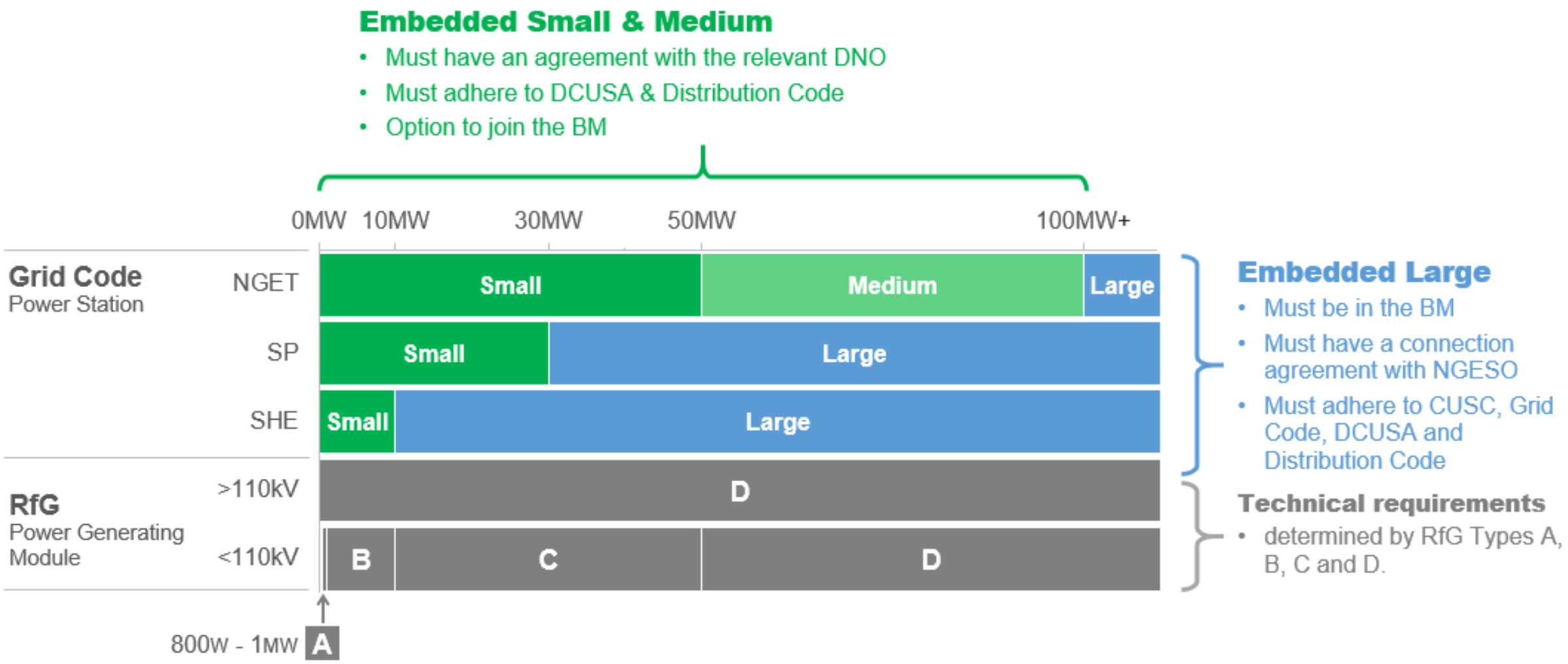
GC0117 – Overview of current options and implications for future participants

- The following slides detail the current options presented as part of the GC0117 Workgroup Consultation and the potential implications for future connecting parties for each option
- For information, this slide pack presents the discussions held at previous GC0117 workgroup meetings but these actual slides have been specifically prepared to enable stakeholders to have an overview of the original proposal and alternatives

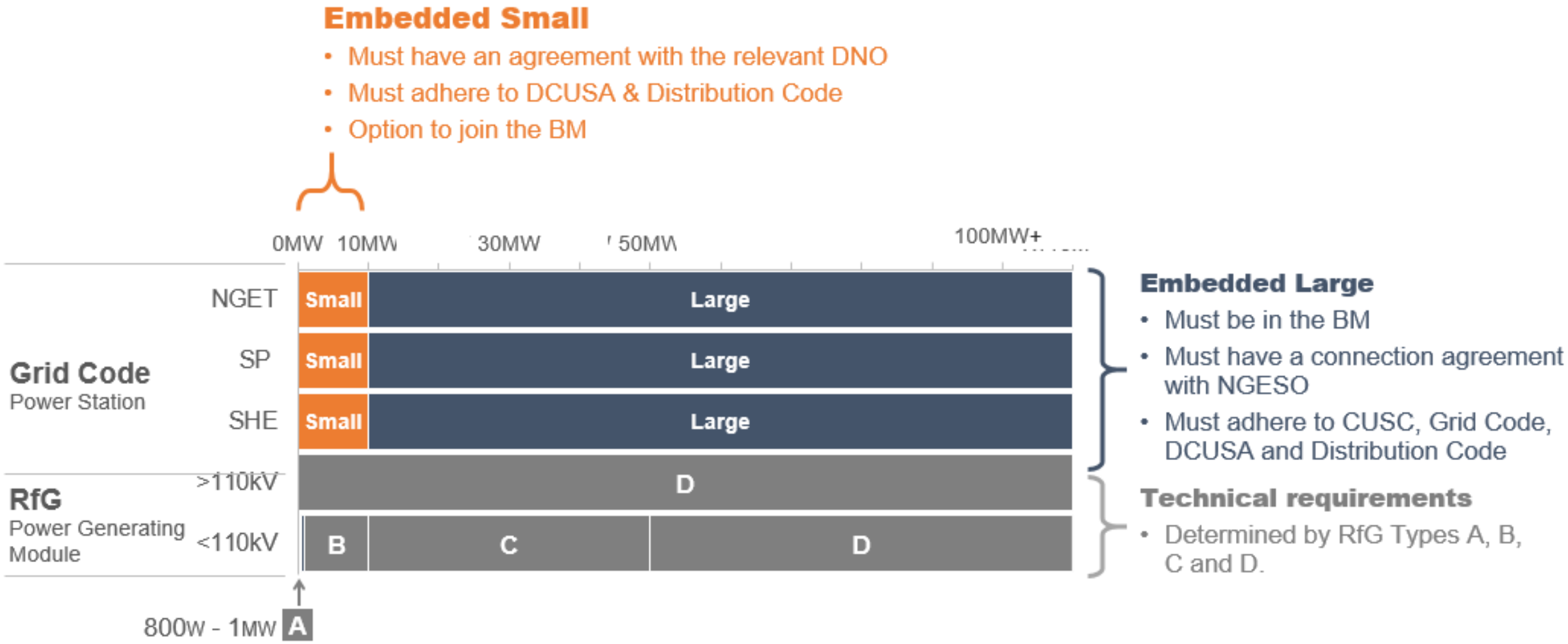
Current Thresholds and obligations



Review of Options

Options	Summary of Original Proposal and Alternatives
Original Proposal	Large/Small Power Station Threshold changed to 10MW
WACM1	Large/Medium/Small Power Station Thresholds in England and Wales applied in Scotland
Alternative 1	Large/Small Power Station Threshold changed to 100MW
Alternative 2	LEEMPS Plus – Medium Power Station Threshold changed to 10 – 100MW across GB. Applies LEEMPS arrangements with a Balancing Mechanism Component and hence becomes a hybrid of LEEMPS and BELLAs or BEGAs
Alternative 3	Apply Large/Medium/Small Power Station Threshold in England and Wales in Scotland (as per WACM1) but all embedded plant between 10 – 100MW would be required to participate in the BM and provide Ancillary Services through a control system which would take the Appendix G and Active Network Management processes behind each Grid Supply Point into account. National Grid ESO are developing several schemes using this approach using the Regional Development Platform (RDP)
Alternative 4	Hybrid solution of Alternative 2 & 3 RDP solution for Small Power Stations between 10 – 49.9MW and LEEMPS Plus solution for Medium Power Stations between 50 –100MW

Original Proposal - Large/Small Threshold set at 10MW



Grid Code requirements: Embedded connections

Requirements for Small and Large Power Stations

Grid Code requirement	Embedded Small	Embedded Large (BELLA)	Embedded Large (BEGA)
Planning Code	✘	✓	✓
European Connection Conditions	✘	Except EDL	✓
European Compliance Processes	✘	✓	✓
Operating Codes	✘	✓	✓
Balancing Codes	✘	BC1 & BC2 apply only in respect of Generating Units, not BM Units BC3 does not apply	✓
Data Registration Code	✘	Yes (part)	✓

Differences between BELLAs and BEGAs

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 including those in Scotland. • 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. They would be subject to TNUoS • NB:- Any Generator which is 100MW and greater must have a Generation Licence and would be subject to TNUoS charges
BELLA	Bilateral Exemptible Large Licence Exempt Generator Agreement	• Only apply in Scotland and applicable to Embedded Large Power Stations (Note Large in SPT's area is 30MW and above and in SHE Transmission Area is 10MW and above) • BELLAs do not have TEC or are Licensed nor do they pay TNUoS • 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. • BELLAs do not submit Bid Offer Data or Dynamic Parameters for the next Operational Day • Many BELLAs have transitioned to BEGA agreements

EXAMPLE

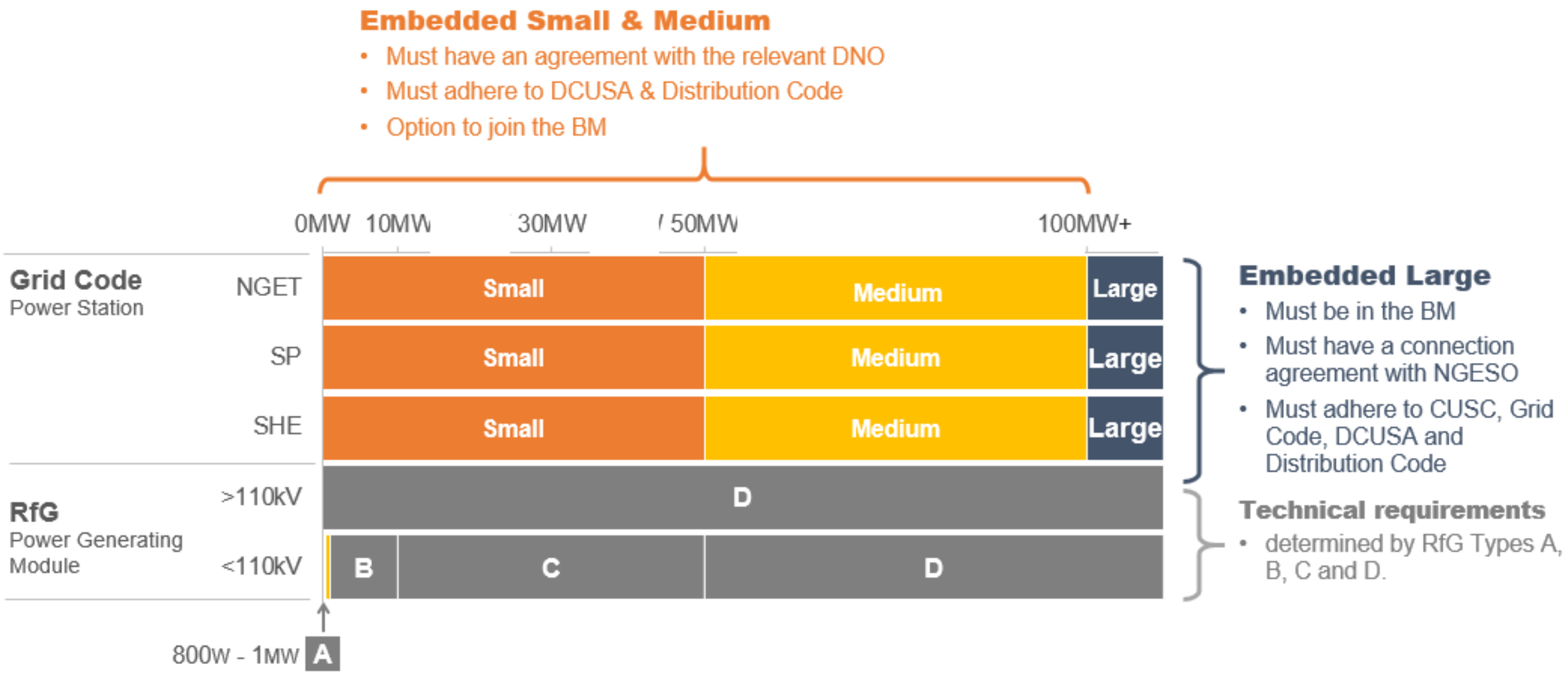
What would a future **Embedded** Power Station with a Registered Capacity of 10MW or more have to do if the Original Proposal is applied

- Satisfy the applicable requirements of the Grid Code and sign CUSC
- Participate in the Balancing Mechanism either as a full BMU or as a Generating Unit (as a BELLA)
    - e.g., Instruction Facilities, Operational Metering / ability to be instructed in the BM (variations apply between BEGAs and BELLAs)
- 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.
- Technical Requirements as per RfG are already consistent between the Grid Code and Distribution Code (G99)
- There would be no changes to the Generators connected in Scottish Hydro Electricity Transmission System
- The main additional requirements would be:
    - Sign the CUSC which has implications for charging
    - Comply with the applicable requirements of the Grid Code
    - Submission of static, scheduled and real time data to the ESO
    - Systems to submit real time data to the ESO

Original Proposal- Summary

Advantages	Disadvantages
Aligns with B/C Power Generating Module threshold in RfG which is universal GB wide	Significant increase in the volume of connection agreements with the ESO, Generators, and DNO as both will be required
Aligns with 10MW Threshold in the North of Scotland and Offshore. Therefore no changes would arise in the North of Scotland	It will take time for the ESO to update its IT systems to facilitate a threshold of 10MW. Initial estimates expect this to be 2027 and this does not include retrospectivity. Even when implemented there would be greater ESO Control Room resource required to deal with the increased volume of Embedded Generation
If the 10MW threshold applied across GB, more Generators would be available to participate in the BM therefore potentially reducing Balancing Costs and overall System Operating Costs	Potential cost increases for 10-100MW Embedded Generators who would have traditionally been Small or Medium and they are now forced to be in the BM. For example IT Systems, submission of data, operational metering data, instructor facilities, routine data submission (e.g. Week 24) and agreement preparation and administration.
Gives the ESO greater visibility and the ability to instruct higher volumes of Embedded Generation	The CUSC, BSC and Grid Code are quite cumbersome documents and owners of Small and Medium Power Stations have the burden of navigating and complying with these documents
Removes arrangements for LEEMPS going forward	This solution potentially undermines the approach being developed through Open Networks.
	Enduring ESO resource required to assess additional Generator data through the Week 24 process.

WAGM1– Small/Medium/Large in England and Wales applied in Scotland



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)	✓

EXAMPLE

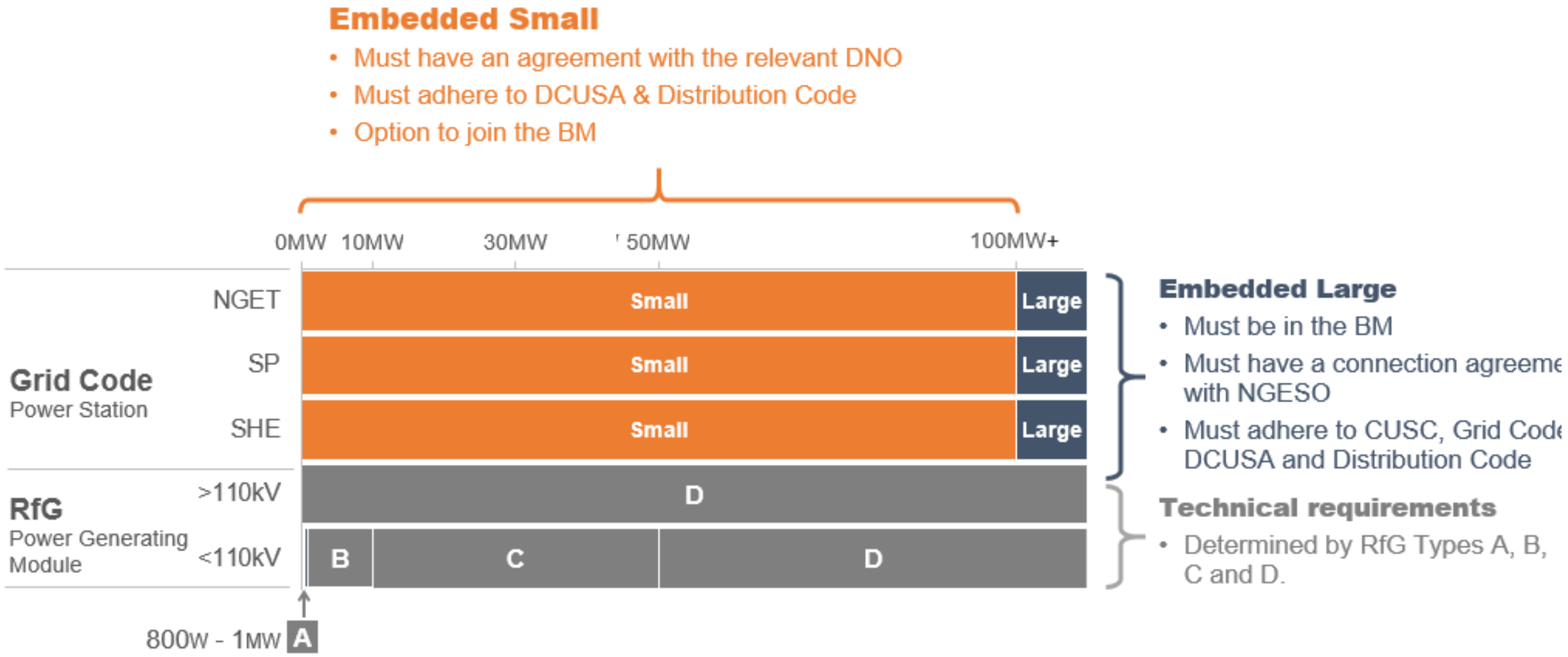
What would a future **Embedded** Power Station with a Registered Capacity of less than 100MW have to do if WAGCM 1 is applied

- Meet the requirements of the Distribution Code
- If the Embedded Power Station is Medium it will need to satisfy the requirements of the Distribution Code which in turn will require obligations to be satisfied under PC3.3 – Data and CC/ECC3.3 which relates to technical requirements – many of which are already captured under G99.
    - Mechanisms of sending and receiving real time data
    - In this case, there would be no impact to Generators in England and Wales
    - Generators in Scotland who have Embedded Power Stations with a Registered Capacity of less than 100MW would no longer be obliged to satisfy the requirements of the Grid Code or CUSC or obliged to meet the requirements of BC1 and BC2.
- In Scotland, Embedded Medium Power Stations 50 – 100MW) would either become a LEEMPS and fall outside the BM though they would need to provide data under PC3.3 and meet technical requirements (which would largely be required under G99) or become a BEGA. An owner and operator of a LEEMP would not need to sign the CUSC.
- In Scotland, any Embedded Power Station less than 50MW would be small and would have no obligations under the Grid Code unless the Generator in respect of that Small Power Station applied for a BEGA. There would be no impact in England and Wales
- Subject to retrospectivity, existing Large Power Stations in Scotland would no longer be obliged to meet their existing obligations under the Grid Code and CUSC or be in the BM

WAGCM1- Summary

Advantages	Disadvantages
Reduces the volume of Connection Agreements with the ESO and between the ESO and DNOs though agreements would still be required between the ESO and DNOs in respect of LEEMPS.	Increased difficulty in managing the Scottish System for both the ESO and TOs.
Reduces the ESO resource required in processing the data submitted, the ESO IT Systems capability required and the real time processing required by the ESO	Increased System operating / Balancing Costs as new Embedded Power Stations with a Registered Capacity of 100MW or less would not be visible in the BM and less visibility to the ESO.
Reduces the burden on Generators in Scotland and normalises on a standard GB approach	Increasingly difficult in managing the System in the longer term due to the increasing volumes of Embedded Generation. The ESO would have less control over generation connected to the network which makes overall system operation more complex, including management of System Frequency – an ESO responsibility
Reduced compliance costs for the ESO	Does not maximise on the capabilities to Smaller parties introduced through RfG.
Aligns with Licensing requirements	The market does not capitalise on the Generator capabilities realised through LEEMPs or RfG
No change in England and Wales	

Alternative 1 - Large/Small Threshold set at 100MW



Grid Code requirements: Embedded connections

Requirements for Small and Large Power Stations

Grid Code requirement	Embedded **Small**	Embedded **Large**
Planning Code	✗	✓
European Connection Conditions	✗	✓
European Compliance Processes	✗	✓
Operating Codes	✗	✓
Balancing Codes	✗	✓
Data Registration Code	✗	✓

EXAMPLE What would a future **Embedded** Power Station with a Registered Capacity of 100MW of more have to do if Alternative 1 is applied

- Satisfy the applicable requirements of the Grid Code and sign CUSC
- Participate in the Balancing Mechanism as a BMU hence all agreements would be BEGA's
- 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.
- The main additional requirements would be:
  - Signature to the CUSC and implications on charging
  - Comply with the applicable requirements of the Grid Code
  - Submission of Static, Scheduled and Real time data
  - Mechanisms of receiving real time data
  - **In this case, there would be no impact to Generators in England and Wales**
  - **Generators in Scotland who have Embedded Power Stations with a Registered Capacity of less than 100MW would no longer be obligated to satisfy the requirements of the Grid Code or CUSC or obliged to meet the requirements of BC1 and BC2.**

Alternative 1- Summary

Advantages	Disadvantages
Reduces the volume of Connection Agreements with the ESO and between the ESO and DNOs and hence resource required	Increased difficulty in managing the Scottish System for both the ESO and TOs.
Reduces the ESO resource required in processing the data submitted, the ESO IT Systems capability required and the real time processing required by the ESO	Increased System operating / Balancing Costs as Embedded Power Stations with a Registered Capacity of 100MW or less would no longer be visible in the BM and less visibility to the ESO.
Reduces the burden and costs on Generators in Scotland and normalises on a standard GB approach	Increasingly difficult in managing the System in the longer term due to the increasing volumes of new Embedded Generation under 100MW which would be uncontrollable by the ESO.
New generators who own and operate Embedded Power Stations in Scotland with a Registered Capacity of less than 100MW (assuming no retrospectivity) would not need to satisfy obligations currently required for large power stations in Scotland less than 100MW	Does not maximise on the capabilities to Smaller parties introduced through RfG.
Reduced Compliance costs for the ESO	The ESO would not receive data from sub 100MW plant which the ESO have traditionally received from LEEMPS. The technical requirements are however replicated in G99 through RfG.
Removes LEEMPS arrangements going forward	
Aligns with Licensing requirements	Removal of Medium Power Stations in England and Wales for new plant going forward would reduce the volume of data submitted to the ESO via Grid Code PC3.3.

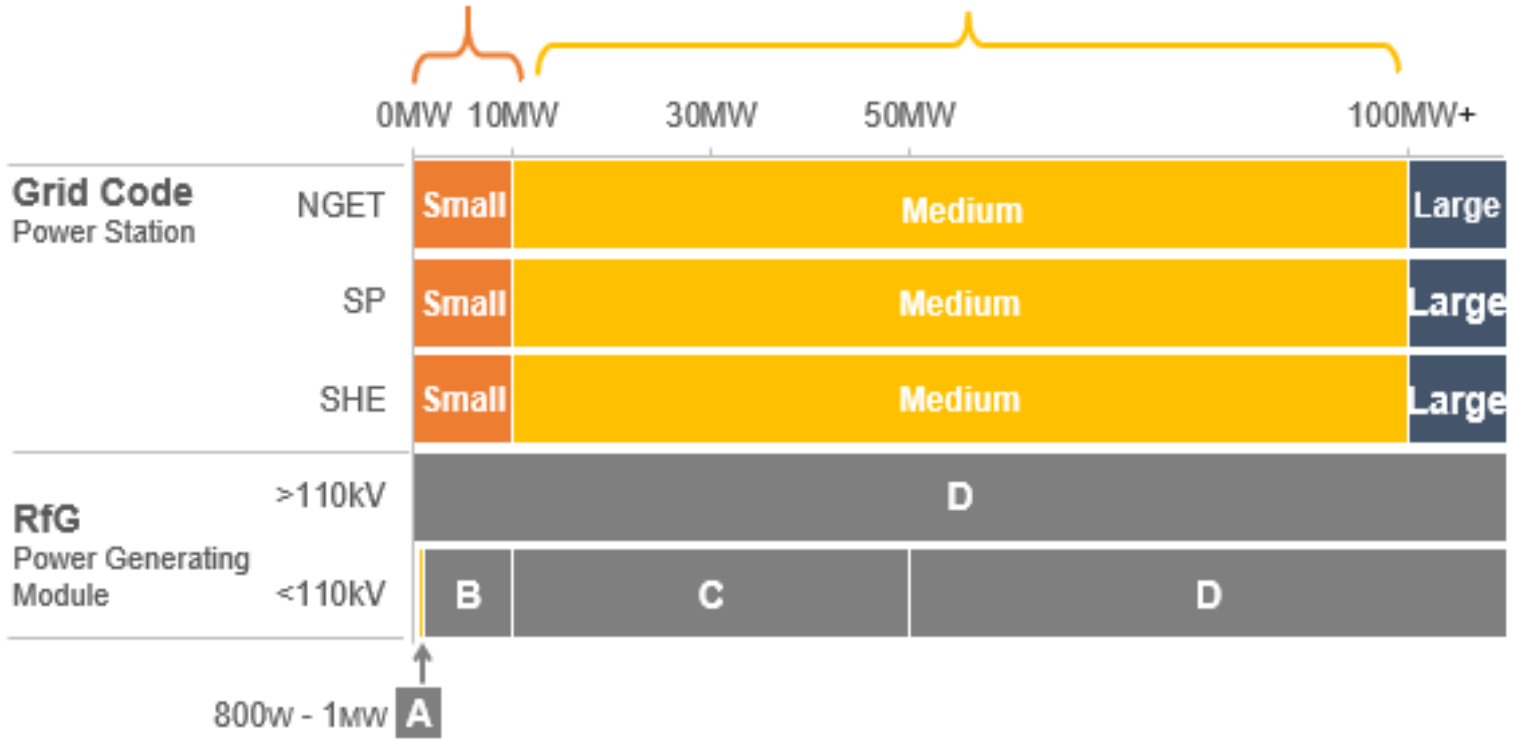
Alternative 2 – LEEMPS Plus applied across GB

Embedded Small

- Must have an agreement with the relevant DNO
- Must adhere to DCUSA & Distribution Code
- Option to join the BM

Embedded Medium

Exisiting LEEMPS provisions apply
ESO has an agreement with the DNO
Obligations on Licence Exempt Embedded Medium Power Stations to comply with Grid Code requirements which now extends to OC's and BC's
LEEMPS submit trading and price data to ESO.
ESO instruct LEEMPS via DNO



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.

Grid Code requirements: Embedded connections

Requirements for Small, Medium and Large Power Stations

Grid Code requirement	Embedded **Small**	**LEEMPS**	Embedded **Medium (BEGA)**	**LEEMPS PLUS**	**BELLA**	Embedded **Large**
Planning Code	✘	Part as defined under PC3.3	✓	As per current arrangements	✓	✓
European Connection Conditions	✘	Part as defined under ECC3.3	✓	As per current arrangement but additional items added to include ECC6.5	Except EDL	✓
European Compliance Processes	✘	✘	✓	Managed through G99	✓	✓
Operating Codes	✘	✘	✓	Relevant sections of OCs added	✓	✓
Balancing Codes	✘	✘	Part	Relevant and applicable sections of BC1, BC2 and BC3 to be added	BC1/2 apply only in respect of Generating Units not BM Units BC3 does not apply	✓
Data Registration Code	✘	As required under PC	✓ (part)	✓ (part)	Yes (part)	✓

Current LEEMPS - Features

- There is no agreement between the LEEMPS Owner and ESO and they are not CUSC Parties
- LEEMPS are not in the BM nor do they pay TNUoS or have any form of Transmission Access Rights
- The ESO has no method of contacting or instructing a LEEMPS
- The Distribution Code places obligations on LEEMPS to meet specific requirements under the Grid Code
    - These mainly relate to data (structural) (DPC7.3.3 and Grid Code PC3.3) and technical requirements (including real time data) (DPC7.5.2 and Grid Code CC3.3)
    - Site specific technical requirements are covered in Appendix E of the Bilateral Connection Agreement between the ESO and DNO
- A LEEMPS has to meet technical requirements including Frequency Response and Reactive Power Capability but they cannot be remunerated for these services unless they have a separate non-CUSC Commercial Contract
- Following the implementation of RfG, all the technical requirements fall under G99 so its benefit is more limited for new plant

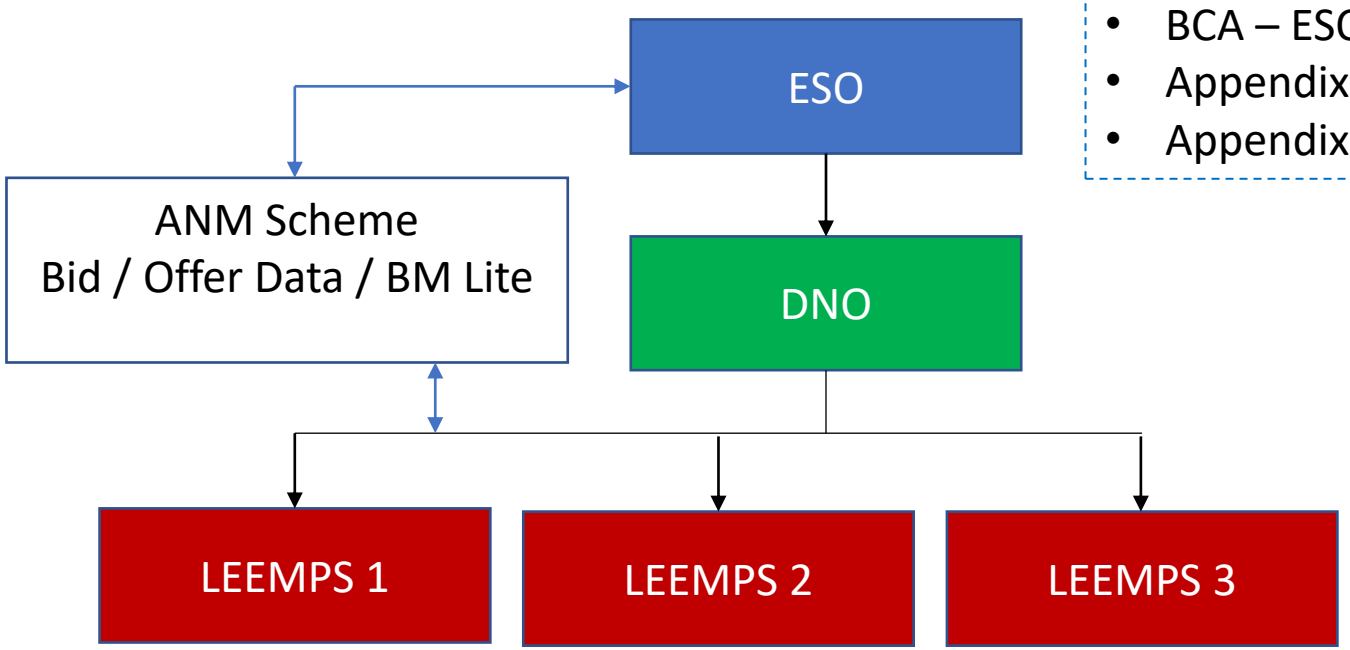
LEEMPS Plus - Features

- Adopts similar approach with obligations placed in the Distribution Code requiring LEEMPS to satisfy specific obligations in the Grid Code
- At present these are limited to data requirements and technical requirements
- The LEEMPS Plus approach would extend the obligations on LEEMPS to include the applicable requirements of the Operating Codes and Balancing Codes. Facilities to participate in the BM (CC/ECC6.5) would be required
- There would need to be a relationship between the ESO and LEEMPS in respect of participation in the BM – a Light touch approach similar to that adopted for Virtual Lead Parties (VLPs) could be used
- The LEEMPS would satisfy all its requirements through the DNO (via the DNO connection agreement and D Code) which the DNO would then pass onto the ESO as applicable. This builds on the Open Networks work
- Instructions from the ESO to the LEEMPS would be via the DNO
- Separate communications channels would be required to submit price and availability data to the ESO directly from the LEEMPS

Bilateral Agreement – LEEMPS Plus

- For LEEMPS Plus the arrangements would be similar to LEEMPS with the need for an additional agreement between the ESO and LEEMPS station but only in respect of submission of confidential data
- The Agreement with between the ESO and DNO would need be updated so Network Operators have the appropriate data logging facilities so they can instruct LEEMPS Stations via the ESO
- The requirements for a LEEMPS Plus agreement does need some work but would be a cut down version of that used for Virtual Lead Parties with a Network Operator Interface.
- It is likely that as a new type of agreement is required a CUSC modification would be required

LEEMPS Plus



- BCA – ESO to DNO at each GSP
- Appendix G
- Appendix E

- ESO issue instructions to the DNO who in turn instruct the LEEMPS
- The DNO will not see Price and Dynamic data submitted by the LEEMPS
- DNO Connection Agreement with each LEEMP
- Includes Appendix E and Appendix G requirements
- LEEMPS only supply data once

EXAMPLE

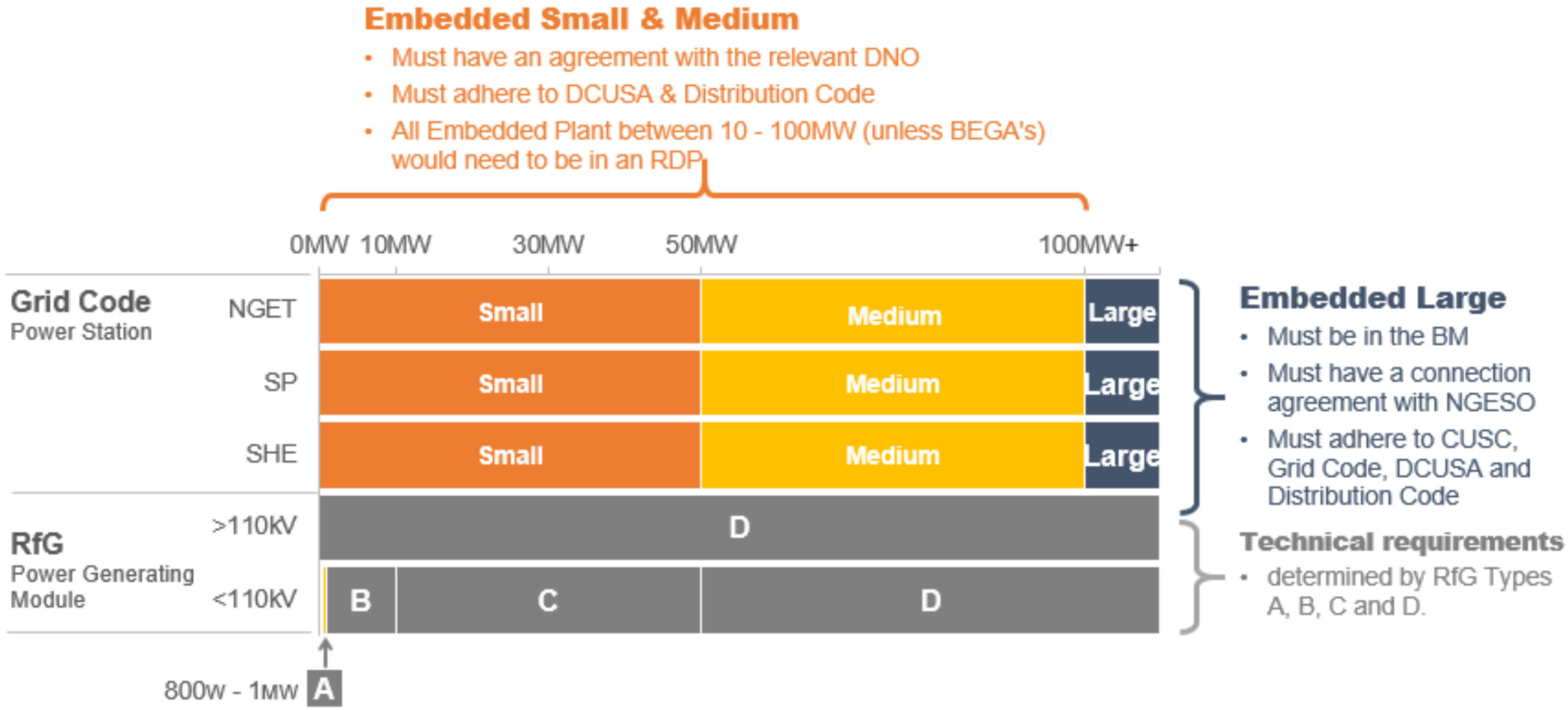
What would a future LEEMPS Plus Generator have to do if Alternative 2 is applied

- A future LEEMPS would be Licence Exempt, Embedded and have a Registered Capacity of between 10 – 100MW.
- Meet the requirements of the Distribution Code
- The D Code would be updated so that additional obligations of the Grid Code are satisfied which would extend to the relevant Operating Codes and Balancing Codes in addition to those already required.
- Some simplification may be possible as the technical requirements in the Grid Code are consistent with those in G99 though the technical requirements would need to be extended for the data communication facilities which are necessary to participate in the BM
- It is expected that similar obligations would apply which are consistent to those of Medium Power Stations already in the Grid Code but the management (other than in respect of balancing) would be managed through the DNO.
- The DNO would pass all relevant data from the
- Separate agreement between the ESO and LEEMPS in respect of participation in the BM e.g., ECC6.5 (Telephony and Data Communication Systems).
- The DNO would require Data Communication Systems so they can act as a proxy to give instructions to the LEEMPS on behalf of the ESO.
- Confidential data would not be visible to the DNO.
- ESO could constrain the embedded generation and they would also be subject to acting upon instructions from the ESO

Alternative 2 - Summary

Advantages	Disadvantages
The LEEMPS satisfies the majority of the requirements through the DNO and D Code. The relationship with the ESO is light touch	It would mean many more agreements between the ESO and DNOs which has resource implications. There would also need to be separate agreement with LEEMPS in respect of participation in the BM.
The DNO have visibility of the instructions issued and the impact of the balancing actions on their network	IT systems would need to be upgraded at the ESO, the earliest this could be achieved for a 10MW threshold would be 2027
More generation will be visible in the BM which should help to reduce balancing costs	Clarity on any additional IT systems required by the DNO and the generator and the associated cost would need to be considered
The solution builds on the work undertaken by Open Networks which allows the Generator to submit data only once which reduces duplication	It is potentially quite a complex solution and increases the workload on the DNO's but is potentially part of the wider DSO Transition
There would be no TNUoS charges	Clarity on the IT Systems required by LEEMPS stations requires further consideration
The interaction with the ESO would be limited to Balancing and market data submission only and therefore light touch	Generators who currently are Small in England and Wales would become Medium and some who are Large and Small in SPT's area would become Medium
Scottish TOs still have visibility of Embedded Generation	

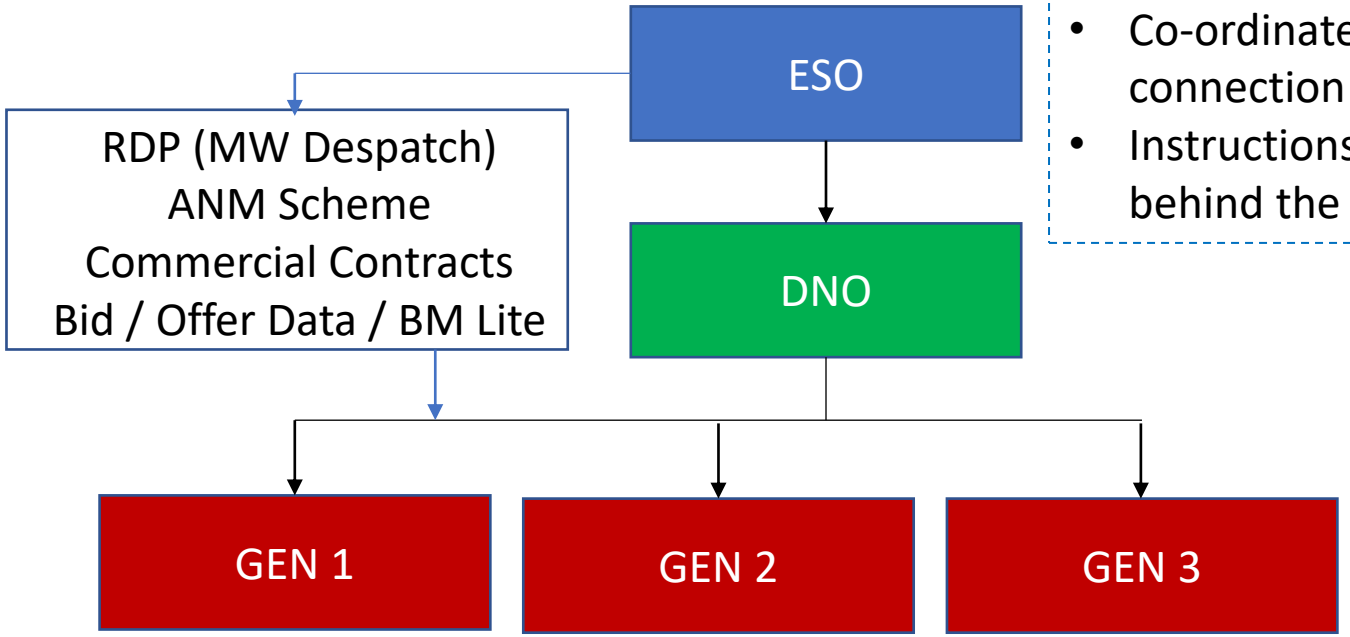
Alternative 3 – Regional Development Programme



Alternative 3– Regional Development Programme

- As per Alternative 2 with a BM and Ancillary Services wrapper around it using a Regional Development Programme
- Obligations are placed on the DNO to ensure each new Embedded Generator sign up to the Regional Development Programme which sits behind the Active Network Management Scheme, unless the embedded generator has a BEGA in which case the RDP would need to take account of this
- This approach is being developed in the South West
- It applies the same Power Station thresholds in England and Wales to Scotland but requires the DNO to implement a Regional Development Programme in respect of each selected Grid Supply Points
- Builds on the Open Networks Work
- Generators in respect of Small and Medium Power Stations would still have the option of applying for a BEGA should they wish to do so. The RDP system would need to have the ability to account for generators with their own BEGA aggreements

Regional Development Platform



- BCA – ESO to DNO at each appropriate GSP
- Co-ordinated with the CUSC and the Appendix G in the bilateral connection agreement with the DNO
- Instructions given to 10 – 100MW Embedded Generation via RDP behind the ANM Scheme

- DNO Connection Agreement with each Embedded Generator
- ESO issue instructions to the DNO who in turn instruct the Generator
- The DNO will not see Price and Dynamic data submitted by the Generator
- Utilises Open Networks for Data Sharing between ESO and DNO

EXAMPLE

What would a future Small Embedded Power Station between 10-99.9MW have to do if Alternative 3 applied

- Meet the requirements of the Distribution Code and G99
- Would need to sign up to an RDP which would enable the ESO to instruct the generator for MW
- Would have the opportunity to provide ancillary services and be instructed by the ESO for purposes of providing those ancillary services
- Additional control and communication facilities would be required including operational metering data
- Greater co-ordination required between the DNO and ESO in respect of data sharing and constraint management

Alternative 3 - Summary

Advantages	Disadvantages
Builds on Open Networks Solution enabling any data to be supplied to the ESO via the DNO	Is still considered developmental. It could take some time for a matured technology to develop
Co-ordinated with the CUSC and the Appendix G in the bilateral connection agreement with the DNO and builds on the Open Networks approach	The impact on Scottish TO's is unclear. It is also unclear if there are any unintended consequences in Scotland as a consequence of this option
Enables the ESO to instruct Generation in the BM and for the purposes of Ancillary Services	There would be a slight loss of functionality in Scotland compared with current arrangements if this option were to be put forward
Is BM light and therefore reduces the administrative burden on Embedded Generators to meet a large volume of additional requirements and be caught by the full requirements of CUSC and Grid Code	There would still be a need for increased IT cost within the ESO, especially with the increase in the number of BM Units. The IT infrastructure may not be available until 2027 at the earliest which could be delayed if the technology is developmental.
Reduces the number of agreements between the ESO and Generators in Scotland and hence the resource required. This would also be true of the consequential number of agreements between the ESO and DNO's in Scotland	For new generators, they would be required to act on instructions from the ESO which means that on occasions they could be constrained, including the requirements to operate under emergency conditions
Allows Embedded Medium and Embedded Small Power Stations above 10MW to be instructed in the BM and despatched for Ancillary Services (particularly in England and Wales) where previously this would not have been the case	Signing up to an RDP, there would be a requirement for additional IT and Comms facilities

Alternative 4 - Hybrid Approach

- The current thresholds in England and Wales are applied in Scotland
- For Medium Power Stations (50 – 100MW) LEEMPS Plus is applied
- For Small Power Stations (10 – 49.9MW) RDP applies

- The advantages and disadvantages are the same as those in alternatives 3 & 4
  - The advantages and disadvantages for LEEMPS Plus apply between 50-100MW
  - The advantages and disadvantages for RDP apply between 10-49.9MW