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GC0102 – System Management & Compliance

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Agenda

- **Timeline**
- **Compliance**
- **System Management**
- **AOB**

Timeline Proposed to Panel

Milestones	Dates
Grid Code Panel Approval	21 June 2017
Distribution Code Panel Approval	w/c 3 July 2017
Workgroup Meeting 1	6 July 2017
Workgroup Meeting 2	August 2017
Workgroup Meeting 3	September 2017
Workgroup Consultation (15 Working days)	September 2017
Workgroup Meeting 4	October 2017
Workgroup Report presented to Panel	15 November 2017
Code Administration Consultation Report issued to the Industry	17 November 2017
Draft Final Modification Report presented to Panel	12 December 2017
Modification Panel Recommendation vote	20 December 2017
Final Modification Report issued the Authority	10 January 2018
Authority decision due (25WDs)	14 February 2018
Decision implemented in Grid Code	01 March 2018

Compliance

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Introduction

- Compliance, as in the existing GB arrangements, remains the responsibility of the generator. The generator has to demonstrate compliance to the relevant system operator.
- Compliance requirements need to be clearly articulated by the network operators
- The network licensees are working on specifying how compliance can be demonstrated in GB
- The network licensees are very keen that the issues, especially the new ones, are discussed and debated with stakeholders.
- Two stages of formal public consultation are expected probably in early and late Autumn.
- We will start with RfG then build HVDC and DCC on top of this.

Background

- The RfG has three main effects on compliance:
  - For transmission connected, and the largest distribution connected (eg >50MW), limited effects (broadly similar to current GB Compliance Process)
  - For Types A, B and C (assuming Distribution connected), new compliance and simulation requirements, particularly with respect to basic capabilities and fault ride through
  - The (possible) introduction of the Equipment Certificate

Background (2)

- The relevant parts of the RfG are:
  - Article 29-33 Operational Notification
  - Article 40-44 Compliance Monitoring
  - Article 44-46 Compliance testing for synchronous
  - Article 47-50 Compliance testing for PPMs
  - Article 51-53 Compliance simulation for synchronous
  - Article 54-56 Compliance simulations for PPMs
- Network Licensees (ie NGET SO and the DNOs) often referred to as Relevant System Operator – ie SO or DNO as appropriate

Type A

- Full connexion requirements will be codified in G99 (and G98 for fully type tested Type A)
- As far as possible technical requirements will be based on EN 50438 and TS 50549.
- Additional GB connexion process and legal requirements included
- Testing and compliance requirements will be included in G99/98.
- Note that Types B and C will also be included in G99

Type B

- Under RfG (Article 32), the Type B (and Type C) Compliance Process requires submission of a PGMD (Power Generating Module Document)
  - Evidence of co-ordination of Protection and Control Settings
  - Itemised Statement of Compliance
  - Detailed Technical data of the PGM as required by the Relevant System Operator
  - Manufacturers' data and/or equipment certificates where they are relied on as evidence of compliance
  - Compliance Reports demonstrating steady state and dynamic performance as required by Chapters 2, 3 and 4 of Title IV including actual measured values
  - Studies demonstrating steady state and dynamic performance as required as required by Chapters 5, 6 or 7 of Title IV to the level of detail required by the Relevant System Operator
  - 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.

Type C

- Under RfG, the (Type B and) Type C Compliance Process requires submission of a PGMD (Power Generating Module Document)
  - Evidence of co-ordination of Protection and Control Settings
  - Itemised Statement of Compliance
  - Detailed Technical data of the PGM as required by the Relevant Network Operator
  - Manufacturers' data and/or equipment certificates where they are relied on as evidence of compliance
  - Compliance Reports demonstrating steady state and dynamic performance as required by Chapters 2, 3 and 4 of Title IV including actual measured values
  - Studies demonstrating steady state and dynamic performance as required as required by Chapters 5, 6 or 7 of Title IV to the level of detail required by the System Operator
  - The Relevant System Operator on acceptance of a complete and adequate PGMD shall issue a FON to the Power Generating Facility Owner.
- For Type C Power Generating Modules – Simulation Models are required as defined under Art 15(6)

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Power Generating Module Documents

- The RfG requires a PGMD for all Type B and C.
- In GB the concept will also be applied to Type A – although the RfG calls this an Installation Document
- The ID will call for evidence (ie references) of Equipment Certificates or manufacturers type testing information
- Type A and B will need to produce information in the format already in use in G83 and G59 – although of course updated to reflect new RfG technical and administrative requirements in G98 and G99.
- T connected generators already produce relevant compliance data in a structured format for NGET – in GC in the Grid Code – User Data File Structure provided by NGET (UDFS)
- Embedded Type C will probably need something similar to the NGET approach, although a subset of it – to be documented in G99.
- In other words the ID or PGM will be specified in G98 and G99 for D connected Type A to C

Type A

- RfG prominently expects Equipment Certificates to be used for mass market generating modules
- No clear route for manufacturers to set up an Equipment Certificate regime.
- ENTSO-e have suggested via the European Stakeholder Committee that national solutions should be found to ensuring compliance
- Art 30.2(g) allows for manufacturers' compliance information in a form other than Equipment Certificates
- Key compliance requirements for Type A are the frequency range capabilities, LFSM-O characteristic and G98/G99 protection requirements.
- These will be specified in G98/G99 much as the protection requirements currently are in G59/G83

Type B & C

- Under RfG (Article 32), the Type B (and Type C) Compliance Process requires submission of a PGMD (Power Generating Module Document)
  - Evidence of co-ordination of Protection and Control Settings
  - Itemised Statement of Compliance
  - Detailed Technical data of the PGM as required by the Relevant Network Operator
  - Manufacturers' data and/or equipment certificates where they are relied on as evidence of compliance
  - Compliance Reports demonstrating steady state and dynamic performance as required by Chapters 2, 3 and 4 of Title IV including actual measured values
  - Studies demonstrating steady state and dynamic performance as required by Chapters 5, 6 or 7 of Title IV to the level of detail required by the System Operator
  - The Relevant System Operator on acceptance of a complete and adequate PGMD shall issue a FON to the Power Generating Facility Owner.
  - Note Art 15(6(c)) requires submission of Simulation models for Type C and above yet the Compliance process requires the results from simulation models for Type B and above.

Approach and Next Steps

- Key principles are to look for the most efficient implementation that complies with new and existing legal requirements
- Duplicate the compliance processes and OC5 sections of the Grid Code to form the ECP and EOC5.
- This will provide clarity to new users to follow the requirements in the ECP and EOC5.
- Existing compliance requirements would apply to existing users in the CPs and OC5.

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System Management

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Introduction

- RfG System Management consists of:
  - Automatic Reconnection
  - Operational Metering
  - Protection
  - Control
  - Synchronising
  - Monitoring
  - Simulation Models
- There are a few extra topics in HVDC and DCC that will be added.

Update and Next Steps

- “Table of System Management topics” was discussed at previous workgroup and is helping us form our proposal for GC0102. (this can be found on the GC0102 website page).
- This has since received further comments and we will update accordingly.
- We will be aiming to have a draft work group report in October.

AOB

Large/Medium/Small vs RfG Banding (A-D)

06/09/2017

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Introducing 'Large/Medium/Small'

- Registered Capacity – a term introduced at vesting is used in various documents, the most notable of which are the Grid Code (GC) and the Licence Standard.
- The value of the term is used in the setting of regulatory, licence and Grid Code requirements in respect of Power Station size – either Small, Medium or Large.
- That classification, in turn, determines whether:
  - The particular plant requires a licence and/or which parts of the Grid Code must be complied with.
  - The application of the Licence Standard, transmission infrastructure planning and transmission connection planning;
  - Defining the size of a Power Station for regulatory, GC compliance and other purposes (e.g. Large, Medium and Small Power Stations);
  - Evaluating Plant Margins; and
  - Charging purposes (e.g. setting TNUoS);

Introducing RfG Types ("A-D")

- EU Code 'Requirements for Generators' (RfG) entered into force on 17th May 2016. It must be implemented by Member States two years later (17/05/2018)
- 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 their maximum capacity
- Four categories - Types "A-D" - are specified for this; each having a connection voltage level and a maximum capacity associated
- TSOs are able to propose their own capacity ranges locally (subject to NRA approval) at or below the maximums set in the code:

Synchronous Area	Limit for the maximum capacity threshold from which a power-generating module is of Type B	Limit for the maximum capacity threshold from which a power-generating module is of Type C	Limit for the maximum capacity threshold from which a power-generating module is of Type D*
Great Britain	1 MW	50 MW	75 MW

*** Regardless of maximum capacity, power-generating modules are designated Type D by default if they connect at 110kV or greater**

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What does RfG Banding do?

- Applies technical requirements proportionately based on unit capacity/connection voltage:

Technical Requirements	Type A	Type B	Type C	Type D
Operation across a range of frequencies	●	●	●	●
Limits on active power output over frequency range	●	●	●	●
Rate of change of frequency settings applied (likely to be at least 1Hz/sec)	●	●	●	●
Logic interface (input port) to cease active power output within 5 secs	●	●	●	●
Ability to automatically reduce power on instruction		●	●	●
Control schemes, protection and metering		●	●	●
Fault Ride Through requirements		●	●	●
Ability to reconnect		●	●	●
Reactive capability		●	●	●
Reactive current injection		●	●	●
Active power controllability			●	●
Frequency response			●	●
Monitoring			●	●
Automatic disconnection			●	●
Optional Black start			●	●
Stable operation anywhere in operating range			●	●
Pole slipping protection			●	●
Quick resynchronisation capability			●	●
Instrumentation and monitoring requirements			●	●
Ramp rate limits			●	●
Simulation models			●	●
Wider Voltage ranges / longer minimum operating times				●
Synchronisation on instruction				●
Enhanced Fault Ride through				●

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Comparison – Generator Categories RfG v GB

Requirements for Generators (GB-wide) 2018- *GC0100 NGET Banding Proposal*			
Type A 800W – 0.99MW	**Type B** 1MW – 9.999MW	**Type C** 10MW- 49.999MW	**Type D** 50MW +

GB Arrangements						
Small			**Medium**	**Large**		
North Scotland	South Scotland	England & Wales	England & Wales	North Scotland	South Scotland	England & Wales
9.99 MW or less	29.99 MW or less	49.99 MW or less	50MW- 99.99 MW	10 MW+	30 MW+	100 MW+
Potential Map to Banding Level above:						
Type A/B	Type A/B/C	Type A/B/C	Type D	Type C/D	Type C/D	Type D

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Comparison – Generator Categories RfG v GB

Requirements for Generators (GB-wide) 2018- *GC0100 Generator Alternative Banding Proposal*			
Type A 800W – 0.99MW	**Type B** 1MW – 49.999MW	**Type C** 50MW- 74.999MW	**Type D** 75MW +

GB Arrangements						
Small			**Medium**	**Large**		
North Scotland	South Scotland	England & Wales	England & Wales	North Scotland	South Scotland	England & Wales
9.99 MW or less	29.99 MW or less	49.99 MW or less	50MW- 99.99 MW	10 MW+	30 MW+	100 MW+
Potential Map to Banding Level above:						
Type A/B	Type A/B	Type A/B	Type C/D	Type B/C/D	Type B/C/D	Type D

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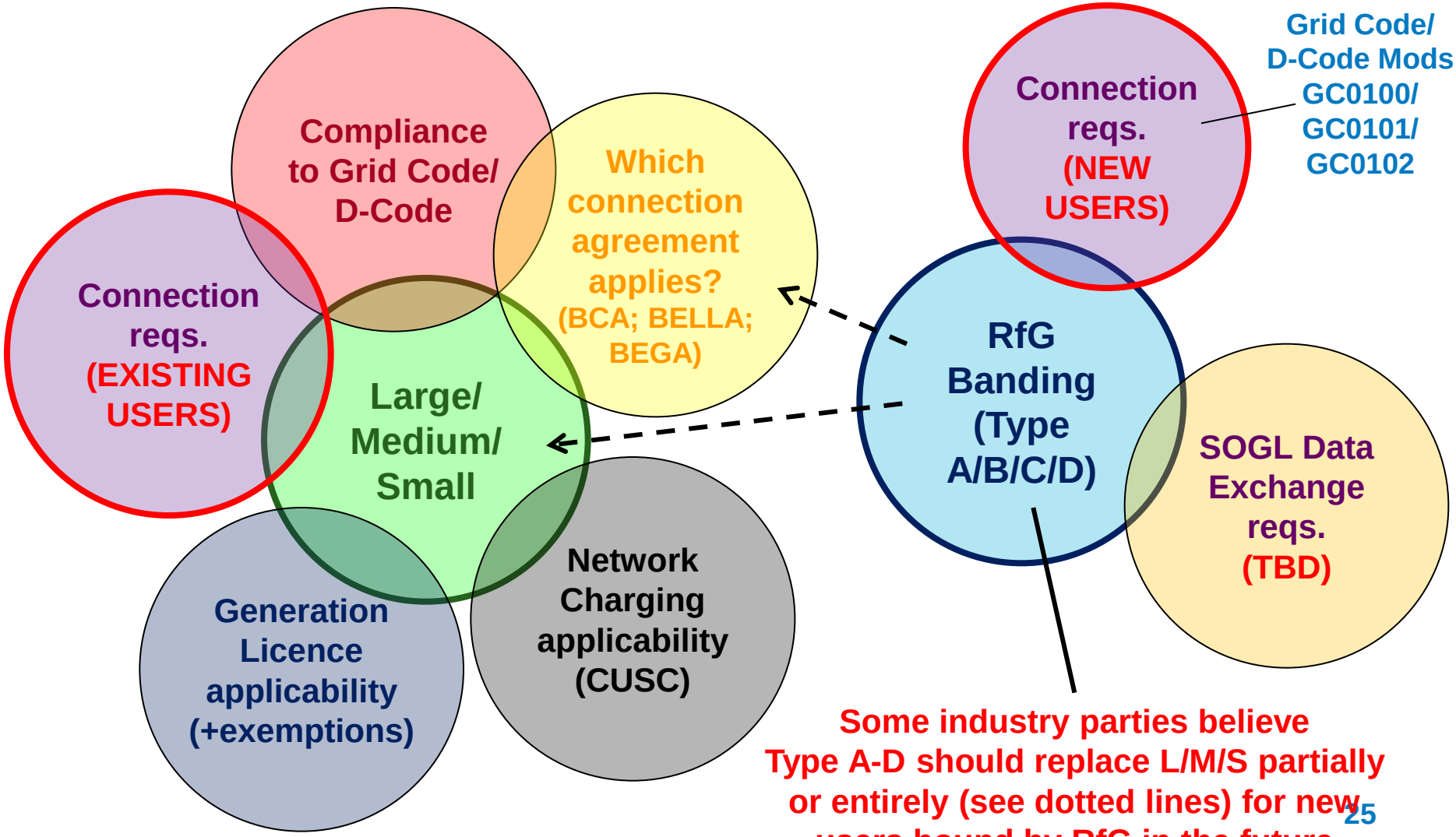
What do L/M/S vs. Type A-D determine?



Some industry parties believe Type A-D should replace L/M/S partially or entirely (see dotted lines) for new users bound by RfG in the future

Proposer Position on Banding vs. L/M/S

- RfG banding will ***only*** set the level of technical capability required for a new user connecting to the Transmission or Distribution system (as per slide 4)
  - In future, it will also be used for determining the extent to which new and existing parties must exchange data with System Operators under the SOGL
- A new user shall still be determined as "Large/Medium/Small" for the purposes of other compliance obligations elsewhere, such as licencing; wider compliance to the Grid Code (beyond 'Connection Conditions'), and Charging