GC0117

Improving transparency and consistency of access arrangements across GB by the creation of a pan-GB commonality of PGM requirements

Summary of GC0117

SSE Generation proposal to align size thresholds for generators across GB

- Raised by SSE Generation in 2018 with the aim of harmonisation across GB
- The workgroup was on hold for 2 years due to the need to introduce other EU requirements (eg Emergency & Restoration Code)
- The Grid Code size bandings for Power Stations differ across the GB transmission regions. This modification aims to align the definitions so the same approach applies irrespective of Transmission Area
- It may materially change (increase / decrease) BM participation and system support.
- The S/M/L categorisation is one of several factors that determine which obligations apply to generators (along with transmission region and connection type)
- A Large Power Station must be a BM participant, have a connection agreement with the ESO and adhere to the CUSC and Grid Code.
- For embedded generators below the Large threshold, joining the BM is optional.
- The technical requirements for new generators were aligned via RfG with Types A-D now applying and being the same across the whole of GB.
- This leaves the connection process and BM participation to be determined by the S/M/L thresholds.
- The proposal is for the changes to only apply to new or substantially modified generators

History of the current bandings

- The concept of Large, Medium and Small Power Stations was introduced at Vesting (privatisation) in 1990.
- At that time, there were two separate Grid Codes, one for England & Wales (E&W) and one for Scotland.
- The thresholds were based on Registered Capacity and varied across the three TO regions.
- This was a product of the relative volume of generation in the three TO regions. A generator in the north of Scotland would have a bigger impact on the local system than in the south of Scotland or E&W, where there's more generation and a more robust, less radial network.
- Therefore it was important for generators of 10MW in SHE and 30MW in SP to meet certain technical requirements and sign the CUSC (which means they must have an agreement with the ESO and meet the requirements of Grid Code).
- In England and Wales, the more onerous obligations only applied above 100MW although limited technical requirements apply to Medium Power Stations which have largely been replaced by RfG.
- These arrangements were put in place at a time before there were significant volumes of distributed generation.

Requirements for Generators (RfG)

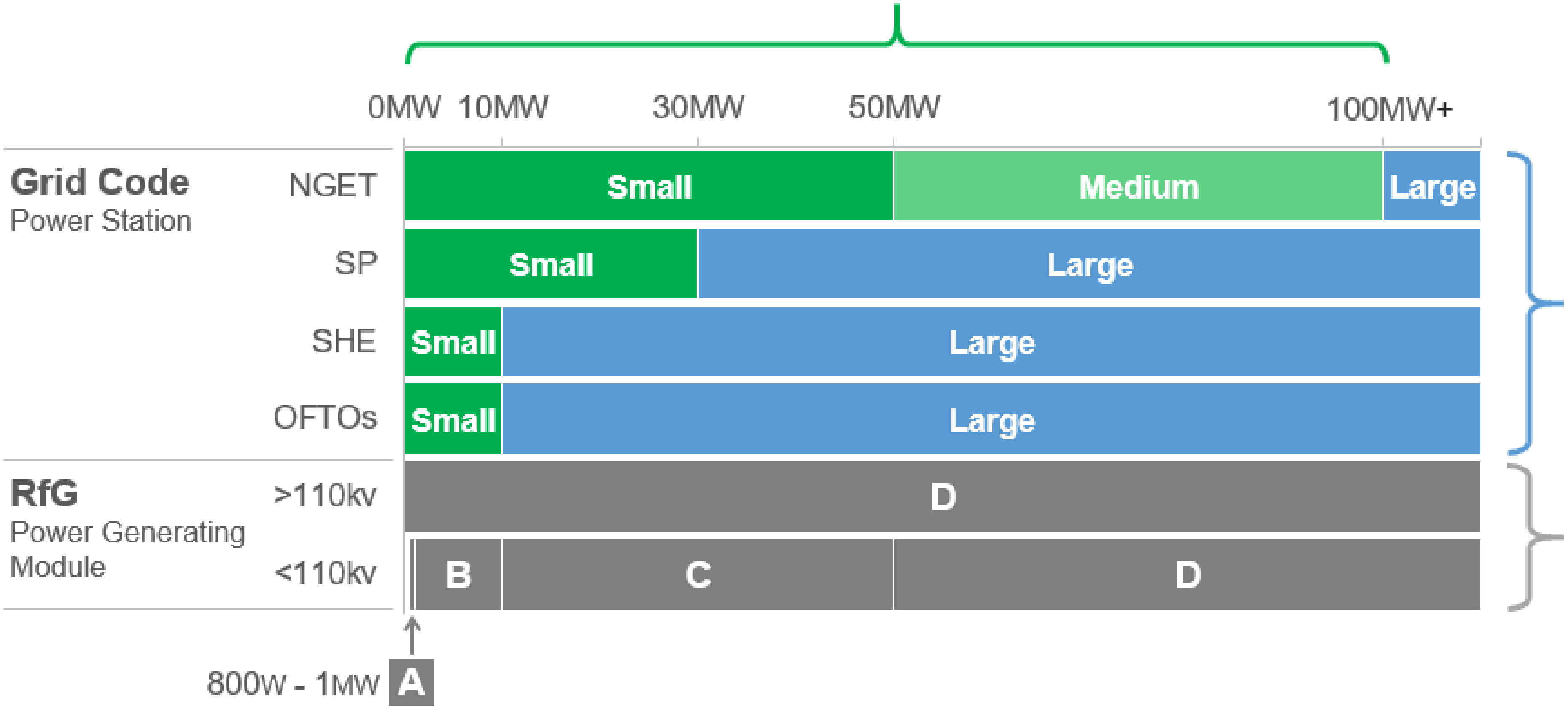
Thresholds for Types A, B, C and D were defined via GC0100 in 2018

- The original S/M/L thresholds defined the technical requirements and the connections process.
- In 2018, as part of the European Third Energy Package, the Requirements for Generators (RfG) code was introduced which puts technical requirements on generators in four capacity bands, A, B, C and D.
- The RfG requirements specify a ceiling for each band, but required national TSOs to set their levels and ratify them via an industry consultation and regulatory authority approval.
- This was done through a similar development process (GC0100) as will be followed for GC0117.
- Ofgem's decision supported bandings that were lower than the possible maximums.

Current thresholds & obligations (simplified view)

Embedded Small & Medium

- Must have an agreement with the relevant DNO
- Must adhere to DCUSA & Distribution Code
- Option to join the BM and be subject to the 'Large' requirements



Embedded Large

- Must be in the BM
- Must have a connection agreement with NGESO
- Must adhere to CUSC, Grid Code, DCUSA and Distribution Code

Technical requirements

- determined by RfG Types A, B, C and D.

nationalgridESO

RfG Technical Requirements

Type A (up to 1MW)

- 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)
- Communication capability requirements

Type A/B requirements are closer to a manufacturer standard

Type B (1-10MW)

All of Type A plus:

- Ability to automatically reduce power on instruction
- Control schemes, protection and metering
- Fault ride through requirements (complex area) - prevents faults causing cascade tripping
- Ability to reconnect
- Reactive capability
- Reactive current injection

Type C (10-50MW)

All of Type B plus:

- Active power controllability
- Frequency response
- Monitoring
- Automatic disconnection
- Black start
- Stable operation anywhere in operating range
- Pole slipping protection
- Quick resynchronisation capability
- Instrumentation and monitoring requirements
- Ramp rate limits
- Simulation models

Type D (50MW+ or >110kv)

All of Type C plus:

- Wider Voltage ranges / longer minimum operating times
- Synchronisation on instruction
- Fault ride through - same as for Type B but with some changes to parameters

Types C/D are associated with much more active real-time response capabilities, particularly frequency control and ancillary service provision

When is a generator caught by Grid Code requirements?

This is defined under section 6.3 of the CUSC but in summary the following rules apply:-

The Grid Code applies when a generator is either:

1. **Directly connected** (irrespective of being Small, Medium or Large)
2. **Large** (irrespective of being either Embedded or Directly connected)
3. **Embedded, Medium or Small**, applies for TEC and has an agreement with the ESO

What type of connection agreements apply?

BCA	Bilateral Connection Agreement	• A CUSC Contract which applies between the ESO and any directly connected party irrespective of being Demand or Generation
BEGA	Bilateral Embedded Generation Agreement	• A CUSC Contract which applies between the ESO and any Embedded Generator who has applied for TEC. All Large Embedded Power Stations greater than 100MW must have a BEGA. • Any Embedded Generator in E&W under 100MW can apply for TEC if they so wish. In this case a BEGA would still be used.
BELLA	Bilateral Exemptible Large Licence Exempt Generator Agreement	• Only apply in Scotland and applicable to Large Power Stations under 100MW. • BELLA's do not have TEC • They have to meet the requirements of the Grid Code applicable to Large Power Stations • They will need to meet the applicable requirements of the Grid Code including the requirements of BC1 and BC2 (a requirement of the Bilateral Agreement) but are classed as Generating Units and not BM Parties for which the requirements are different.

*Note re **LEEMPS** (License Exemptible. Embedded Medium Power Station): Specific agreements do not exist in respect of LEEMPS – this is achieved through the BCA between National Grid and the DNO (Appendix E)*

What other requirements apply?

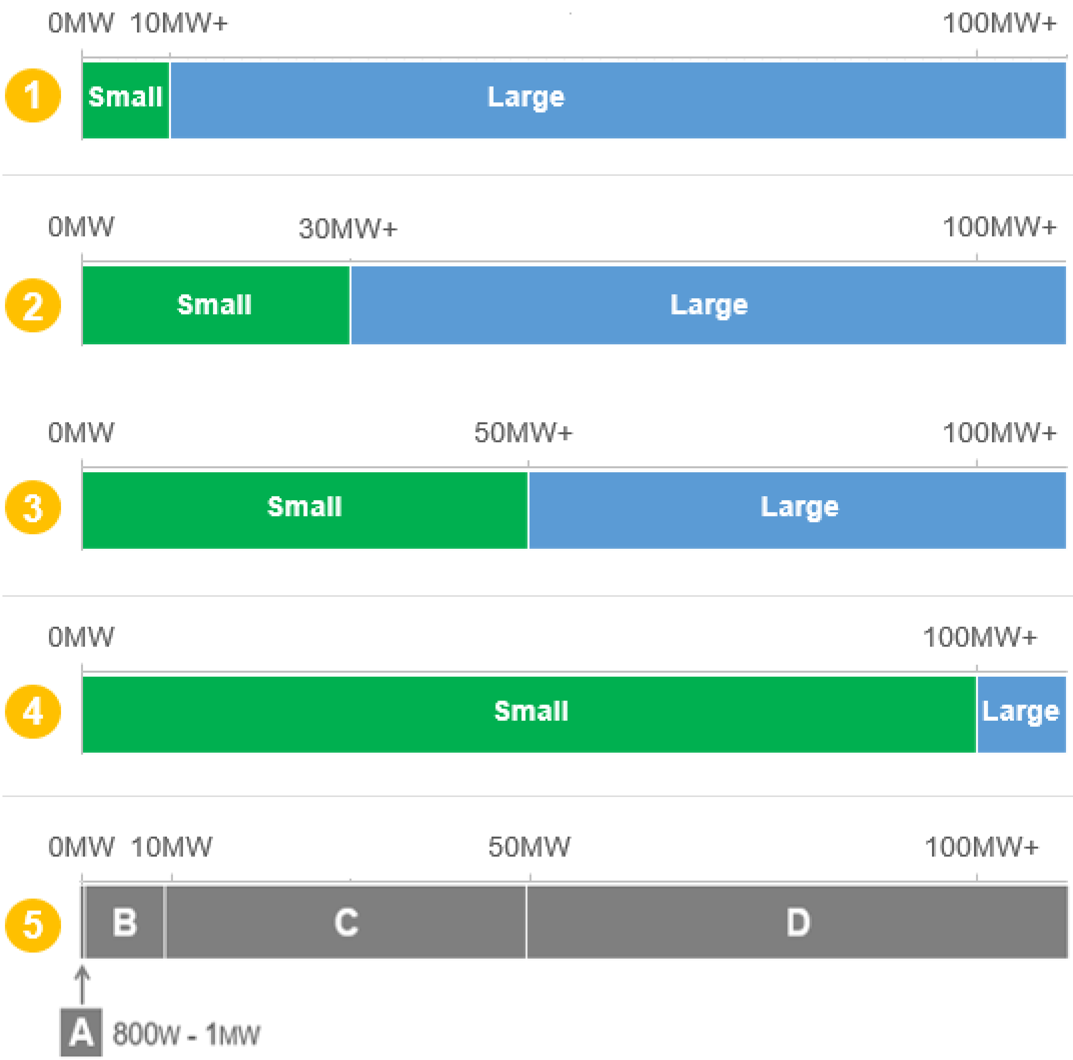
Generator type	Requirements
Any Generator who: • owns a Power Station (irrespective of size) which is **directly connected** • owns a **Large Embedded Power Station of 100MW or greater**	**Must be in the Wholesale Market (i.e. in the BM).**
Any Generator who owns an **Embedded Power Station and less than 100MW** *(Note special arrangements apply in Scotland – see BELLA's below)*	**Can choose to be in the BM** This would mean they apply for TEC.
LEEMPS (England and Wales only, 50–100MW)	**Not required to be in the BM**
BELLAs	**Required to meet the applicable requirements of the Grid Code including BC1 and BC2** as a condition of their Connection Agreement, but they are treated as Generating Units not BM Parties and therefore a form of BM subset.

nationalgridESO

How is consistency best achieved across GB?

- To adopt a consistent set of thresholds for Large, (Medium and) Small across GB.
- One approach is to define two new thresholds between Large and Small with Medium being removed – Several options are under consideration – see subsequent slide
- This would apply across the whole of GB
- LEEMPS would/could be removed.
- Code changes are believed to be minimal as most changes are made to the definitions between Large, (Medium) and Small
- Other options could be considered

5 potential options



Option 1

- increases visibility to the ESO and could reduce balancing costs whilst enabling greater use of services from smaller players.
- increases costs for the ESO, DNO's and generators with respect to agreements and metering issues

Options 2 & 3

- Some of the benefits and costs of the more extreme options, but are not necessarily the cheapest or most efficient.

Option 4

- Reduces visibility to the ESO and could increase balancing costs whilst reducing the ability to utilise services from smaller players unless they choose to participate in the BM.
- reduce costs for the ESO, DNO's and Generators with respect to agreements and metering issues but not necessarily BM costs

Option 5

- Requirements for Power Stations could be linked to the RFG Types A-D rather than Small, Medium and Large

nationalgridESO

Potential aggregator approach

This could apply with any of options 1-5

Power Station spec	BM requirements
(a) Directly connected, or above 100MW	→ **Must be in the BM**
(b) Embedded and below a certain MW capacity (level to be agreed)	Can either: → **Become a BM participant** in their own right → **Appoint an aggregator** to do their trading: • the embedded plant would submit the data to the aggregator who then send to the ESO. • instructions are issued by the ESO to the Aggregator who then send the instructions to their portfolio generators.

Implications & considerations

- Changes to the Grid Code
- Retrospectivity options:
  1. No retrospectivity – changes apply from a future point in time
  2. Retrospective for EU code users only – those caught by the EU connection network codes (RfG, DCC, HVDC)
  3. Retrospective for all users (in terms of data requirements only – this would be consistent with the requirements of SOGL for all significant grid users)
- Volumes involved for each option
- Costs – both to generators and the ESO/DNO's
- Benefits
- Impacts on other industry codes

Expected changes to the Grid Code

- Irrespective of the option eventually selected, Grid Code and Distribution Code changes are expected to be minimal. This could be slightly more involved where the Aggregator option is selected
- Medium Power Stations would be removed including LEEMPS
- Data requirements would be consistent across the whole of GB (Structural, Scheduled and Real Time) and therefore achieves the requirements of SOGL
- The BELLA Approach would effectively be applied across the whole of GB (Options 1 – 3 only)
- Option 4 simply sets the threshold between Large and Small at 100MW
- Any Plant which is 100MW or greater or directly connected would have to be in the BM
- Any Plant which is Large and less than 100MW (Options 1 – 3 only) would be treated in the same way as a BELLA unless they choose to apply for TEC in which case they would become a BEGA – This is the choice of the generator
- Additional changes may be required if the aggregator approach is taken
- In summary, the existing Grid Code requirements would apply other than removal of Medium Power Stations and changes to the definitions
- Consequential changes to other industry codes including the Distribution Code would need to be assessed.

Appendix 1

Options 1-5 with pros and cons

nationalgridESO

Option 1 Align to **10MW** Large threshold

Pros

- ✓ Achieves wider BM access
- ✓ Aligns with current SHE and OFTO thresholds
- ✓ Aligns with RfG Type B-C threshold
- ✓ Gives operational support at lower sizes than currently in SP and NGET TO areas
- ✓ Aligns with proposed GC0134 threshold for 24/7 telephony

Cons

- × Cost to generators in SPT and NGET areas that become ‘large’
- × Cost to ESO to manage more BMUs, connection agreements and data
- × May cut across DNO Open Networks work which considers interaction between transmission and distribution including embedded generation

Option 2 Align to **30MW** Large threshold

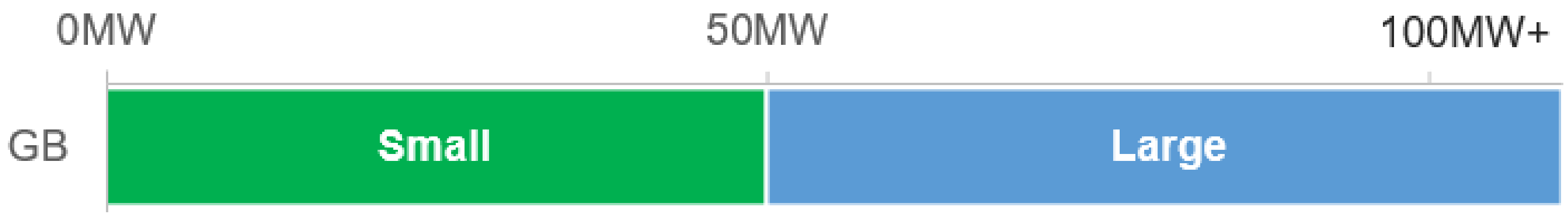
Pros

- ✓ Achieves wider BM access in England & Wales
- ✓ Aligns with current SP thresholds
- ✓ Gives operational support at lower sizes currently in NGET TO area

Cons

- ✗ Cost to generators in SPT and NGET areas that become 'large'
- ✗ May cut across DNO Open Networks work which considers interaction between transmission and distribution including embedded generation

Option 3 Align to **50MW** Large threshold



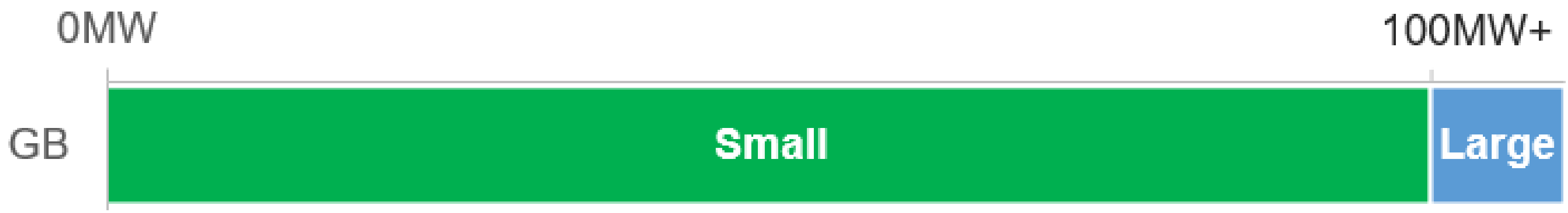
Pros

- ✓ Achieves wider BM access in England & Wales
- ✓ Gives operational support at lower sizes in NGET area

Cons

- × Cost to generators in NGET area that become ‘large’
- × Reduction in system support in SHE and SP areas
- × May cut across DNO Open Networks work which considers interaction between transmission and distribution including embedded generation

Option 4 Align to **100MW** Large threshold



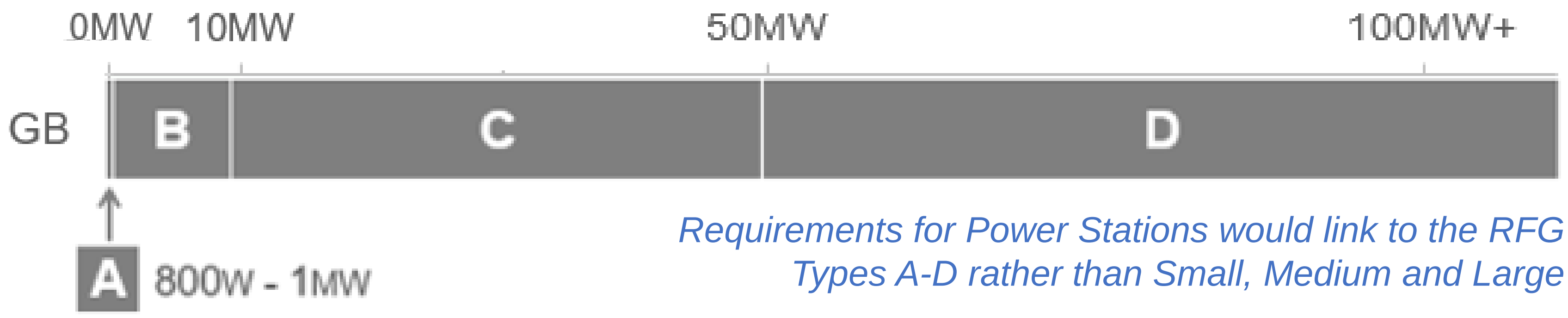
Pros

- ✓ Aligns with current NGET threshold
- ✓ Reduction in costs to smaller generators, particularly in SHE and SP areas (need to consider treatment of ‘medium’ in NGET area)

Cons

- × Reduces mandatory BM participation
- × Does not align with any RFG thresholds
- × Reduces operational support in SHE and SP areas
- × Reduces ability to utilise the technical capability of embedded generators
- × May not resolve the issue of Medium in E&W

Option 5 Align to **RFG Type A-D** thresholds



Requirements for Power Stations would link to the RFG Types A-D rather than Small, Medium and Large

Pros

✓ One set of thresholds (Type A-D) would determine a range of obligations including technical requirements, the connections process and BM participation

Cons

× Would be a more complicated solution requiring more substantial changes to code

× If not applied retrospectively, there would be additional legal text complications

❖ *Other impacts would depend on the details of this solution*

Appendix 2
Grid Code requirements and impacts

Grid Code requirements: Transmission connections

Requirements for Small, Medium and Large Power Stations

Grid Code requirement	Directly Connected **Small**	Directly Connected **Medium**	Directly Connected **Large**
Planning Code	✓	✓	✓
European Connection Conditions	✓	✓	✓
European Compliance Processes	✓	✓	✓
Operating Codes	✓	✓	✓
Balancing Codes	✓	✓	✓
Data Registration Code (DRC)	✓ *	✓ *	✓ *

** Whilst directly connected Small, Medium and Large Power Stations will have to submit data under the Data Registration Code, the categories of data to be submitted under the DRC are different between Small, Medium and Large Power Stations.*

DRC Structural and Scheduled data differences (1)

Transmission Connected Small, Medium and Large Power Stations

Grid Code requirements		Directly Connected **Small**	Directly Connected **Medium**	Directly Connected **Large**
Schedule 1	**Power Generating Module and HVDC Data**	✓	✓	✓
Schedule 2	**Generating Planning Parameters**		✓ (part)	✓
Schedule 3	**Large Power Station Outage Programmes, Output Useable and Flexibility Information**			✓
Schedule 4	**Large Power Station Droop and Response Data**			✓
Schedule 5	**Users System Data**	✓	✓	✓
Schedule 6	**Users Outage Information**	✓	✓	✓
Schedule 7	**Load Characteristics at Grid Supply Points**			
Schedule 8	**Data supplied by BM Participants**	✓	✓	✓
Schedule 9	**Data supplied by The Company to User's**	✓	✓	✓

DRC Structural and Scheduled data differences (2)

Transmission Connected Small, Medium and Large Power Stations

Grid Code requirements		Directly Connected **Small**	Directly Connected **Medium**	Directly Connected **Large**
Schedule 10	**Demand Profiles and Active Energy Data**			
Schedule 11	**Connection Point Data**			
Schedule 12	**Demand Control**			
Schedule 13	**Fault Infeed Data**			
Schedule 14	**Fault Infeed Data (Generators)**	✓	✓	✓
Schedule 15	**Mothballed Generating and HVDC Data**	✓	✓	✓
Schedule 16	**Black Start Information**			✓
Schedule 17	**Access Period Data**			
Schedule 18	**Offshore Transmission System Data**			
Schedule 19	**User Data File Structure Data**	✓	✓	✓

nationalgridESO

Grid Code requirements: Embedded connections

Requirements for Small, Medium and Large Power Stations

Grid Code requirement	Embedded Small	Embedded Small (BEGA)	LEEMPS	Embedded Medium (BEGA)	BELLA	Embedded Large
Planning Code	✘	Part	Part as defined under PC3.3	✓	✓	✓
European Connection Conditions	✘	ECC.6.5 (Equivalent RfG requirements would be picked up under the D Code)	Part as defined under ECC3.3	✓	Except EDL	✓
European Compliance Processes	✘	✓	✘	✓	✓	✓
Operating Codes	✘	Part	✘	✓	✓	✓
Balancing Codes	✘	Only in respect of them operating as a BM Participant	✘	Part	BC1/2 apply only in respect of Generating Units not BM Units BC3 does not apply	✓
Data Registration Code	✘	Only in respect of them operating as a BM Participant	As required under PC	✓ (part)	Yes (part)	✓

nationalgridESO

EXAMPLE What would an **Embedded Small** Power Station have to do if in the future it became an **Embedded Large** Power Station?

- Satisfy the applicable requirements of the Grid Code and sign CUSC
- Comply with the requirements of the Planning Code, Operating Codes, Connection Conditions or European Connection Conditions (as applicable), Compliance Processes or European Compliance Processes, Balancing Code 1 & 2 and Data Registration Code.
- Compliance with the Connection Conditions for pre RfG plant is expected to be a real issue as they are generally exempt from these requirements. Some form of exemption is likely here other then in respect of CC.6.5 as it would otherwise make a number of projects uneconomic. Compliance is also expected to be an issue.

- The main additional requirements would be:
  - Signature to the CUSC and implications on charging
  - Comply with the applicable requirements of the Grid Code
  - New Connection Agreements for existing Small Parties caught by the New thresholds
  - Submission of Static, Scheduled and Real time data
  - Mechanisms of receiving real time data
  - Some areas of synergy could be developed by identifying those obligations that such Generators have to provide under the Distribution Code

EXAMPLE

Comparison between current arrangements for:

- a 40MW Embedded Power Station in **England and Wales**
- a 40MW Embedded Power Station in **Scotland**

Requirements	40MW Embedded Power Station in **E&W**	40MW Embedded Power Station in **Scotland**	**Cost of making changes**
CUSC Signatory	✗	✓	To be discussed – different options and conditions apply
Comply with Grid Code	✗	✓	
Planning Code Data Submissions	✗	✓	
Connection Conditions inc Control Telephony, Operational metering and EDT	✗	✓	
Compliance Processes	✗	✓	
Operating Codes	✗	✓	
Balancing Codes 1 and 2	✗	✓	
Data Registration Code	✗	✓	

nationalgridESO