Licence Exempt Embedded Medium Power Stations (LEEMPS) (Embedded Medium Power Stations between 50 – 100MW in England and Wales) regime was introduced into the Grid Code and Distribution Codes in 2006. Its aim was to reduce the administrative burden of Generators in that they would only have an agreement with the DNO yet they would have to meet certain conditions of the Grid Code relating to data and technical requirements. Although these issues become largely redundant because of the RfG Type D requirements, the contractual mechanisms between National Grid, the DNO and the Generator, for example how the Generator provides operational metering data to National Grid or what operational metering signals need to be provided, still remain an issue. For this reason, given that LMS will persist, it is simpler by far to retain the status quo as far as LEEMPS are concerned. To this end the Distribution Code (and G99) retain the term Medium Power Station, but the terms Large and Small cease to be used.

Please see question 11 in the Consultation questions:

Do you agree it is appropriate to drop the designation Large and Small from the Distribution Code as proposed in section 3.3.1 of this consultation? Do you believe it is appropriate to drop the designation Large, Medium and Small from the Grid Code?

4 Proposer Solution – System Management

This Section 4 (Original Proposal) is sourced directly from the Proposer. Any statements or assertions have not been altered or substantiated or supported or refuted by the Workgroup. Section 6 of the Workgroup Consultation Report outlines the subsequent discussions held by the Workgroup on the Proposal, the Solution and alternatives.

The System Management issues in RfG and HVDC Codes are all those aspects (excluding compliance) which have not been addressed through Grid Code consultations GC0100 and GC0101. In summary, the following topics relate to System Management requirements and these are common to both RfG and HVDC:

i) Automatic reconnection
ii) Control Schemes
iii) Protection
iv) Operational Metering
v) Monitoring (RES)
vi) Automatic disconnection
vii) Simulation Models
viii) Additional devices for system security
ix) Rates of change of Active Power
x) Neutral Earthing Arrangements
xi) Synchronisation (RES)

Additional System Management Requirements applicable specifically for the HVDC Code are summarised below but the reader should note that the HVDC Code also includes DC Connected Power Park Modules and Remote End DC Converters:

i) Maximum loss of Active Power
ii) Power Quality
iii) Fast Recovery from DC Faults
iv) Interaction between HVDC Systems or other plants and equipment
v) Subsynchronous torsional interaction damping capability
vi) HVDC System Robustness

4.1.1 **RfG System Management Issues**

As far as RfG is concerned, Annex 10 summarises the System Management issues separating these out into issues for the SO, TO and DNO and general comments.

There are however a number of high level issues which are summarised below.

4.1.2 **Power Generating Module Type A and Type B System Management Requirements Automatic Reconnection - (Articles 13 & 14)**

Article 13(7) and Article 14(4) define the requirements for automatic reconnection to the network. Article 13(7)(a) and (b) relate to the conditions (ie frequency and ramp rate conditions) under which automatic connection is allowed and Article 14(4) defines the requirements that TSO's shall specify for automatic reconnection following a network disturbance. Where automatic reconnection is permitted, this shall be subject to authorisation by the System Operator with the reconnection conditions specified by the relevant TSO.

4.1.2.1 **Grid Code**

With regard to the conditions for reconnection (ie frequency range and ramp rates) these would be covered under CC.6.1.3 and BC1.A.1.1. In summary, the frequency range would need to be within the limits of 47 – 52Hz, the voltage consistent with the requirements of CC.6.1.4, and the ramps rates consistent with BC1.A.1.1. With regard to CC.6.1.3 and CC.6.1.4, these would be translated to the equivalent references in ECC.

In relation to automatic reconnection to the Transmission system, as RSO for the Transmission System the requirements are broadly the same as currently. For any Generator caught by the requirements of the Grid Code (ie a CUSC party) they would be required to meet the requirements of BC1 and the Connection Conditions. Under BC2.5.2 automatic reconnection is not permitted unless an instruction is given by NGET and we see this requirement being equally applicable in the future.

The growth of embedded generation does however present some concern and this issue would need to be re-evaluated under a separate GB workgroup to understand the implications on the System.

4.1.2.2 **Distribution Code**

The TSO has specified the network conditions in 4.1.2.1 above for which connection and reconnection is allowed, the historic DNO practices in G83 and G59 are within these ranges and will be carried forward into G98 and G99.

The existing automatic reconnection will be retained for all PGMs Type A, B and C. These requirements are that provided the voltage and frequency at the connexion point have returned within the interface protection setting limits and have remained there for 20s, the PGM is allowed to auto reconnect/synchronize as appropriate. These requirements are made explicit in both G98 and G99, as they are already in G59 and G83.

Please see question 9 of the Consultation questions:

Do you agree with the retaining of the current GB arrangements for automatic connection and reconnection and the logic for it? If not, what alternative should be proposed?

4.1.3 **Type B System Management - Control Schemes (Article 14)**

4.1.3.1 **Grid Code**

Article 14(5) defines the requirements for control schemes and settings. The current Grid Code drafting in the proposed ECC's has been updated to include these requirements at a high level. However, such schemes tend to be site specific so any requirement would be included in the Bilateral Connection Agreement which would be consistent with the Grid Code. Examples include requirements such as operational intertripping schemes or auto close schemes where the operating times and interfacing arrangements will vary on a site by site basis.

4.1.3.2 **Distribution Code**

In general there is no requirement in the Distribution Code for specific control schemes. As is the current practice where a PGM is sufficiently large to trigger the Statement of Works (SoW) process, any necessity for such control schemes will be identified as part of the SoW process and will lead to a tripartite agreement between TSO, DNO and Generator.

4.1.4 **Power Generating Module Type B System Management Requirements Protection (Article 14(5)(b))**

Article 14(5)(b) defines the requirements for protection.

4.1.4.1 **Grid Code**

The Grid Code is already well catered for in respect of protection requirements for direct connections to the Transmission System, be it generation, demand or HVDC systems.

The ECCs have been updated to ensure consistency with RfG in particular with regards to issues such as protection changes. There will however still need to be site specific arrangements which cover issues such as relay protection operating times, grading and discrimination which are agreed as part of the commissioning process (i.e. the TO and Generator in coordination with the System Operator define the connection and co-ordination processes when a User first connects to the Transmission System) as these issues vary from site to site.

The Grid Code is however silent on embedded connections as these aspects are covered under the Distribution Code.

4.1.4.2 Distribution Code

The Distribution Code and G59 and G99 contain the necessary interface protection requirements and need no amendment to reflect the very high level requirements of RfG Art 14.

4.1.5 **Power Generating Module Type B System Management Requirements Operational Metering (Article 14(3)(d)**

4.1.5.1 **Grid Code**

This requirement is the same as current GB practice for existing Large and Medium directly connected Generators. Under CC.6.5.6 of the Grid Code the general requirements are covered at a high level in the code with the details including the operational metering signals, resolution and communication arrangements being addressed in the Bilateral Agreement.
For any Generator that is required to meet the requirements of the Grid Code these arrangements are perfectly adequate. There are wider issues relating to how Non CUSC Generators (excluding LEEMPS plant) would

provide the operational metering data to NGET. However as noted below the DNO's and National Grid are working together to resolve these issues.

4.1.5.2 Distribution Code

DNOs are already usually installing their own SCADA systems at Power Stations of 1MW or above and therefore no new actions are required to discharge the requirements of RfG Art 14. However there is ongoing work between NG and DNOs to agree how appropriate information from the DNOs' SCADA systems can be aggregated for NG consumption and use. The existing practices of DNOs will be documented as an overall standard approach in G99 to ensure compliance and regulatory certainty.

4.1.6 Power Generating Module Type C System Management Requirements FSM Monitoring / Automatic Disconnection at specified voltages (Article 15 (2)/(3))

4.1.6.1 Grid Code

The current Ancillary Services Monitoring (frequency response monitoring) requirements are specified in OC.5.4.1(c). At the present time the more detailed requirements are defined in the Bilateral Agreement which then refers the user to meet the requirements of TS.3.24.95_RES which is the Ancillary Services Monitoring RES.

These requirements are however very loose and the opportunity has therefore been taken to update the ECC's to explicitly define these requirements and ensure they are consistent with RfG. In addition there will also be a requirement to ensure the RES standard is updated to ensure consistency with RfG.

4.1.6.2 Distribution Code

There is no requirement for Type C generators connected to the distribution system to disconnect unless voltages are out with the settings of the interface protection in Section 10 of G99.

4.1.7 Power Generating Module Type C System Management Requirements Robustness (Article 15(4))

This requirement is the same as current GB practice. Stability and connection during disturbances and during auto reclosures are covered under CC.6.3.10 and CC.6.3.15, therefore no change is required.

4.1.8 Power Generating Module Type C System Management Requirements (Article 15(6)(a))

Article 15(6)(a) relates to loss of angular stability or loss of control.

4.1.8.1 Grid Code

In summary this relates to pole slipping protection which is already covered in the Grid Code under CC.6.2.2.3.4. This requirement is therefore carried

forward in the ECC's with any requirement for such protection or control measures (where this is required for system reasons) being covered in the Bilateral Agreement.

4.1.8.2 **Distribution Code**

The Distribution Code and G99 already contain these requirements. Furthermore through the Statement of Works process significant total system stability risks can be considered by both NG and the relevant DNO as part of the planning process.

4.1.9 **Power Generating Module Type C System Management Requirements Monitoring (Article 15(6)(b)**

Article 15(6) (b) relates to Dynamic System Monitoring, Fault Recording and Power Quality Monitoring.

4.1.9.1 **Grid Code**

All these aspects with the exclusion of fault recording are already specified either in the Grid Code or the Bilateral Agreement.

There are however some differences and the opportunity has therefore been taken to update the ECCs to ensure consistency with RfG. CC.6.6 relates to Dynamic System Monitoring which is currently applicable to any site which is five times a Large Power Station. Under RfG, this requirement now applies to any Type C or above Power Generating Module. There will however be a need to update the corresponding Dynamic System Monitoring Specification (TS.3.24.70_RES).

Power Quality Monitoring is specifically covered in the Bilateral Agreement but again the opportunity has been taken to make minor changes to the ECCs to ensure consistency with RfG.

4.1.9.2 **Distribution Code**

There is currently no D Code requirement. A high level functional specification will be included in G99 such that Type C Generators can procure appropriate equipment to meet their obligation.

4.1.10 **Power Generating Module Type C System Management Requirements Simulation / Models (Article 15(6(c))**

4.1.10.1 **Grid Code**

Much of the modelling data required by RfG is already covered under the Planning Code PC.A.5.3, PC.A.5.4.2, and the Compliance Processes CP.A.3.

It is proposed to update the Planning Code so that it includes requirements for both Existing Generators and new Power Generating Modules. So far

as the Data Registration Code is concerned (which is a summary of all the Grid Code data) it is proposed to duplicate the DRC to form the European Data Registration Code (EDRC).

There are two issues worthy of note. RfG (Article 15(c)(i)) states that the model supplied should properly reflect the power generating module in both steady state and dynamic simulations (50Hz component) or in electromagnetic transient simulations. It is not National Grid's intention to require electromagnetic simulations on a routine basis but the Planning Code will be updated to reflect this requirement.

It is important that the models provided do reflect the behaviour of the plant as built. For plants using new technology, the model often has to be subject to an iterative set of updates and final tests against the actual plant before an accurate model is obtained. To submit an accurate model before testing for this type of plant could therefore present a challenge as required under Article 15(6)(c)(iv).

4.1.10.2 **Distribution Code**

G99 has been drafted to replicate the approach being taken by NG.

4.1.11 **Power Generating Module Type C System Management Requirements - Other Issues (Article 15(6)(d)-(f))**

Article 15(6)(d) relates to additional devices which are required to preserve or restore System Security.

4.1.11.1 **Grid Code**

It is believed these general requirements are already catered for with any specific additional requirements being covered in the Bilateral Agreement.

Article 15(6)(e) relates to ramp rates which is already covered under BC1.A.1.1. This would apply to any plant caught by the requirements of the Grid Code which needs to satisfy the requirements of BC1. It would however remain an issue for LEEMPS plant but could be addressed by an amendment to CC.3.3.

Article 15(6)(f) relates to neutral earthing which is already covered under CC.6.3.11. This requirement is already consistent with RfG and will be carried forward into the ECC's.

4.1.11.2 **Distribution Code**

Simulation requirements for distribution connected PGMs which are Small Power Stations are new and there are no existing D Code or other requirements. There are existing requirements on LEEMPS but these are implemented by reference to the Grid Code.

New appendices have been written for G99 which pick up both simulation and compliance testing. These are based on the historic and current NG

practices, but simplified as appropriate and proportionate for DNO connexion and RfG compliance. The LEEMPS commissioning etc process will continue for new LEEMPS as before.

4.1.12 Power Generating Module Type D System Management Requirements Synchronising (Article 16(4))

The requirements for Synchronising are covered in Article 16(4).

4.1.12.1 Grid Code

Under the current GB arrangements these requirements are covered in the Bilateral Agreement and TS.3.24.60_RES. The Grid Code text under the ECC's has been updated to reflect this requirement. There will also be a need to update the RES standard.

4.1.12.2 Distribution Code

All PGMs will be subject to synchronizing arrangements agreed on a site by site basis with the DNO.

4.1.13 Type D Synchronous Power Generating Modules and Type C PPM's Angular Stability under fault conditions / Power Oscillation Damping (POD - Articles 19 and 21)

4.1.13.1 Power Generating Module Type D System Management Requirements – Type D Synchronous Power Generating Modules – Angular Stability under fault conditions

This requirement would be dependent upon System Studies during the connection application phase. It is not a requirement that can be specified generically and therefore would need to be included as part of the Bilateral Agreement.

Under the GB arrangements as there is no direct contract between the TSO and Generator this would need to be coordinated via the System Operator. There are current arrangements for this under the STC where the TSO defines the technical requirements based on their system studies and the System Operator then reflect these requirements in the Connection Agreement with the Generator. It is assumed the same principles would apply going forward.

4.1.13.2 Power Generating Module Type D System Management Requirements – Type D – Power Park Modules – Power Oscillations Damping Control

This requirement is already covered under CC.A.7.2.4 and would be carried forward into the ECC's.

4.1.13.3 Distribution Code

The existing Distribution Code already allows, along with the CUSC statement of works process, for shared analysis with NG of stability issues.

4.2 **HVDC System Management Issues**

The HVDC System Management issues are very similar to those of RfG. However it is noted that the following HVDC System Management issues deserve special mention.

i) Maximum loss of Active Power
ii) Power Quality
iii) Fast Recovery from DC Faults
iv) Interaction between HVDC Systems or other plants and equipment
v) Subsynchronous torsional interaction damping capability
vi) HVDC System Robustness

As far as HVDC is concerned, Annex 11 summarises the System Management issues separating these out into issues for the SO, TO and DNO and general comments. Again the issues relating to protection, control, operational metering etc are all believed to be the same as RfG, however those additional areas highlighted above are covered in Annex 11.

4.2.1 **Article 17 Maximum loss of Active Power**

For HVDC Systems including Remote End HVDC Converter Stations, the HVDC Code requires the HVDC System shall be configured in such a way as to limit the loss of active power injection into the Synchronous area with co-ordination between relevant TSOs where the TSO connects two or more control areas.

The legal drafting in the ECCs has been updated to include this requirement but it is effectively linked to the GBSQSS which defines limits for the maximum infrequent infeed loss which effectively places a criterion on the amount of generation that can be lost for a credible system fault. It is therefore proposed that this value is set to 1800MW to ensure consistency with the SQSS.

4.2.2 **Article 24 Power Quality**

RfG makes no reference to power quality requirements. So far as the HVDC code is concerned, the requirements for power quality as applicable to HVDC Systems, DC Connected Power Park Modules and Remote End HVDC Converters extends to ensuring that the level of distortion of fluctuation of supply voltage does not exceed the level specified by the TSO with the need to ensure that appropriate study data is supplied by all Grid Users involved so the defined limits are maintained within standards.
Under the current GB Grid Code, these requirements are already well defined under CC.6.1.5, CC.6.1.6, CC.6.1.7 and CC.6.1.8 in addition to the site specific requirements which are included in the Bilateral Agreement. Other than minor changes it is considered that the HVDC code requirements for HVDC equipment is already more than adequately catered

for in the GB Grid Code and therefore it is proposed to simply carry these requirements forward into the ECCs.

4.2.3 Fast Recovery from DC Faults

The HVDC Code requires DC overhead lines to be capable of fast recovery from transient faults with details of the capability and scheme settings to be agreed with the protection settings under Article 34 of the HVDC Code.

This is a new requirement and the drafting under the HVDC Code has been updated to reflect these conditions in the GB Grid Code under the ECC's. The specific requirements for schemes and settings would be pursuant to the connection requirements under ECC.6.2 with any site specific requirements being pursuant to the Bilateral Agreement.

4.2.4 Interaction between HVDC Systems or other plants and equipment

The current GB Grid Code is limited in this area, although it should be noted that under the generic technical requirements for a HVDC Interconnector there is a requirement for DC Converter Stations to meet the requirements of TS.3.24.90.

It is acknowledged that the GB Code is however generally deficient in this area and therefore the opportunity has been taken to update the ECCs so that they are consistent with the HVDC Code.

4.2.5 Subsynchronous torsional interaction damping capability

The GB Grid Code (CC.6.1.9, CC.6.1.10 and CC.6.3.16) define requirements for Subsynchronous torsional interaction and subsynchronous resonance. There are some slight differences between these requirements and those in the HVDC Code so the opportunity has been taken to clarify these issues in the ECC's. It should be noted that these issues are complex and further internal reviews are likely to be required to the draft legal text.

4.2.6 HVDC System Robustness

These requirements are new to the GB Grid Code and the ECC's have been updated to ensure consistency with the HVDC Code.

5 Proposer Solution – Compliance

This Section 5 (Original Proposal) is sourced directly from the Proposer. Any statements or assertions have not been altered or substantiated or supported or refuted by the Workgroup. Section 6 of the Workgroup Consultation Report outlines the subsequent

discussions held by the Workgroup on the Proposal, the Solution and alternatives.

The purpose of Compliance is to ensure that the plant built is fully capable of meeting the requirements of the Grid and Distribution Codes and Bilateral Agreements. In addition it is also a key method of ensuring the data and models provided reflect the true steady state and dynamic performance of the equipment, this being a fundamental prerequisite for the design and operation of the System going forward. The compliance process has been part of the GB Grid Code since August 2012 and has been modified where appropriate to provide the European Compliance Processes.

Compliance covers three main areas. These are summarised as follows:-

i) The Compliance Process (i.e. the process by which parties demonstrate their plant can meet the requirements of the Code)
ii) Simulation (the submission of plant performance based on simulations)
iii) Testing (Plant testing - validation of actual test results against simulated results)

In respect of the Compliance Process, this approach varies depending upon the Banding that the PGM falls into.

RfG

i) Type A – Based on an Installation Document and manufacturers' information
ii) Type B and C – The process is the same for both Type B and C Power Generating Modules other than Type C plant has to meet more requirements than Type B. Both Type B and Type C plant will need to submit a Power Generating Module Document (PGMD) which is essentially a subset of the requirements for Type D
iii) Type D – Compliance confirmed by a compliance statement supported by a User Data File Structure which is very similar to the current GB Compliance Process.

HVDC

i) Very similar to that required for Type D Power Generating Modules under RfG

5.1 **Grid Code**

5.1.1 **Compliance Process**

To implement the RfG and HVDC compliance processes into the Grid Code, the compliance processes sections of the Grid Code will be duplicated to form the ECP's. This will cover all aspects of the compliance process, simulation and testing in one place which it is believed will provide clarity to new users.

The current GB Grid Code includes testing within OC5 however it is considered appropriate to contain all the compliance requirements within one section of the Grid Code. For existing Users the compliance and testing arrangements will remain in the CP's and OC5.

The Compliance process for Generators who have to meet the requirements of the Grid Code is well established and very similar to that for Type D Power Generating Modules and DC Converters. However it is the smaller Generators (Types A – C) who are most greatly affected by the European requirements.

Many of these issues were discussed at a Workshop held by the ENA on 24 July 2017 and a copy of the slides presented is listed in Appendix 3.

5.1.2 **Type A**

Currently, there is no Compliance process in the Grid Code "Type A"-equivalent generators and although possible it is unlikely that a Type a Power Generating Module would connect to the GB transmission system.

RfG prominently expects Equipment Certificates to be used for mass market Power *Generating* Modules. There is however concern that the absence of an Equipment Certificate regime in Europe does present some difficulties. It has therefore been proposed that as an alternative to Equipment Certificates manufacturers' self-generated test certificates can be used.

The requirements under RfG are with respect to the Power Generating Module, not the Unit. However as the requirements for Type A are generally frequency related (frequency range, rate of change of frequency, LFSM-O, power output with falling frequency etc) all these aspects lend themselves well to unit testing which is beneficial for compliance purposes but also is useful due to the mass market volumes expected in this range.

Under Article 30 a Type A Generator will have to supply an installation document which contains the following information.

a) The location at which the connection is made;
(b) The date of the connection;
(c) The maximum capacity of the installation in kW;
(d) The type of primary energy source;
(e) The classification of the power-generating module as an emerging technology
(f) Reference to equipment certificates issued by an authorised certifier used for equipment that is in the site installation;
(g) Where an equipment certificate has not been received, information shall be provided as directed by National Grid or the DNO.
(h) the contact details of the Generator and the installer and their signatures.

All of these issues should be reasonably straight forward to achieve via a certified approval scheme and manageable for any transmission or distribution connected installations.

5.1.3 **Type B and C**

Under RfG (Article 32), the Type B and Type C Compliance Process require submission of a PGMD (Power Generating Module Document).

In summary, the compliance process for a Type B and Type C Power Generating Module is essentially the same other than in respect of the number of tests and simulations that need to be carried out by virtue of the different requirements applicable to Type B and C plant.

Article 32 of RfG defines the following requirements to be included in the PMGD which includes the following information.

a) Evidence of an agreement on the protection and control settings relevant to the connection point between National Grid or the DNO and the Generator;
b) Itemised statement of compliance;
c) detailed technical data of the power-generating module with relevance to the grid connection as specified by National Grid or the DNO;
d) Equipment Certificates issued by an authorised certifier in respect of Power-Generating Modules, where these are relied upon as part of the evidence of compliance;
e) for Type C power-generating modules, simulation models pursuant to point (c) of RfG Article 15(6);
f) Compliance test reports demonstrating steady-state and dynamic performance as required by RfG Chapters 2, 3 and 4 of Title IV, including use of actual measured values during testing, to the level of detail required by National Grid or the DNO ; and
g) Studies demonstrating steady-state and dynamic performance as required by RfG Chapters 5, 6 or 7 of Title IV, to the level of detail required by National Grid or the DNO.

The Relevant System Operator on acceptance of a complete and adequate PGMD shall issue a Final Operational Notice (FON) to the Power Generating Facility Owner.

As part of the GB implementation process, the ECPs have been updated to introduce a compliance process for Type B and Type C Power Generating Modules. As part of this implementation process two points were noted;

(i) Article 15 which applies only to Type C and D Power Generating Modules requires the submission of simulation models upon request of the System Operator whereas for Type B Power Generating Modules, study results have to be provided from a simulation model but that actual model does not need to be provided as there is no clause in the RfG to request this model and;

(ii) the Compliance process for Type B and C Power Generating Modules only provides for the issue of a Final Operational Notification on complete acceptance of all compliance information including test reports. Where compliance tests must be completed while connected to the network this leaves Power Generating Modules connected with no Operational Notification in place. To provide clarity during this period whilse the Power Generating Module is connecting, we have introduced the concept of a Preliminary Operational Notification (PON) so there is at least some knowledge that the Power Generating Module is about to synchronise to the System for the first time and capture the outstanding compliance activity of testing.

5.1.4 **Type D and HVDC Systems including DC Connected Power Park Modules**

For Type D Power Generating Modules, HVDC Systems, DC Connected Power Park Modules and Remote End HVDC Converter Stations the compliance process is the same with the issue of EON permitting energisation, ION permitting synchronisation, active or dynamic reactive power export and FON issued when compliance is confirmed. . The LON process is also carried across and remains unaffected from current Grid Code. One addition to the ION process is the capturing of a 24 month limit mandated by RfG which has now been included. Beyond these items there are also other minor definitions changes but it is believed there are no other significant material differences to the current Grid Code compliance arrangements.

5.1.5 **Summary of Grid Code Changes**

In terms of the Grid Code changes required to reflect the compliance processes, testing and simulation activities the following updates are believed to be necessary and these are reflected in the draft ECP legal text.

5.1.5.1 **Compliance Processes**

The compliance processes legal text has been duplicated and updated to include the following requirements:-

- Type A Compliance Process – This needs to be included in the Grid Code as it is theoretically possible a Type A Power Generating Module could connect directly to the Transmission System.
- Type B and C Compliance Process including the submission of a PGMD and Preliminary Operational Notification – These requirements again need to be included in the Grid Code as it is possible that whilst Type C Power Generating Modules connect to the Transmission System the same is true of Type B Power Generating Modules.

- Type D and HVDC Compliance Process as per current GB compliance process but with definition changes etc.

5.1.5.2 **Updates to the Grid Code Legal Drafting in respect of Simulation test for compliance purposes**

The list below provides a summary of the changes incorporated into the Grid Code legal drafting to ensure consistency with the EU Codes. A has been mentioned the Compliance process, testing and simulations have now all been incorporated into the ECPs leaving OC5 being only applicable to Existing Generators and DC Converters.

1. Specific consequential changes which impact both the simulation and testing specifications:

2. Add option for Equipment Certificates for demonstration of simulation and/or compliance tests.

3. As a consequence of additional “Types” introduce the concept of PGMD and Installation Document.

4. Specific consequential changes to simulation specifications.

5. Redraft CP.A3 to comply with the simulation requirements set out in RfG with material changes to:

   Appendix 3

   - Addition of Open Circuit simulation of 10% step response to PSS tuning study specification in line with current practice.
   - Reactive Capability requirement now at the connection point for Synchronous Power Generating Modules instead of machine terminals.
   - Modify Fault Ride Through simulation requirements for different generation “Types” and reintroduce FRT simulations for synchronous modules. Retain the simulation for longer duration voltage dips and update simulation requirements to align with Grid Code change in 2016 (GC0062).
   - Frequency response compliance now determined from step response in frequency instead of ramp and LFSM-U concept introduced. New simulation of LFSM-U introduced.
   - Introduction of modification to the Load Rejection simulation for non-synchronous power generating modules in line with recent practice.

5.1.5.3 **Updates to the Grid Code Legal Drafting in respect of Testing for compliance purposes**

Redraft of OC5.A.1-4 and instead incorporate as appendices ECP.A.4-7 leaving existing OC5 untouched for existing plant.

Specific consequential changes to test specifications:

ECP Appendix 4 – Onsite Signal Provision for Compliance Tests

- Add MW, MVAr and voltage signals at the connection point for a Synchronous Power Generating Module to facilitate demonstration of reactive capability as the compliance point has been moved from the machine terminals.

ECP Appendix 5 - Synchronous Power Generating Modules

- Reactive Capability demonstration now at the connection point for Synchronous Power Generating Modules and also include part load and minimum load test points all for 1 hour.
- Frequency response compliance now determined from step response so modification to test spec of test A & K and additional step tests O, P, Q added at full load and minimum generation load points.
- Addition of Target Frequency setpoint demonstration in line with current practice.
- Introduction of LFSM-U tests BC5 and BC6.

ECP Appendix 6 - Power Park Modules

- Reactive Capability demonstration timescales and loading levels modified in line with RfG requirements. Longer duration tests at lower output.
- Frequency response modified as for Synchronous Power Generating Modules in Appendix 5.

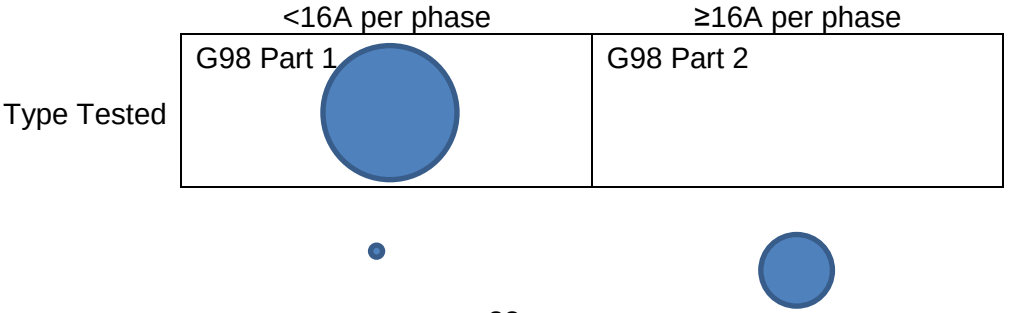
ECP Appendix 7 – HVDC Systems

- Removal of current source converter (CSC) specific testing requirements.
- Changes to reactive capability MW test points and durations.
- Frequency response compliance now determined from step response so modification to test spec of test A & K and additional step tests O, Q added. MLP 2,3 and 5 removed because of testing of both import and export mode requirements.

5.2 **Distribution Code**

5.2.1 **Type A**

Type A can be subdivided into two broad categories of PGMs; those which are covered by the European Standard EN50438 (up to a capacity of 16A per phase), and those larger than this (ie above 16A per phase and up to 1MW three phase). And these categories in turn can be divided between those which are type tested and those which need compliance to be assessed on an individual basis.



Not Type Tested	G99	G99

The size of the circle is illustrative of the relative numbers of PGMs in category.

G98 has been written, as an update of G83, to apply to all the <16A per phase units complying with EN 50438. By far the greatest number of PGMs (referred to in 50438 as microgenerating plant) will be connected under the requirements of G98.

All other type A generators, both type tested and those that are not, will be connected under the requirements of G99.

In all cases the compliance process is largely unchanged from the existing. The documentation used has been rationalized and badged as an installation document in line with RfG requirements.

Note that it is realized that the legal text for type testing Type A synchronous Power Generating Modules is still to be developed. DNOs and stakeholders will continue to work on this and ensure that the legal text is available for subsequent consultations.

5.2.2 **Type B and Type C**

Both of these types are covered by the compliance processes of G99. A significant part of the compliance requirements are new for Type B and C PGMs connected to distribution networks. The compliance requirements have been aligned as far as is practicable with the equivalent transmission connected PGMs in these size ranges.

Individual DNOs have subtly different process details relating to the connexion of new generation to their networks and these will continue to operate as before with the inclusion of the new compliance requirements. Other initiatives in the industry (such as the Open Networks project) are working on standardizing process requirements; the drafting of the G98 should not interfere with this. All DNOs will issue FONs on successful completion of commissioning as is now required by G99.

5.2.3 **Type D**

Assuming the Band C/D boundary is at 50MW then all Type D PGMs will either be LEEMPS or large power stations. As such LEEMPS will be subject to a compliance process that as far as practicable is based on the equivalent transmission process. This has been written into G99. Large power stations, as now, will remain the responsibly of National Grid to oversee the compliance process through the contractual agreement between the generator and National Grid.

5.2.4 **Simulation requirements**

The simulation requirements have been written into appendix A6 of G99, as far as practicable to mirror the equivalent requirements for transmission connected PGMs

5.2.5 **Type Testing versus on site Testing Requirements**

G98 assumes that all microgenerators <16A per phase will be type tested by their manufacturer.

G99 makes provision for full or partial testing of generating units and/or power generating modules. For all generation types it is expected that manufacturers will need to provide information as part of the compliance process. Where this information is repeatable for a number of identical units, modules or components, the facility to lodge this as type tested information exists, such that it can be called on without the need to repeat resource-intensive testing.

The following matrix demonstrates where Manufacturers' Information and compliance and installation checks on site can be combined to demonstrate compliance for each Power Generating Module.

	Manufacturers' Information	**Site Tests**
Fully Type Tested (assumed Type A only)	Registered as Fully Type Tested information on ENA website via the Compliance Verification Report (G99 Appendix A.4)	Only installation checks required – as on the Installation Document (G99 Appendix A.3)
Partially Type Tested (Type A)	(i) Registered as product or component Type Test information on ENA Website using applicable parts of Compliance Verification Report (G99 Appendix A.4); and/or (ii) Supplied by the Generator using applicable parts of Compliance Verification Report (G99 Appendix A.4)	Demonstration of technical requirements not covered by Manufacturers' Information. (G99 Appendix A.4) Standard installation checks also required (G99 Appendix A.3)
Partially Type Tested (B, C, D)	(i) Registered as product or component Type Test information on ENA Website; and/or (ii) Supplied by the Generator	Demonstration of technical requirements not covered by Manufacturers' Information. (G99 Appendix B.2) Standard installation checks also required (G99 Appendix B.3)

One off installation	To be provided by the Generator for those aspects that cannot be demonstrated on site (including simulations etc)	Demonstration of technical requirements not covered by Manufacturers' Information. (G99 Appendix B.2) Standard installation checks also required (G99 Appendix B.3)

The site testing requirements for RfG requirements and the existing interface protection requirements have been incorporated into G99. The historic protection etc. tests are included in G99 Appendix B.3, whilst the RfG requirements on synchronous PGMs and PPMs are in appendices B.5 and B.6 respectively. Appendices B.5 and B.6 have been written to follow Grid Code requirements as far as is practicable.

References

[1] Grid Code Consultation GC0100
[2] Grid Code Consultation GC0101

Please see Consultation question 10:

Do you consider any parts of the proposed compliance, simulation or testing requirements for Transmission or distribution-connected generators to be disproportionately onerous?

6 Workgroup Discussions

6.1 Workgroup

The Workgroup has so far[2] convened three times to discuss the modification, detail the scope of the proposed defect, devise potential solutions and assess the proposal in terms of the Grid Code Applicable Objectives. The Workgroup will conclude these tasks after this Consultation (taking into account all responses to this Consultation).

At the second Workgroup meeting held on the 6 September, the Proposer of GC0102 talked through their position on Large, Medium and Small generation and how it can coexist with Banding (which is outlined in Section 3.3 of this Consultation document) using the slides which can be found on the National Grid website[3].

The Workgroup talked through the difference in Connection Conditions should a party connect at transmission in Scotland versus connecting at

[2] As at 9th October 2017

[3] http://www2.nationalgrid.com/UK/Industry-information/Electricity-codes/Grid-code/Grid-Code-Development-Forum/Workgroup-Day/?LangType=2057

transmission in England and Wales. A Workgroup member submitted the following detail following the meeting to provide additional context; in terms of achieving the RfG objectives; such as Recitals (3)[4] (5)[5] and (15)[6]; and in particular the need to "*avoid unnecessary investments in some geographical areas in order to take into account their respective regional specificities*". Some Workgroup members agreed that the small, medium and large issue was out of scope, whilst other Workgroup members believed that it was within the scope of GC0102. If it was indeed out of scope then it was noted that this could be a potential future modification to the Grid Code.

The Workgroup convened for the third time on Monday 9th October[7] during which members initially reviewed (but not in detail) the draft Workgroup Consultation in addition to some initial examples from the corresponding draft legal text. The voluminous draft legal text had not been reviewed in depth by all Workgroup members prior to the meeting. It was noted that a full review of the legal text needed to be carried out by the Workgroup. The Workgroup concluded that the best time to complete this piece of work would be following the Workgroup Consultation to ensure all feedback had been fed in from Industry members.

In response to the scope, the Proposer invited comment in relation to removing the Demand Connection Code areas of scope from this GC0102 modification. It was outlined that this was due to the fact that all of the other EU Network Code Articles being addressed within this modification have an implementation date of May 2018 except for HVDC and Demand Connection Code which have an implementation date of September 2018. A Workgroup member expressed concern regarding a potential re-assignment of defects from one modification (GC0102) to GC0104 and so agreed that Ofgem should first be consulted on this intent but otherwise offered a general consensus. The Code Administrator stated that they would update the Terms of Reference (which are joint with the Distribution Code) and seek approval from the Panel and from Ofgem.

Following the Grid Code Panel meeting on 18 October 2017 and after consulting with Ofgem it was agreed to remove the Demand Connection Code Articles from the modification. The Terms of Reference will be

[4] " Harmonised rules for grid connection for power-generating modules should be set out in order to provide a clear legal framework for grid connections, facilitate Union-wide trade in electricity, ensure system security, facilitate the integration of renewable electricity sources, increase competition and allow more efficient use of the network and resources, for the benefit of consumers."

[5] "….Therefore, as a prerequisite for grid connection, relevant technical requirements should be set for power- generating modules."

[6] "The requirements should be based on the principles of non-discrimination and transparency as well as on the principle of optimisation between the highest overall efficiency and lowest total cost for all involved parties. Therefore those requirements should reflect the differences in the treatment of generation technologies with different inherent characteristics, and avoid unnecessary investments in some geographical areas in order to take into account their respective regional specificities. …."

[7] The agenda for this 9th October Workgroup meeting can be found online via the following link: http://www2.nationalgrid.com/UK/Industry-information/Electricity-codes/Grid-code/Modifications/GC0102/

updated for GC0102 and GC0104 following this decision and circulated to the Panel for sign off.

Harmonisation

Workgroup members expressed a concern that (i) distribution and transmission or (ii) distribution only or (iii) transmission only new connections in GB are not being harmonised to the extent possible (which is advisable to promote market integration) in the proposed draft legal text and the solution that was outlined by the Proposer, as per the requirement under RfG.

A Workgroup member made the point that, for example, where the RfG requirement(s) for a Type D generator in GB are not harmonised to the extent possible for (i), (ii) or (iii) above then this will not facilitate Union-wide trade in electricity, will not ensure system security, will not facilitate the integration of renewable electricity sources, will not increase competition and will not allow more efficient use of the network and resources, for the benefit of consumers..

Workgroup members acknowledged the need to evidence the implementation of a harmonised and non-discriminatory approach as part of the GC0102 work. The Workgroup noted that they should ultimately be looking to find a solution to this and agreed to add a Workgroup Consultation question to seek any guidance or proposed solutions from Industry on this matter (question 15). The degree to which connection differences are evident depending on who owns the network (as distinct from voltage) was also highlighted; although a Workgroup member noted that given, for example, the Grid Code requirements on network operators in terms of exercising Good Industry Practice[8] it was not clear why there should be connection differences in GB in the context of the RfG (and HVDC).

The problem comes if a user wishes to connect a power station at say 33,000V the connection requirements depend on who owns the connection point and not the voltage or size of the power station. If the connection point is owned by The Transmission Owner the connectee is required to enter into a contract with the System Operator and comply with the requirements of the grid code, however if the connection point is owned by a Distribution Company the connectee is only required to enter a contract with the DNO and comply with the D-code where the power station is small. This issue is more apparent at 110,000V where there are currently significant regional ownership differences meaning the technical requirements and compliance can be significantly different for providing the same power station.

Please see question 15 in the consultation questions:

[8] "The exercise of that degree of skill, diligence, prudence and foresight which would reasonably and ordinarily be expected from a skilled and experienced operator engaged in the same type of undertaking under the same or similar circumstances."

If you do not consider the proposed solution to sufficiently harmonise the connection requirements for new parties connecting to the transmission and distribution networks, how would you propose this to be addressed?

Guidance Document following EU Network Code Implementation

The merits of a non-interpretative guidance document to assist Grid Code users following the implementation of the EU Network Codes was discussed. The Code Administrator acknowledged that this would be beneficial for all Stakeholders involved in the process.

Openness and Transparency

Some Workgroup members were concerned about the lack of openness and transparency; within the GC0102 Original proposal; about the actual relevant technical requirements that newly connecting parties will need to comply with once the RfG and HVDC Network Codes are implemented in GB in May 2018. These concerns resulted in a Workgroup member submitting some possible solutions outlined below.

It was noted that as part of the implementation of the RfG and HVDC there is a requirement on either (i) the relevant TSO(s) and / or (ii) the relevant network operator(s) so specify certain technical requirements that, in the case of generators, Types A-D plant need to comply with from May 2018. This is, for example, set out in Recitals (3)[9] (5)[10] and (15)[11] of the RfG[12] and it highlights, in particular, that "*as a prerequisite for grid connection, relevant technical requirements should be set for power- generating modules*".

Most of these requirements are 'generic'; that is they apply, for example, to all Type B generators in the control area of the party who specify them. Therefore in order for the RfG to be implemented into the GB national codes (such as the Grid Code and Distribution Code) then the relevant TSO(s) and / or (ii) the relevant network operator(s) will need to set these 'generic' relevant technical requirements so that newly connecting parties have the maximum visibility of what they are.

Some Workgroup members put forward that given that the relevant TSO(s) and / or the relevant network operator(s) who are obligated (separately or collectively) to specify the relevant technical requirement(s) have already had circa 18 months (from 14th April 2016) to date (and over two years in

[9] " Harmonised rules for grid connection for power-generating modules should be set out in order to provide a clear legal framework for grid connections, facilitate Union-wide trade in electricity, ensure system security, facilitate the integration of renewable electricity sources, increase competition and allow more efficient use of the network and resources, for the benefit of consumers."
[10] "….Therefore, as a prerequisite for grid connection, relevant technical requirements should be set for power- generating modules."
[11] "The requirements should be based on the principles of non-discrimination and transparency as well as on the principle of optimisation between the highest overall efficiency and lowest total cost for all involved parties. Therefore those requirements should reflect the differences in the treatment of generation technologies with different inherent characteristics, and avoid unnecessary investments in some geographical areas in order to take into account their respective regional specificities. …."
[12] https://electricity.network-codes.eu/network_codes/rfg/

total up to May 2018) to discharge these obligations (within the RfG and / or HVDC) it would be appropriate to require them; in the interest both of openness and transparency and to ensure stakeholders can comply with their obligations; to publish these 'generic' relevant technical requirement(s) within ten Business Days of Ofgem approving GC0102 and to further require them to (a) publish any future changes to the 'generic' relevant technical requirement(s) and (b) to give stakeholders no less than ten Business Days' notice of any such change prior that change (to the 'generic' relevant technical requirement(s)) being applied.

In a very limited number of cases a few of the RfG (and HVDC) relevant technical requirements are not to be set 'generically' but are, instead, to be set 'specifically' to each new connection. In other words the relevant TSO(s) and / or the relevant network operator(s), often only in agreement with the newly connecting party, shall specify a specific value for that new connection.

On review of the proposed draft legal text for the system management aspects of GC0102, there was a Workgroup discussion about how and the degree to which the relevant TSO(s) and / or the relevant network operator(s) could enhance openness and transparency of these 'specific' relevant technical requirements.

It was suggested by a Workgroup member that it could be expected, in GB, that these site specific relevant technical requirements could be incorporated into the relevant part(s) of the bilateral connection agreement (which, for example, is publically available on the CUSC part of the National Grid website) for the specific new connection.

Some Workgroup members were of the view that taking account of the need for openness, transparency and non-discrimination it would be appropriate to therefore require the relevant TSO(s) and / or the relevant network operator(s) (i.e. whomsoever is the counter party to the bilateral connection agreement) to publish (quarterly?) the 'specific' relevant technical requirements that they have placed upon, in the case of generators, each Type (A-D) of plant. It may also be appropriate that this information is be further broken down by plant fuel type. There was a view from some Workgroup members about the legal complexity that would likely ensue from this and/or the publication of this detail. However, a Workgroup member noted that as the relevant TSO(s) and / or the relevant network operator(s) would themselves need to have such a list (of all the individual specific relevant technical requirements they were contractually enforcing) that the publication of this list could not be seen as unduly onerous. Legal feedback regarding the implications of publishing this material to facilitate openness, transparency and the non-discriminatory treatment of newly connecting parties will be provided to Workgroup in due course.

Some workgroup members raised concerns of data in Bilateral Connection Agreements being shared publicly due to sensitive commercial information within them. They also voiced their opinion that, currently, anything that can

be made public (i.e. generic requirements) are already transparent and available.

Please see question 20 in the Consultation questions:

Do you believe that this modification helps to promote transparency across the Industry and if not which areas should be improved?

Future Housekeeping modification following GC0100/GC101 and GC0102

During an initial review of the proposed draft legal text during the meeting it was noted that there would be some housekeeping amendments that would have to be made as a result of the work on GC0100 and GC0101. It was also noted that there would be subsequent referencing that would have to be amended throughout the Grid Code as a result of the work completed on these modifications. The Code Administrator noted that it would be beneficial for a housekeeping modification to be raised to be implemented in line with the implementation date of these modifications (GC0100/101/102).

Preliminary Operating Notice (PON)
On review of the draft legal text associated with the proposed Original Compliance solution, questions were raised around the legality of the Proposer's solution with its introduction of a '*Preliminary Operating Notice* (PON)'[13] as a new, additional, mechanism to facilitate the compliance process but which, firstly, does not form part of the existing GB national network codes or associated documents[14] and, secondly, does not form part of the RfG requirements. The future proposed '*requirement*' for a newly connecting generator to have a PON would apply to Type B and Type C connections (at transmission only)

Within the RfG a procedure is set out[15] which is based around the Energisation Operation Notification (EON), Interim Operation Notification (ION), and Final Operation Notice (FON) which are specified for Type D generators only. Questions were asked by a Workgroup member around placing more stringent requirements for Types B and C generators that go beyond the RfG provisions[16].

A Workgroup member was also concerned that in addition to the possible legality of the PON, this implied that the PON took precedence over the Equipment Certificate. The Workgroup member noted that where an Equipment Certificate had been issued by an authorised certifier that those elements of the RfG (or HVDC) that had been so tested (by the certifier)

[13] See ECP.1.1 (ii) and ECP.6B in the draft legal text for further details.
[14] During the GC0100 and GC0101 Workgroup meeting to review the responses to the Workgroup consultation it was highlighted (within the Scottish Power response) that the current GB accepted minimum technical standards appears to be the version of the Electricity Safety, Quality and Continuity Regulations 2002, Electricity Transmission Licence, Electricity Distribution Licence, Electricity Interconnector Licence, the Grid and Distribution Codes that have been submitted by the Member State (i.e. BEIS for GB) to the Commission.
[15] See Articles 33, 34, 35 36 and 37 for further details.
[16] See Articles 31 and 32 for further details.

would not have to be repeat tested by the newly connecting party as part of the GB compliance procedure(s) to newly connect to the system.

The Proposer clarified that where Equipment Certificates cover the test requirements a PON would not need to be issued and the station could go direct to FON.

Please see Question 8 in the Consultation questions:

Do you agree on the introduction of a Preliminary Operation Notification relating to the Compliance process for Transmission connected Type B and Type C PGMs?

A Workgroup member asked an open question in relation to the process for a non-compliant generator on the Distribution network. The Distribution Code member stated that they would look into what the process for such an event would be. It was noted that this would have an impact on the forthcoming EU Network Code modification(s) for the System Operator Guideline.

In relation to the Compliance-related draft legal text, one Workgroup member questioned why the draft legal text does not sufficiently evidence the differences in the requirements between Type B and Type C generators that are otherwise apparent in RfG. For example, the general requirements on Type B generators[17]runs to just under four pages, whilst the equivalent for Type C generators[18] runs to an additional seven pages. The Workgroup member noted that it is very difficult for stakeholders to see where, exactly, each RfG (and HVDC) obligation is set out in the corresponding GB national network code legal text drafting that has been produced for GC0102[19]. This was taken away as an action for the Proposer and has subsequently been factored into the revised draft legal text as circulated.

Anecdotally it seemed, to the Workgroup member, that the Proposer has been 'gilding the lily' by seeking to place additional obligations on some or all newly connecting parties and / or omitting corresponding obligations etc., on the relevant TSO and / or relevant network operator(s) from those within the RfG or HVDC Network Code respectively. However, the Workgroup member who raised these concerns, noted that the revised draft legal text which was circulated ahead of the meeting did not appear to have addressed all the concerned they had raised.

Further initial thoughts on the draft legal text

Clarity on ECC6.3.7(c)(i) which refers to load rejection parameters. Some articulation of acceptable ramp rate and/or droop setting would be useful. One Workgroup member agreed to look at how this could be achieved.

[17] See Article 14 for further details.
[18] See Article 15 for further details.
[19] And also for GC0100 and GC0101.

Clarity on Offshore Transmission System User Arrangements (OTSDUA) and ION A/B was raised by another Workgroup member. The Proposer acknowledged that this has not been part of the current Grid Code drafting so therefore not part of the drafting of the ECP. It was noted that a separate modification on this would have to be raised to address this additional defect due to the fact that the RfG does not cover this.

Most Workgroup members agreed with the Proposer's suggestion to extract the proposed ECPA1 flow diagrams from the draft legal text and re-position it into the suggested Grid Code guidance document which was discussed, but which Workgroup members have not seen.

One Workgroup member noted the simulation methodology only indicated a single minimum fault level. The Proposer confirmed that Article 14 (3) (iv) requires provision for two fault levels (pre fault level and post fault level).

Sub-Synchronous Resonance and Sub-Synchronous Torsional Interaction (SSTI)

It was highlighted that the proposed new legal text relating to HVDC connections was detailing with issues discussed in SQSS modification GSR0018 & GC0077 and it was queried, how the modification interacted with those changes.

GSR018 and GC0077 apply on interactions between Transmission Plant and User's plant. For reference, the main concepts were agreed (when it comes to SSO arising from interactions with Transmission Connected Plants) for example

1) NGET (and TOs through NGET) are responsible for the mitigation
2) NGET can pass some of the obligations for mitigation measures to Users
3) The SQSS criteria is vague kept at a very high level to allow Users to specify what level of damping is unacceptable to their plant.

It was also noted although both GC0077 & GSR0018 had been approved by the Authority but only GC0077 had been implemented, with GSR0018 still awaiting a Licence amendment (to reference the correct version number) ahead of formal implementation of the modification into the SQSS. The Code Administrator stated that they would speak to the Authority around this impact and whether the licence change process could be actioned now to ensure it is implemented ahead of the EU Network Code implementation for this modification.

During the final meeting to discuss the workgroup consultation, one member of the workgroup raised a concern that another individual member had substantially reworked the "Workgroup Discussion" section of the report and had added detailed context that had not been discussed during previous sessions. They stated that it would be more appropriate to add this as a Consultation response.

7 Potential Alternatives

During the course of the first three Workgroup meetings a number (currently one) of potential alternatives to the Original proposal was submitted.

At time of writing, the potential alternative relates to removing more stringent requirements and is set out below.

Additional potential alternatives may by submitted by industry stakeholders including Workgroup members during the Workgroup Consultation phase.

Once submitted, all potential alternative options will be considered by the Workgroup. The alternatives which require a majority of the Workgroup (or the Workgroup Chair) to consider better meet the Applicable Grid Code Objectives as compared to the Original Proposal will be taken forward as formal Alternatives to the Original proposal. This means that they will be developed with legal text and will ultimately be available for Ofgem to approve and implement if appropriate.

Please note that this potential alterative has not yet been discussed in the GC0102 Workgroup although the principle has been debated within the GC0100/101 Workgroup, it will be discussed within the Workgroup following this Consultation period. The below has been sourced from the Proposer of the potential alternative.

Removing More Stringent Requirements

This proposed alternative was raised at the second GC0100 and GC0101 and first GC0102 Workgroup meeting[20] and, subsequently, at the August 2017 joint Workgroups meeting where the Proposer outlined that it was the intention, with GC0102 (original) that all the existing obligations placed on new connecting parties within the (GB) national network codes (such as, but not limited to, the Grid Code, the Distribution Code, the Engineering Requirements, the CUSC etc.,) would continue (with the GC0102 original proposal) to be applied to future parties connecting under the RfG, DCC and HVDC Network Codes. In other words, the obligations in those EU Network Codes would be applied to future parties connecting whilst retaining all existing national network code obligations. In short, it was not intended that, in principle, any obligations for future connecting parties would be removed from the national network codes as a result of the GC0102 original proposal.

However, a Workgroup member identified that this appeared to be incompatible with the requirements of the Third Package, and in particular Articles 8(7) and 21 of Regulation 714/2009[21].

Article 8(7)

[20] Held on 6th July 2017

[21] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:211:0015:0035:EN:PDF

> *"The network codes shall be developed for cross-border network issues and market integration issues and shall be without prejudice to the Member States' right to establish national network codes* ***which do not affect cross-border trade****."* [emphasis added]
>
> *Article 21*
> *"This Regulation shall be without prejudice to the rights of Member States to maintain or introduce measures that contain* ***more detailed*** *provisions than those set out herein or in the Guidelines referred to in Article 18."* [emphasis added]

The Workgroup member highlighted that when the RfG was first drafted by ENTSOE (noting that the proposer of GC0102, National Grid, was an active member of the RfG drafting team for ENTSOE) they had included an Article 7, which was subsequently deleted by the Commission on 14th January 2014.

That old Article 7 said the following:

> *"This Network Code shall be* ***without prejudice to the rights of Member States to maintain or introduce measures that contain*** *more detailed or* ***more stringent provisions than those set out herein****, provided that these measures are compatible with the principles set forth in this Network Code."* [emphasis added]

Of particular relevance to the currently discussions are the parts emphasised in bold.

It was clear, by their drafting, that ENTSOE intended to be able to maintain (or introduce later) requirements contained in the exiting national network codes[22] where those requirements were (or could be in the future) more stringent than the provisions set out in the EU Network Codes.

The Commission explicitly removed this proposed wording by ENTSOE.

Shortly after the Commission's deletion of the old Article 7 in January 2014, and at the prompting of GB stakeholders (including the Workgroup member who raised this potential alternative) Ofgem enquired of the Commission as to why that article had been deleted.

In their response dated 28th February 2014, the Commission wrote to Ofgem in the following terms:

> *"1. that Article 21 of Regulation (EC) No 714/2009 already provided for the possibility for Member States to adopt* ***more detailed*** *measures and that there was thus no need to reiterate this possibility in the ENC RfG"* [emphasis added]
>
> *"2.* ***the adoption by Member States of measures more stringent than the ones of the ENC RfG*** *(to the extent of measures with cross-border trade effect)* ***would not be in line with Article 21 of***

[22] Such as, but not limited to, the Grid Code, the Distribution Code, the Engineering Requirements, the CUSC etc., in GB

> ***Regulation (EC) No 714/2009**, i.e. if the Member states were to adopt more stringent measures then it should be proved that there is no cross border trade effect of doing so"* [emphasis added]

This response was shared by Ofgem with GB stakeholders (including the proposer of GC0102, National Grid) shortly after.

Over a year later, on 26th June 2015, the RfG (and later the DCC and HVDC) Network Code was approved via the Comitology procedure, noting that in doing so, it:

> *"…**provide[s] a clear legal framework for grid connections**, facilitate Union-wide trade in electricity, ensure system security, facilitate the integration of renewable electricity sources, increase competition and allow more efficient use of the network and resources, for the benefit of consumers*"[23] [emphasis added]

As part of that approval process an arrangement was put in place by DECC (later BEIS) and Ofgem to canvass GB stakeholder views (including from the proposer of GC0102, National Grid) on any 'red line' items that the stakeholder(s) believed that DECC and Ofgem should seek to change in each of the respective EU Network Code prior to its approval. The Workgroup member could not recall National Grid identifying, as one of its 'red line' items, the need to allow for more stringent obligations (to those set out in the EU Network Codes) being placed on future connecting parties in GB.

The Workgroup member was also unaware of any other TSO in other Member States having, likewise, raised any similar concerns in respect of more stringent obligations in the intervening seventeen month period (from mid January 2014 to late June 2015) as the RfG Network Code was proceeding though the approvals process.

Clearly in the intervening seventeen month period TSOs could , if they believed this issue to be important, have put forward 'more stringent' obligations if they were required; such as those, for example, needed for maintaining the security of the electrical system; for inclusion in the EU Network Codes. If this had been done at the time then, as such, they would not, in law, be 'more stringent' in terms of Article 8(7) or Article 21 as any obligation(s) would not be in the national network codes (but rather in the EU Network Codes). However, this was not done by the TSOs, despite there being time for them to do so if they wished.

As part of the implementation of the EU Network Codes arrangements have been put in place for stakeholder involvement going forward (this is, for example, set out in Article 11 of the RfG, Article 10 of the DCC and Article 11 of the HVDC).

As a result a ('combined') stakeholder committee for the three connections codes[24] (RfG, DCC and HVDC) was established in 2016. Chaired by

[23] RfG, 14th April 2016, Recital 3

[24] Further details, including papers / minutes etc., can be found at

ACER, with secretariat support from ENTSOE it brings together pan European trade associations etc., of stakeholders with interest in the three EU Network Codes relating to connections.

One of the questions that arose early on in the life of the connections codes stakeholder committee was around applying more stringent requirements within the national network codes.

This question was posed to the Commission in the following terms:

> *"Can a Member State impose more stringent requirements by a separate legislation than imposed by the network code Requirements for Generators (RfGNC)?"*

The Commission's answer to the question was provided in its presentation to the stakeholder committee on 8th September 2016 (which was subsequently repeated at the 9th December 2016 and 7th June 2017 meetings). The answer is as follows:

> "**•In general, no – not outside of the values provided for in the code**. [emphasis added]
>
> •But: "*the relevant system operator, in coordination with the relevant TSO, and the power-generating facility owner* ***may agree*** *on wider frequency ranges, longer minimum times for operation or specific requirements for combined frequency and voltage deviations to ensure the best use of the technical capabilities of a power-generating module, if it is required to preserve or to restore system security." Article 13.* [emphasis added]
>
> •*"The network codes shall be developed for cross-border network issues and market integration issues and shall be without prejudice to the Member States' right to establish national network codes* ***which do not affect cross-border trade****." Article 8, Regulation 714.*" [emphasis added]

This issue had also been brought to the attention of GB stakeholders (including the proposer of GC0102, National Grid) in the spring of 2014 via a presentation which was given to meetings of the three relevant GB stakeholder bodies at that time (ECCAFF, JESG and the joint DECC/Ofgem Stakeholder Group).

That spring 2014 presentation was also shared with the GC0102 Workgroup prior to the joint Workgroup meeting[25]. The Workgroup member wished to highlight a number of points in that presentation (some of which have been set out already in the above few paragraphs so are not repeated here), including:

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https://www.entsoe.eu/major-projects/network-code-implementation/stakeholder-committees/Pages/default.aspx

[25] 6th September 2017

– Firstly: burden of proof to say a particular "more stringent" national measure (over and above the ones of the ENCs) does not affect cross border trade resides with the Member State (not stakeholders)

– Secondly: the presumption for all "more stringent" national measures (over and above the ones of the ENCs) is that they are not legally binding unless and ***until the Member State*** *(not stakeholders)* ***has "proved*** *that there is no cross border trade effect"* [26][emphasis added]

"• In terms of Art 8 and Art 21 what do "...which do not affect cross-border trade..." and "... no cross border trade effect..."mean?

• Important to be mindful of very strong ENTSOe arguments about Type A generators – individually an 800W generator will not affect cross border trade but, cumulatively, they will have an affect on cross border trade" [27]

"• Single GB code requirement:*
– on one generator, maybe a case of there being no cross border affect?
– cumulatively on multiple generators, a case that there is an affect?

• Multiple GB code requirements:*
– cumulatively on one generator, some cross border affect?
– cumulatively on multiple generators, a clear affect?

• All GB code requirements:*
– cumulatively on one generator, some cross border affect?
– cumulatively on multiple generators, a clear affect?

** document(s) where national requirements are set out - such as GC, DC, DCUSA, BSC, CUSC, Engineering Recommendations (G59 / G83) etc."* [28]

In respect of the effect on cross border trade of obligating future connecting parties in GB, such as generators[29], to meet more stringent requirements than those set out in the respective EU Network Code, the Workgroup member wished to highlight to the Workgroup twelve examples of additional costs etc., which, in that scenario, a generator could (would?) face.

These examples include:

1) *"pay for the extra obligations to be assessed and the solutions identified;*

[26] Slide titled 'Another point of view (3)'
[27] Slide titled 'Another point of view (4)'
[28] Slide titled 'Another point of view (5)'
[29] But not limited to generators - the DCC Network Code concerns demand connections and the HVDC Network Code deals with the connection of HVDC systems.

2) pay for the extra equipment or pay for the extra procedures to be developed to meet the extra obligations;

3) pay for the operation and maintenance of the extra equipment;

4) pay for the extra operational costs of the procedures (including extra staff);

5) pay for the extra equipment and procedures to be internally(*) tested (prior to the network operator compliance testing);

6) pay for the network operator's compliance testing of the extra equipment and procedures;

7) have to include a risk premium for items (5) and (6) in terms of if the tests are failed or delayed and either (a) remedial actions / costs are incurred to put this right and / or (b) the delay results in the plant not commissioning on time (delaying the revenue income being received);

8) in respect of (7) if the tests under items (5) and (6) fail, then pay for the extra equipment/ procedures changes plus the (re) testing of these elements (or the full rerun of the testing);

9) pay for the replacement costs of the extra equipment either at the end of its design life or if the equipment fails during its operational lifetime;

10) have to include a risk premium for the failure of the extra equipment resulting in the plant being non compliant and the plant being placed off line till the repairs or replacement can be undertaken;

11) in terms of (10) pay for the (re) testing (internal and / or compliance) of the repaired / replaced extra equipment; and (last, but not least)

12) pay the capital cost for all these extra items above, noting that last time we look as an industry at this, the WACC of GB generators was over twice and in some cases more than quadruple that of network operators.

(*) the test is undertaken for the internal purposes of the generator, although the actual testing itself maybe undertake by an external provider, such as the equipment supplier."[30]

The Workgroup member noted that this list is not comprehensive and that other generators may identify additional items that have, inadvertently, been omitted. (e.g costs associated with compliance with other codes such as mandatory participation in the balancing mechanism for 132 kV

[30] Shared with the GC0100 and GC0101 Workgroup by email on 3rd August 2017

connected generators in Scotland > 10 MW) (?)

In the view of the Workgroup member it was clear that the cumulative effect, of all these additional costs[31], on multiple generators in GB, would affect cross border trade; although the Workgroup member acknowledged, as per the Commission's statement[32] of 28th February 2014 to Ofgem, that it was not for the stakeholder, such as a generator, to prove that there was a cross border trade affect, but rather for *those who wish to apply more stringent requirements* (than those in the EU Network Codes) to prove that there is no cross border trade effect of doing so.

The Workgroup member was mindful that the GC0102 proposals would, in due course, be presented to the National Regulatory Authority (Ofgem) for determination. In this context, the Workgroup member was alive to the duty placed upon Ofgem (as the NRA for GB) "to ensure compliance with European Union Law". This was summarised under duties of the regulatory authority; in the Commission's interpretive note on Directive 2009/72 concerning the common rules for the internal market in Electricity (and the Gas equivalent) dated 22nd January 2010[33]; in the following terms:

> "Article 37(1)(b) of the Electricity Directive and Article 41(1)(b) of the Gas Directive state that the NRA has the duty of '*ensuring compliance of transmission and distribution system operators, and where relevant, system owners, as well as of any electricity and natural gas undertakings, with their obligations under this Directive and other relevant Community legislation, including as regards cross border issues*'.
>
> It follows from this provision that, without prejudice to the rights of the European Commission as guardian of the Treaty on the functioning of the European Union, the NRA is granted a general competence — and the resulting obligation — as regards ensuring general compliance with European Union law. The Commission's services are of the opinion that Article 37(1)(b) of the Electricity Directive, and Article 41(1)(b) of the Gas Directive, are to be seen as a provision guaranteeing that the NRA has the power to ensure compliance with the entire sector specific regulatory '*acquis communautaire*' relevant to the energy market, and this vis-à-vis not only the TSOs but any electricity or gas undertaking."[34]

In light of the above, and given the information from the GC0102 Proposer noted at the start of this item; together with the presentations (and associated discussions of the 'more stringent' point in terms of compliance) at the 24th July 2017 'Compliance with the RfG' hosted at the ENA; the Workgroup member believed that the original proposal (by virtue of <u>not</u>

[31] Arising from having to comply with the more stringent national network code obligations which go beyond what is required by the EU Network Code(s)

[32] *"if the Member states were to adopt more stringent measures then it should be proved that there is no cross border trade effect of doing so"*

[33] https://ec.europa.eu/energy/sites/ener/files/documents/2010_01_21_the_regulatory_authorities.pdf

[34] Found at pages 14-15 of the Commission's interpretive note.

removing ‘more stringent’ requirements contained within the GB national network codes, that it was proposed to apply to future GB connecting parties) would be incompatible with EU law for the reasons set out above[35] and would thus also not better facilitate Grid Code Applicable Objective (d)[36]:

> *“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”*

Therefore, the Workgroup proposed to bring forward an alternative proposal to the GC0102 original proposal which would be to ensure that more stringent obligations contained within the GB national network codes would not be applicable to future connecting parties who fall within the scope of the RfG, DCC and HVDC Network Codes respectively; although, for the avoidance of doubt, those (GB) national network code obligations would continue to be applicable to ‘existing’ connected parties (as defined in the RfG, DCC and HVDC Network Codes respectively) unless and until they fall within the scope of the EU Network Codes for connection.

To set this in context the Workgroup member was mindful of the recent presentation given by the Proposer setting out (in a tabular form) the items covered, in the case of generation, with the RfG Network Code for the four types of generation (A-D).

This table is shown below:

[35] As well as, potentially, with respect to Competition Law for the reasons outlined under Section 2 ‘Governance – Legal Requirements’ in the GC0103 proposal: http://www2.nationalgrid.com/UK/Industry-information/Electricity-codes/Grid-code/Modifications/GC0103/

[36] Or the Distribution Code equivalent Applicable Objective (iv).

Technical Requirements	Type A	Type B	Type C	Type D
Operation across range of frequencies	•	•	•	•
Rate of change of System Frequency (ROCOF)	•	•	•	•
Limited Frequency Sensitive Mode Over Frequency (LFSM-O)	•	•	•	•
Output Power with falling Frequency	•	•	•	•
Logic Interface (input port) to cease active power production	•	•	•	•
Conditions for automatic reconnection	•	•	•	•
Operation across range of frequencies	•	•	•	•
Ability to reduce Active Power on instruction		•	•	•
Fault Ride Through and Fast Fault Current Injection		•	•	•
Conditions for automatic reconnection following disconnection		•	•	•
Protection and Control		•	•	•
Operational Metering		•	•	•
Reactive Capability		•	•	•
Active Power Controlability			•	•
Frequency Response including LFSM-U			•	•
Monitoring			•	•
Robustness			•	•
System Restoration / Black Start			•	•
Simulation Models			•	•
Rates of Change of Active Power			•	•
Earthing			•	•
Enhanced Reactive Capability and control			•	•
Voltage Ranges				•
Enhanced Fault Ride Through				•
Synchronisation				•
Excitation Performance				•

Using this summary table, the Workgroup member identified that with the potential alternative that Type A generators would only be obligated, in terms of their connection to the grid, to those items shown in the table (and so on for Types B, C and D). All other items would be considered more stringent unless it could be proven that there was no cross border trade affect of obligating generators to comply with further obligations over and above those in the RfG (and likewise in terms of the DCC for Demand and the HVDC for HCDV connecting parties).

this alternative is being submitted to)

GC0102

01	Proposed alternative
02	Formal Workgroup alternative

Mod Title: As per original (Removing More Stringent Requirements)

Purpose of alternative Proposal:
As per the Original.

Date submitted to Code Administrator: August 2017

You are: A Workgroup member

Workgroup vote outcome: Formal alternative/not alternative

(Should your potential alternative become a formal alternative it will be allocated a reference)

Any Questions?
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Contents

Should you require any guidance or assistance with this form and how to complete it please contact the Code Administrator at grid.code@nationalgrid.com

Alternative proposed solution for workgroup review

Removing More Stringent Requirements

This proposed alternative was raised at the second GC0100 and GC0101 and first GC0102 Workgroup meeting[37] and, subsequently, at the August 2017 joint

[37] Held on 6th July 2017

Workgroups meeting where the Proposer outlined that it was the intention, with GC0102 (original) that all the existing obligations placed on new connecting parties within the (GB) national network codes (such as, but not limited to, the Grid Code, the Distribution Code, the Engineering Requirements, the CUSC etc.,) would continue (with the GC0102 original proposal) to be applied to future parties connecting under the RfG, DCC and HVDC Network Codes. In other words, the obligations in those EU Network Codes would be applied to future parties connecting whilst retaining all existing national network code obligations. In short, it was not intended that, in principle, any obligations for future connecting parties would be removed from the national network codes as a result of the GC0102 original proposal.

However, a Workgroup member identified that this appeared to be incompatible with the requirements of the Third Package, and in particular Articles 8(7) and 21 of Regulation 714/2009[38].

> *Article 8(7)*
> *"The network codes shall be developed for cross-border network issues and market integration issues and shall be without prejudice to the Member States' right to establish national network codes* ***which do not affect cross-border trade****."* [emphasis added]
>
> *Article 21*
> *"This Regulation shall be without prejudice to the rights of Member States to maintain or introduce measures that contain* ***more detailed*** *provisions than those set out herein or in the Guidelines referred to in Article 18."*
> [emphasis added]

The Workgroup member highlighted that when the RfG was first drafted by ENTSOE (noting that the proposer of GC0102, National Grid, was an active member of the RfG drafting team for ENTSOE) they had included an Article 7, which was subsequently deleted by the Commission on 14th January 2014.

That old Article 7 said the following:

> *"This Network Code shall be* ***without prejudice to the rights of Member States to maintain or introduce measures that contain*** *more detailed or* ***more stringent provisions than those set out herein****, provided that these measures are compatible with the principles set forth in this Network Code."* [emphasis added]

Of particular relevance to the currently discussions are the parts emphasised in bold.

It was clear, by their drafting, that ENTSOE intended to be able to maintain (or introduce later) requirements contained in the exiting national network codes[39] where those requirements were (or could be in the future) more stringent than the provisions set out in the EU Network Codes.

The Commission explicitly removed this proposed wording by ENTSOE.

Shortly after the Commission's deletion of the old Article 7 in January 2014, and at the prompting of GB stakeholders (including the Workgroup member who raised

[38] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:211:0015:0035:EN:PDF

[39] Such as, but not limited to, the Grid Code, the Distribution Code, the Engineering Requirements, the CUSC etc., in GB

this potential alternative) Ofgem enquired of the Commission as to why that article had been deleted.

In their response dated 28th February 2014, the Commission wrote to Ofgem in the following terms:

> *"1. that Article 21 of Regulation (EC) No 714/2009 already provided for the possibility for Member States to adopt* ***more detailed*** *measures and that there was thus no need to reiterate this possibility in the ENC RfG"* [emphasis added]
>
> *"2.* ***the adoption by Member States of measures more stringent than the ones of the ENC RfG*** *(to the extent of measures with cross-border trade effect)* ***would not be in line with Article 21 of Regulation (EC) No 714/2009****, i.e. if the Member states were to adopt more stringent measures then it should be proved that there is no cross border trade effect of doing so"* [emphasis added]

This response was shared by Ofgem with GB stakeholders (including the proposer of GC0102, National Grid) shortly after.

Over a year later, on 26th June 2015, the RfG (and later the DCC and HVDC) Network Code was approved via the Comitology procedure, noting that in doing so, it:

> *"…****provide[s] a clear legal framework for grid connections****, facilitate Union-wide trade in electricity, ensure system security, facilitate the integration of renewable electricity sources, increase competition and allow more efficient use of the network and resources, for the benefit of consumers*"[40] [emphasis added]

As part of that approval process an arrangement was put in place by DECC (later BEIS) and Ofgem to canvass GB stakeholder views (including from the proposer of GC0102, National Grid) on any 'red line' items that the stakeholder(s) believed that DECC and Ofgem should seek to change in each of the respective EU Network Code prior to its approval. The Workgroup member could not recall National Grid identifying, as one of its 'red line' items, the need to allow for more stringent obligations (to those set out in the EU Network Codes) being placed on future connecting parties in GB.

The Workgroup member was also unaware of any other TSO in other Member States having, likewise, raised any similar concerns in respect of more stringent obligations in the intervening seventeen month period (from mid January 2014 to late June 2015) as the RfG Network Code was proceeding though the approvals process.

Clearly in the intervening seventeen month period TSOs could , if they believed this issue to be important, have put forward 'more stringent' obligations if they were required; such as those, for example, needed for maintaining the security of the electrical system; for inclusion in the EU Network Codes. If this had been done at the time then, as such, they would not, in law, be 'more stringent' in terms of Article 8(7) or Article 21 as any obligation(s) would not be in the national network codes (but rather in the EU Network Codes). However, this was not done by the TSOs, despite there being time for them to do so if they wished.

[40] RfG, 14th April 2016, Recital 3

As part of the implementation of the EU Network Codes arrangements have been put in place for stakeholder involvement going forward (this is, for example, set out in Article 11 of the RfG, Article 10 of the DCC and Article 11 of the HVDC).

As a result a ('combined') stakeholder committee for the three connections codes[41] (RfG, DCC and HVDC) was established in 2016. Chaired by ACER, with secretariat support from ENTSOE it brings together pan European trade associations etc., of stakeholders with interest in the three EU Network Codes relating to connections.

One of the questions that arose early on in the life of the connections codes stakeholder committee was around applying more stringent requirements within the national network codes.

This question was posed to the Commission in the following terms:

> *"Can a Member State impose more stringent requirements by a separate legislation than imposed by the network code Requirements for Generators (RfGNC)?"*

The Commission's answer to the question was provided in its presentation to the stakeholder committee on 8th September 2016 (which was subsequently repeated at the 9th December 2016 and 7th June 2017 meetings). The answer is as follows:

> "•**In general, no – not outside of the values provided for in the code**. [emphasis added]
>
> •But: "*the relevant system operator, in coordination with the relevant TSO, and the power-generating facility owner **may agree** on wider frequency ranges, longer minimum times for operation or specific requirements for combined frequency and voltage deviations to ensure the best use of the technical capabilities of a power-generating module, if it is required to preserve or to restore system security." Article 13.* [emphasis added]
>
> •*"The network codes shall be developed for cross-border network issues and market integration issues and shall be without prejudice to the Member States' right to establish national network codes **which do not affect cross-border trade**." Article 8, Regulation 714.*" [emphasis added]

This issue had also been brought to the attention of GB stakeholders (including the proposer of GC0102, National Grid) in the spring of 2014 via a presentation which was given to meetings of the three relevant GB stakeholder bodies at that time (ECCAFF, JESG and the joint DECC/Ofgem Stakeholder Group).

That spring 2014 presentation was also shared with the GC0102 Workgroup prior to the joint Workgroup meeting[42]. The Workgroup member wished to highlight a number of points in that presentation (some of which have been set out already in the above few paragraphs so are not repeated here), including:

[41] Further details, including papers / minutes etc., can be found at https://www.entsoe.eu/major-projects/network-code-implementation/stakeholder-committees/Pages/default.aspx

[42] 6th September 2017

– Firstly: burden of proof to say a particular "more stringent" national measure (over and above the ones of the ENCs) does not affect cross border trade resides with the Member State (not stakeholders)

– Secondly: the presumption for all "more stringent" national measures (over and above the ones of the ENCs) is that they are not legally binding unless and ***until the Member State*** *(not stakeholders)* ***has "proved*** *that there is no cross border trade effect"* [43][emphasis added]

"• In terms of Art 8 and Art 21 what do "...which do not affect cross-border trade..." and "... no cross border trade effect..."mean?

• Important to be mindful of very strong ENTSOe arguments about Type A generators – individually an 800W generator will not affect cross border trade but, cumulatively, they will have an affect on cross border trade" [44]

"• Single GB code requirement:*
– on one generator, maybe a case of there being no cross border affect?
– cumulatively on multiple generators, a case that there is an affect?

• Multiple GB code requirements:*
– cumulatively on one generator, some cross border affect?
– cumulatively on multiple generators, a clear affect?

• All GB code requirements:*
– cumulatively on one generator, some cross border affect?
– cumulatively on multiple generators, a clear affect?

** document(s) where national requirements are set out - such as GC, DC, DCUSA, BSC, CUSC, Engineering Recommendations (G59 / G83) etc."* [45]

In respect of the effect on cross border trade of obligating future connecting parties in GB, such as generators[46], to meet more stringent requirements than those set out in the respective EU Network Code, the Workgroup member wished to highlight to the Workgroup twelve examples of additional costs etc., which, in that scenario, a generator could (would?) face.

These examples include:

2) *"pay for the extra obligations to be assessed and the solutions identified;*

2) pay for the extra equipment or pay for the extra procedures to be developed to meet the extra obligations;

3) pay for the operation and maintenance of the extra equipment;

4) pay for the extra operational costs of the procedures (including extra staff);

[43] Slide titled 'Another point of view (3)'
[44] Slide titled 'Another point of view (4)'
[45] Slide titled 'Another point of view (5)'
[46] But not limited to generators - the DCC Network Code concerns demand connections and the HVDC Network Code deals with the connection of HVDC systems.

5) pay for the extra equipment and procedures to be internally(*) tested (prior to the network operator compliance testing);

6) pay for the network operator's compliance testing of the extra equipment and procedures;

7) have to include a risk premium for items (5) and (6) in terms of if the tests are failed or delayed and either (a) remedial actions / costs are incurred to put this right and / or (b) the delay results in the plant not commissioning on time (delaying the revenue income being received);

8) in respect of (7) if the tests under items (5) and (6) fail, then pay for the extra equipment/ procedures changes plus the (re) testing of these elements (or the full rerun of the testing);

9) pay for the replacement costs of the extra equipment either at the end of its design life or if the equipment fails during its operational lifetime;

10) have to include a risk premium for the failure of the extra equipment resulting in the plant being non compliant and the plant being placed off line till the repairs or replacement can be undertaken;

11) in terms of (10) pay for the (re) testing (internal and / or compliance) of the repaired / replaced extra equipment; and (last, but not least)

12) pay the capital cost for all these extra items above, noting that last time we look as an industry at this, the WACC of GB generators was over twice and in some cases more than quadruple that of network operators.

(*) the test is undertaken for the internal purposes of the generator, although the actual testing itself maybe undertake by an external provider, such as the equipment supplier."[47]

The Workgroup member noted that this list is not comprehensive and that other generators may identify additional items that have, inadvertently, been omitted. (e.g costs associated with compliance with other codes such as mandatory participation in the balancing mechanism for 132 kV connected generators in Scotland > 10 MW) (?)

In the view of the Workgroup member it was clear that the cumulative effect, of all these additional costs[48], on multiple generators in GB, would affect cross border trade; although the Workgroup member acknowledged, as per the Commission's statement[49] of 28th February 2014 to Ofgem, that it was not for the stakeholder, such as a generator, to prove that there was a cross border trade affect, but rather for *those who wish to apply more stringent requirements* (than those in the EU Network Codes) to prove that there is no cross border trade effect of doing so.

The Workgroup member was mindful that the GC0102 proposals would, in due course, be presented to the National Regulatory Authority (Ofgem) for

[47] Shared with the GC0100 and GC0101 Workgroup by email on 3rd August 2017

[48] Arising from having to comply with the more stringent national network code obligations which go beyond what is required by the EU Network Code(s)

[49] *"if the Member states were to adopt more stringent measures then it should be proved that there is no cross border trade effect of doing so"*

determination. In this context, the Workgroup member was alive to the duty placed upon Ofgem (as the NRA for GB) "to ensure compliance with European Union Law". This was summarised under duties of the regulatory authority; in the Commission's interpretive note on Directive 2009/72 concerning the common rules for the internal market in Electricity (and the Gas equivalent) dated 22nd January 2010[50]; in the following terms:

> "Article 37(1)(b) of the Electricity Directive and Article 41(1)(b) of the Gas Directive state that the NRA has the duty of '*ensuring compliance of transmission and distribution system operators, and where relevant, system owners, as well as of any electricity and natural gas undertakings, with their obligations under this Directive and other relevant Community legislation, including as regards cross border issues*'.
>
> It follows from this provision that, without prejudice to the rights of the European Commission as guardian of the Treaty on the functioning of the European Union, the NRA is granted a general competence — and the resulting obligation — as regards ensuring general compliance with European Union law. The Commission's services are of the opinion that Article 37(1)(b) of the Electricity Directive, and Article 41(1)(b) of the Gas Directive, are to be seen as a provision guaranteeing that the NRA has the power to ensure compliance with the entire sector specific regulatory '*acquis communautaire*' relevant to the energy market, and this vis-à-vis not only the TSOs but any electricity or gas undertaking."[51]

In light of the above, and given the information from the GC0102 Proposer noted at the start of this item; together with the presentations (and associated discussions of the 'more stringent' point in terms of compliance) at the 24th July 2017 'Compliance with the RfG' hosted at the ENA; the Workgroup member believed that the original proposal (by virtue of not removing 'more stringent' requirements contained within the GB national network codes, that it was proposed to apply to future GB connecting parties) would be incompatible with EU law for the reasons set out above[52] and would thus also not better facilitate Grid Code Applicable Objective (d)[53]:

> *"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"*

Therefore, the Workgroup proposed to bring forward an alternative proposal to the GC0102 original proposal which would be to ensure that more stringent obligations contained within the GB national network codes would not be applicable to future connecting parties who fall within the scope of the RfG, DCC and HVDC Network Codes respectively; although, for the avoidance of doubt, those (GB) national network code obligations would continue to be applicable to 'existing' connected parties (as defined in the RfG, DCC and HVDC Network Codes respectively) unless and until they fall within the scope of the EU Network Codes for connection.

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50 https://ec.europa.eu/energy/sites/ener/files/documents/2010_01_21_the_regulatory_authorities.pdf

51 Found at pages 14-15 of the Commission's interpretive note.

52 As well as, potentially, with respect to Competition Law for the reasons outlined under Section 2 'Governance – Legal Requirements' in the GC0103 proposal: http://www2.nationalgrid.com/UK/Industry-information/Electricity-codes/Grid-code/Modifications/GC0103/

53 Or the Distribution Code equivalent Applicable Objective (iv).

To set this in context the Workgroup member was mindful of the recent presentation given by the Proposer setting out (in a tabular form) the items covered, in the case of generation, with the RfG Network Code for the four types of generation (A-D).

This table is shown below:

Technical Requirements	Type A	Type B	Type C	Type D
Operation across range of frequencies	•	•	•	•
Rate of change of System Frequency (ROCOF)	•	•	•	•
Limited Frequency Sensitive Mode Over Frequency (LFSM-O)	•	•	•	•
Output Power with falling Frequency	•	•	•	•
Logic Interface (input port) to cease active power production	•	•	•	•
Conditions for automatic reconnection	•	•	•	•
Operation across range of frequencies	•	•	•	•
Ability to reduce Active Power on instruction		•	•	•
Fault Ride Through and Fast Fault Current Injection		•	•	•
Conditions for automatic reconnection following disconnection		•	•	•
Protection and Control		•	•	•
Operational Metering		•	•	•
Reactive Capability		•	•	•
Active Power Controlability			•	•
Frequency Response including LFSM-U			•	•
Monitoring			•	•
Robustness			•	•
System Restoration / Black Start			•	•
Simulation Models			•	•
Rates of Change of Active Power			•	•
Earthing			•	•
Enhanced Reactive Capability and control			•	•
Voltage Ranges				•
Enhanced Fault Ride Through				•
Synchronisation				•
Excitation Performance				•

Using this summary table, the Workgroup member identified that with the potential alternative that Type A generators would only be obligated, in terms of their connection to the grid, to those items shown in the table (and so on for Types B, C and D). All other items would be considered more stringent unless it could be proven that there was no cross border trade affect of obligating generators to comply with further obligations over and above those in the RfG (and likewise in terms of the DCC for Demand and the HVDC for HCDV connecting parties).

Difference between this proposal and Original

This proposal will ensure that the GB code changes set out in GC0102 are not more stringent than the requirements set out in the RfG.

Justification for alternative proposal against Grid Code objectives

As per original.

Impact of the modification on the Relevant Objectives:	
Relevant Objective	**Identified impact**
To permit the development, maintenance and operation of an efficient, coordinated and economical system for the transmission of electricity	**Positive**
To facilitate 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**
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 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**
To promote efficiency in the implementation and administration of the Grid Code arrangements	**Positive**

In broad term the reasons why this proposal better meet the Applicable Objectives are as per the Original whilst, in addition, ensuring that the proposal is compliant with the Electricity Regulation and the EU Network (connection) Codes as the original proposal; in applying more stringent requirements on connecting generators, demand facilities and HVDC system than permitted by the EU Network (connection) Codes; is incompatible with the Electricity Regulation and the EU Network (connection) Codes.

Furthermore, when compared with the original, this alternative also better facilitates efficiency in the implementation and administration of the Code arrangements as it ensure that the solution to the Original defect is approvable and implementable.

Impacts and Other Considerations

As per the Original.

Consumer Impacts

As per the Original.

Implementation

As per the Original.

Legal Text

As per the Original, not yet agreed.

End of Potential Alternative section and forms submitted to the Code Administrator

8 Impact and Assessment

Impact on the Grid Code/ Distribution Code

The Grid Code and Distribution Code will bear the primary impact of the EU Connection Code mods. Some consequential changes are anticipated in the STC code especially from HVDC (primarily Section K - Technical, Design and Operational Criteria and Performance Requirements for Offshore Transmission Systems)

Impact on Greenhouse Gas Emissions

Impact on Core Industry Documents

The Transmission/Distributions connections and compliance processes will need to be altered to ensure they accommodate the new EU requirements as set out in the modified Grid Code and Distribution Codes.

The electrical standards documents owned by the Transmission Owners will need amending to accommodate the new requirements.

Impact on EU Network Codes

Impact on Consumers

This GC0102 modification facilitates the implementation of consistent technical standards across the EU for the connection of new Generation or HVDC equipment.

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

The EU Network Code implementation is being undertaken as a significant programme of work within the GB industry. This GC0102 modification forms part of that programme, but is not part of an on-going SCR.

9 Relevant Objectives – Initial assessment by Proposer

The EU Connection Codes derive from the Third Energy Package legislation which is focused on delivering security of supply, supporting the connection of new renewable plant, and increasing competition to lower end consumer costs. As such they support the first three Grid Code objectives.

In addition, this GC0102 modification seeks to ensure GB compliance with EU legislation in a timely manner, which positively supports the fourth Grid Code applicable objective.

Impact of the modification on the Grid Code Relevant Objectives:

Relevant Objective	Identified impact
To permit the development, maintenance and operation of an efficient, coordinated and economical system for the transmission of electricity	**Positive**
To facilitate 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**
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 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**
To promote efficiency in the implementation and administration of the Grid Code arrangements	**Neutral**

Impact of the modification on the Applicable Distribution Code Objectives:	
Relevant Objective	**Identified impact**
To permit the development, maintenance and operation of an efficient, coordinated and economical system for the distribution of electricity	**Positive**
To facilitate competition in the generation and supply of electricity	**Positive**
To efficiently discharge the obligations imposed upon distribution licensees by the distribution licences and comply with the Regulation and any relevant legally binding decision of the European Commission and/or the Agency for the Co-operation of Energy Regulators;	**Positive**
To promote efficiency in the implementation and administration of the Distribution Code	**Positive**

10 Implementation

This GC0102 modification must be in place to ensure the requirements of the EU Connection Codes are formally incorporated into the GB codes two years from the respective Entry Into Force dates (set out earlier in this Consultation).

It is critical that this work is concluded swiftly to allow industry the maximum amount of time to consider what they need to do to secure compliance.

This modification is required to be implemented into the Grid Code on 18th May 2018.

This GC0102 modification will be implemented into the Grid Code [and Distribution Code] ten Business Days after an Authority decision to approve the proposed change.

11 Workgroup Consultation questions

The GC0102 Workgroup is seeking the views of Grid Code Users and other interested parties in relation to the issues noted in this document and specifically in response to the questions highlighted in the report and summarised below:

Standard Workgroup Consultation questions:

1. Do you believe that GC0102 original proposal better facilitate the Applicable Grid Code Objectives?

2. Do you support the proposed implementation approach?

3. Do you have any other comments?

4. Do you wish to raise a Workgroup Consultation Alternative request for the Workgroup to consider?

The form to complete can be found here:

http://www2.nationalgrid.com/uk/industry-information/electricity-codes/grid-code/modifications/forms-and-guidance/

Specific GC0102 Workgroup Consultation Questions:

5. Do you have any comments on the structure of the proposed relationship between the D Code, G59 and G83, and G98 and G99? In particular which of the three options in Section 3.2 of this consultation do you support and why?

6. Do you agree with the organization of G99 and how it applies to the different Types of generation? Do you have any alternative suggestions for structure? (see page 11)

7. Do you agree with the current view of how the Grid and Distribution Codes (and G98 and G99) will be applied to installations where new PGMs are installed alongside existing pre-RfG equipment? (see 6.1.5 of Annex 8)

8. Do you agree on the introduction of a Preliminary Operation Notification relating to the Compliance process for Transmission connected Type B and Type C PGMs? (See Workgroup discussions section)

9. Do you agree with the retaining of the current GB arrangements for automatic connection and reconnection and the logic for it? If not, what alternative should be proposed? (see section 4.1.2)

10. Do you consider any parts of the proposed compliance, simulation or testing requirements for distribution-connected generators to be disproportionately onerous? (See section 5.2.5)

11. Do you agree it is appropriate to drop the designation Large and Small from the Distribution Code as proposed in section 3.3.1 of this consultation? Do you believe it is appropriate to drop the designation Large, Medium and Small from the Grid Code?

12. Do you have any comments on the draft requirements for fault recording equipment for distribution-connected Type C PGMs as drafted in Section 13.11 and Appendix C3 of G99? (Annex 8)

13. Do you agree that it is appropriate to include storage in G98 and G99, noting that as storage is explicitly excluded from the RfG, the technical requirements that arise solely from the RfG are not applied to storage in G09 and G99? (Annexes 6-9)

14. Do you agree that it is appropriate to include Type A PGMs <800W in capacity in G99, noting that those technical requirements that emanate from the RfG are not applied to PGMs <800W?

15. If you do not consider the proposed solution to sufficiently harmonise the connection requirements for new parties connecting to the transmission and distribution networks, how would you propose this to be addressed? (See Workgroup discussions section)

16. G98 and G99 include specific requirements for power quality, harmonic compliance etc. Do you believe it should be possible to use other international standards or requirements to achieve these ends such that these specific requirements can be dropped from these documents? An explanation of your views would be useful. (Annexes 6-9)

17. Do you agree that the explanation of type testing, both full and partial, and the inclusion of equipment certificates, is sufficiently clear and unambiguous in G99 drafting? Please make any suggestions that could add clarity. (Annexes 6-9)

18. The application of new technical requirements to non-type tested generation connecting to distribution networks will give rise to new processes etc. Please comment on how comprehensive the coverage of this is in the current drafting of G99 and please suggest any improvements. (Annexes 8-9)

19. Do you have any views on how the data and information required and articulated within G99 can or should relate to the Distribution Data Registration Code in the Distribution Code? (Annexes 8-9)

20. Do you believe that this modification helps to promote transparency across the Industry and if not which areas should be improved? (see Workgroup discussions section)

Legal drafting questions:

21. The Proposed draft Grid Code legal text contains a number of comments incorporating both internal and workgroup comments. Please feel free to provide further comment on the documents (Annex 1-5)

22. Do you have any views on the structure of the Grid Code drafting for System Management and Compliance? (Annex 2-5)

23. Are there are any areas in the Grid Code or Distribution Code drafting which you do not believe reflect the requirements of the RfG or HVDC Codes and, if so, why do you believe they are deficient? (Annex 1-9)

24. Please make any other comments on the legal text drafting for the Distribution Code, G98 and G99 using the appropriate templates issued with this consultation (Annex 13-15)

Please send your response using the Response Pro-forma which can be found on the National Grid website via the following link:

http://www2.nationalgrid.com/UK/Industry-information/Electricity-codes/Grid-code/Modifications/GC0102

In accordance with Governance Rules Section 8 of the Grid Code, any Authorised Electricity Operator; the Citizens Advice or the Citizens Advice Scotland, NGET or a Materially Affected Party may (subject to GR.20.17) raise a Workgroup Consultation Alternative Request. If you wish to raise such a request, please use the relevant form available at the web link below:

http://www2.nationalgrid.com/UK/Industry-information/Electricity-codes/Grid-code/Modifications/Forms-and-guidance/

Views are invited upon the proposals outlined in this report, which should be received by **5pm** on **Thursday 9 November 2017.** Your formal responses may be emailed to: grid.code@nationalgrid.com

Please note that the information provided in response to this consultation will be published on the National Grid website unless the response is clearly marked "Private & Confidential". If this is the case, the Code Administrator will make contact with the person submitting the response to establish the extent of the confidentiality. A response marked "Private & Confidential" will be disclosed to the Authority in full, but (and unless otherwise agreed) it will not be shared with the Grid Code Review Panel or the industry and may, therefore, not influence the debate to the same extent as a non-confidential response.

Please note that an automatic confidentiality disclaimer generated by your IT System will not in itself render your response "Private and Confidential".

Please note that you can also send responses directly to the Authority.

Annex 1 – Draft Planning Code

Given the length and complexity of the text, please see separately attached document. Please note that this draft legal text has been provided by the Proposer and is yet to be throughly reviewed by the Workgroup.

Annex 2 –Draft Connection Conditions – Legal Text (ECC)

Given the length and complexity of the text, please see separately attached document. Please note that this draft legal text has been provided by the Proposer and is yet to be throughly reviewed by the Workgroup.

Annex 3 – Draft Connection Conditions – Legal Text (ECP)

Given the length and complexity of the text, please see separately attached document. Please note that this draft legal text has been provided by the Proposer and is yet to be throughly reviewed by the Workgroup.

Annex 4 – Draft OC5 - Legal Text

Given the length and complexity of the text, please see separately attached document. Please note that this draft legal text has been provided by the Proposer and is yet to be throughly reviewed by the Workgroup.

Annex 5 – Draft EDRC – Legal Text

Given the length and complexity of the text, please see separately attached document. Please note that this draft legal text has been provided by the Proposer and is yet to be throughly reviewed by the Workgroup.

Annex 6 – Draft Distribution Code – Legal Text

Given the length and complexity of the text, please see separately attached document.

Annex 7 – G98 Draft Legal Text

Given the length and complexity of the text, please see separately attached document.

Annex 8 – G99 Draft Legal Text

Given the length and complexity of the text, please see separately attached document.

Annex 9 – G99 Appendices

Given the length and complexity of the text, please see separately attached document.

Annex 10 – Solution Doc 1 RfG System Management Requirements

As above

Annex 11 – Solution Doc 2 Additional HVDC System Management Requirements

As above

Annex 12 – Solution Doc 3 Slides from Compliance Workshop

http://www2.nationalgrid.com/UK/Industry-information/Electricity-codes/Grid-code/Modifications/GC0102/

Annex 13 – D Code Legal Text Comments Form

Annex 14 – G98 Legal Text Comments Form

Annex 15 – G99 Legal Text Comments Form