
Supporting document to the GB
LFC Block Operational
Methodologies developed in
accordance with Article 119 of
Commission Regulation (EU)
2017/1485 of 2 August 2017
establishing a guideline on
electricity transmission system
operation

14 Sept 2018

Disclaimer

This explanatory document is provided by NGET for information purposes only and accompanying the proposal for the GB LFC Block Operational Methodologies document in accordance with Article 119 of Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system.

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Introduction

1. The Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation (hereafter "**SOGL**") was published in the official Journal of the European Union on 25 August 2017 and entered into force on 14 September 2017. The SOGL sets out guidelines regarding requirements and principles concerning operational security, as well as the rules for determining common load-frequency control processes and control structures and to maintaining a frequency quality level of the synchronous area.
2. The GB LFC Block Operational Methodologies is used to demonstrate that this is a declaration of the rules to be applied in the GB LFC block by the single ESO. Although referred to as 'agreements' in SOGL Article 119, it is stated in the definitions in SOGL Article 3(136), "means a LFC block operational methodology to be adopted unilaterally by the relevant TSO if the LFC block is operated by only one TSO".
3. Article 119 of SOGL requires the development of LFC Block Operational Methodologies (hereafter "**LFCBOM**") for Great Britain by 12 months after entry into force. Those elements of the LFCBOM also referenced in Article 6(3) of the SOGL are subject to public consultation in accordance with Article 11 of the SOGL, prior to NRA approval.
4. The supporting document has been developed in recognition of the fact that the LFCBOM, which will become a legally binding document after NRAs' approval, inevitably cannot provide the level of explanation, which some parties may desire. Therefore, this document aims to provide interested parties with greater descriptive information and explanation of the methodology text contained in the LFCBOM.

General information about the LFC Block Operational Methodologies and the document for GB

Subject matter and scope

1. The LFC Block Operational Methodologies (LFCBOM) for Great Britain contains:
 - a. Title 2: Those Articles referenced from both 119 and 6(3). These are subject to OFGEM approval and public consultation from Article 11.
 - b. Title 3: Those Articles referenced in Article 119 but not found in Article 6 or 11. These Articles are not subject to either OFGEM approval or public consultation.

Governance and implementation within GB

1. OFGEM is the sole competent National Regulatory Authority (NRA) for the LFCBOM of Great Britain.
2. The electricity system operator (ESO) role in GB is fulfilled at the time of drafting by NGET. This will transfer to NGESO on and after the 1 April 2019.
3. OFGEM determined in the GB TSO responsibility mapping document published in 14 September 2017, that Article 119 is the sole responsibility of the electricity system operator (the ESO) in GB to draft.
4. The SOGL determines that there are two paths for approvals in the LFCBOM (Article 119).
 - a. Those methodologies from SOGL Article 119 developed by NGET for GB which are referenced in SOGL Article 6(3) concerning NRA approval are subject to a public consultation from SOGL Article 11 and then NRA (OFGEM) approval. These are contained in Title 2 of the LFCBOM document (see the next section for a list);
 - b. Those methodologies from SOGL Article 119 not requiring OFGEM approval or public consultation will be drafted by NGET. These methodologies are found in Title 3 of the LFCBOM document.
 - c. The LFCBOM document will be published on the internet at the end of the drafting and approval process according to SOGL Articles 183, 184 and 8.
5. Whilst the LFCBOM includes methodologies specific to the security considerations of exchanged and shared services via HVDC interconnectors with other LFC Blocks, these methodologies only consider the GB implications on security and effective operation of the Load Frequency Control Structure and not the needs of other LFC Blocks. When those methodologies, relative to the exchange and sharing of reserves between LFC Blocks in different synchronous areas, are subsequently drafted the rules and limits will need to consider the combined effect of the obligations and limitations of all methodologies of all the relevant LFCBOMs.

Methodologies from Article 119 that are subject to National Regulatory Authority (OFGEM) approval.

Part-A - Methodologies, conditions and values included in the LFCBOM mandated in SOGL Article 119 referenced in Article 6(3) and Article 11 thus requiring OFGEM approval:

SOGL Article ref	In GB LFCBOM	SOGL Article 119 text
119(c); 6(3)(e)(i)	Y	ramping restrictions for active power output in accordance with Article 137(3) and (4);
119(h); 6(3)(e)(iv)	Y	the FRR dimensioning rules in accordance with Article 157(1);
119(q); 6(3)(e)(ii)	N	coordination actions aiming to reduce FRCE as defined in Article 152(14);
119(r); 6(3)(e)(iii)	Y	measures to reduce FRCE by requiring changes in the active power production or consumption of power generating modules and demand units in accordance with Article 152(16);

Methodologies from Article 119 that are NOT subject to National Regulatory Authority (OFGEM) approval.

Part B - Methodologies, conditions and values mandated in the LFCBOM SOGL Article 119 but not referenced in Article 6 or 11. These articles must be produced and will be published on the internet but are not subject to OFGEM approval. The ESO is voluntarily electing to consult on these article texts in the interests of open and transparent operation of the system.

SOGL Article ref	In GB LFCBOM	SOGL Article 119 text
119(a)	N	where the LFC block consists of more than one LFC area, FRCE target parameters for each LFC area defined in accordance with SOGL Article 128(4);
119(b)	Y	LFC block monitor in accordance with SOGL Article 134(1);

119(d)	N	where the LFC block is operated by more than one TSO, the specific allocation of responsibilities between TSOs within the LFC block in accordance with SOGL Article 141(9);
119(d)	N	where the LFC block is operated by more than one TSO, the specific allocation of responsibilities between TSOs within the LFC block in accordance with SOGL Article 141(9);
119(e)	N	if applicable, appointment of the TSO responsible for the tasks in SOGL Article 145(6);
119(f)	N	additional requirements for the availability, reliability and redundancy of technical infrastructure defined in accordance with SOGL Article 151(3);
119(g)	Y	operational procedures in case of exhausted FRR or RR in accordance with SOGL Article 152(8);
119(i)	Y	the FRR dimensioning rules defined in accordance with SOGL Article 157(1);
119(j)	N	where the LFC block is operated by more than one TSO, the specific allocation of responsibilities defined in accordance with SOGL Article 157(3), and, if applicable, the specific allocation of responsibilities defined in accordance SOGL Article 160(6);
119(k)	Y	the escalation procedure defined in accordance with SOGL Article 157(4) and, if applicable, the escalation procedure defined in accordance with SOGL Article 160(7);
119(l)	N	the FRR availability requirements, the requirements on the control quality defined in accordance with SOGL Article 158(2), and if applicable, the RR availability requirements and the requirements on the control quality defined in accordance with SOGL Article 161(2);
119(m)	N	if applicable, any limits on the exchange of FCR between the LFC areas of the different LFC blocks within the CE synchronous area and the exchange of FRR or RR between the LFC areas of an LFC block of a

		synchronous area consisting of more than one LFC block defined in accordance with SOGL Article 163(2), SOGL Article 167 and SOGL Article 169(2);
119(n)	N	the roles and the responsibilities of the reserve connecting TSO, the reserve receiving TSO and of the affected TSO for the exchange of FRR and/or RR with TSOs of other LFC blocks defined in accordance with SOGL Article 165(6);
119(o)	N	roles and the responsibilities of the control capability providing TSO, the control capability receiving TSO and of the affected TSO for the sharing of FRR and RR between synchronous areas in accordance with SOGL Article 175(2);
119(p)	Y	roles and the responsibilities of the control capability providing TSO, the control capability receiving TSO and of the affected TSO for the sharing of FRR and RR between synchronous areas in accordance with SOGL Article 175(2);

Timeline for the initial LFCBOM development process

1. According to SOGL Article 119(1), the agreement text drafting must be completed and submitted to the NRA by SOGL EIF+12months, 14th September 2018;
2. For those Articles referenced in SOGL Article 6(3), SOGL Article 11 states that these must also undergo a public consultation which must be open for at least 1 month (to be conducted from 5th April to 18th May 2018 for GB);
3. The ESO has voluntarily elected to conduct a 2nd public consultation, this version of the LFCBOM document will contain revised proposals to Part-A incorporating changes derived from stakeholder comments and proposals submitted during the 1st public consultation on version 1 and also to provide visibility of the additional texts being proposed in Part-B. (This second consultation will be conducted from 23rd July to 23rd August 2018 for GB);
4. SOGL 6(7) states that the NRA will take no longer than 6 months to issue its decision on the TSO proposed LFCBOM text. (SOGL EIF+18months);
5. SOGL Article 119(2) specifies that the TSO must conclude any required revisions to the LFCBOM by 1 month after the NRA has issued its opinion on the document (SOGL EIF+19months);
6. SOGL Article 184 specifies that the LFCBOM must be notified to the NRA or where applicable other relevant NRAs (no deadline set by SOGL);
7. SOGL Article 119(2) specifies that the LFCBOM will enter into force no later than 3-months after the proposed text has been approved by the NRA (SOGL EIF+21months);

8. SOGL Article 8 specifies that all terms and conditions or methodologies must be published after approval or following their specification where no approval is required unless the confidentiality clause 12 applies (propose alignment with the timescale prescribed for the Synchronous Area Operational Agreement document i.e. publication 1-week after entry into force).

Revisions to the LFCBOM for GB

1. The process of changing these methodologies depends on whether they are subject to NRA approval or not.
 - a. Those items in Title 2 of the LFCBOM requiring OFGEM approval, for which a revision is desired, require review by the NRA according to SOGL Article 7.
 - b. Those items in Title 3 of the LFCBOM not requiring OFGEM approval, for which a revision is desired, will be amended and published by NGET.
2. In both of the above cases, where the methodologies interact with GB industry codes, there will need to be close coordination of any proposed modification and application of both national industry code governance and SOGL change governance as appropriate.

TITLE 2 - Explanatory text to accompany each agreement Article in the LFCBOM document that is subject to NRA approval

LFCBOM Article 1 - SOGL Article 119(c) - “ramping restrictions for active power output for each HVDC interconnector between the LFC Block of another synchronous area and the GB LFC Block in accordance with SOGL Article 137(3)”

1. Background to the physical need for restriction:

- a. The needs of the electrical power system are for a continuous moment to moment balance between the power injection and off-take into and out of the system to maintain frequency. Imbalances can be caused by sudden plant-failure, inherent variability in the control system or source (e.g. wind-power or consumer demand) or ‘deterministic deviations’ caused by market design and changes in power injection, off-take or interconnector transfer at market period boundaries in particular.
- b. HVDC interconnectors following a CACM derived market design have market flows driven by energy trades for a market period. These have given profiles with flat-topped power transfers and ramps between market periods. A purist market design (incorporating this flat-topped design) would thus have a very fast ramp between those periods to minimize energy delivery error. This however often results in imbalance between generation, consumption and HVDC power transfer which can grow and last for an insignificant number of minutes during which the ESO must correct the error by use of FCR, FRR and RR. If this significantly erodes the ESO’s reserve capacity holding it can create system security risks as well as create economic inefficiencies for end-consumers. The solution to reducing the imbalance / FRCE to a level that is manageable by the ESO is to apply ramping restrictions.
- c. A number of system and market factors and alter the given ramping-rate which is securable, manageable and economically advisable.
 - i. The amount of inertia (MW/s) and stiffness of the system (MW/Hz) affect how much and how fast changes in one participant’s activity affect the system as a whole
 - ii. The availability of reserve and response services and how big the FCR/FRR/RR capacity required to correct the ramping induced error relates to the general prevailing dimensioning of the system
 - iii. Evolution in market design to couple wider markets tend to align movements of all interconnectors between two market areas heightening the problem (since the effect on the system is the summated ramping of all interconnectors together) – a staggered ramp is better for system security.

2. Further information on why there are two forms of ramping restriction defined in the SOGL.

- a. The SOGL in Article 137 defines ramping-restrictions as being either ‘ramping-period’ based or ‘ramping-rate’ based.

- i. Ramping-Periods are utilized for the *virtual* cross-border ‘virtual tie-line’ program between LFC Areas and LFC Blocks within the same synchronous area and connected by A.C. lines. The virtual tie-line program values feed the LFC Block’s FRCE calculation which governs the activation of aFRR and therefore using ramping-periods reduces the likelihood of counter-activations within the synchronous area. The extension to applying this rule to HVDC interconnectors, logically still applies to HVDC interconnectors which are between LFC Areas and between LFC Blocks embedded within the same synchronous area.
- ii. Ramping-Rate based restrictions are applied between synchronous areas to ensure that rapid changes in power transfer do not create large Frequency Deviations and Frequency Restoration Control Error values that the ESO could not easily manage.

3. The text in this Article of the GB LFCBOM:

- a. The ESO has sought to maintain simplicity of application in that compliant regimes already exist on all GB connecting HVDC interconnectors, where the ramping-restrictions and manner in which they are applied is agreed and defined in the operational agreements.
- b. The ESO wishes to demonstrate that all interconnector parties are being treated fairly, but highlights that rules between different synchronous areas may differ as ramping-restrictions imposed from another synchronous area may, if more onerous than those sought by the ESO, result in different rules for those particular interconnectors.
- c. Transparency and fairness is demonstrated by publishing a summary of the ramping-restrictions being applied to GB interconnectors on the internet.
- d. There is a need to be able to reduce the ramping-rates being applied to interconnectors when there is a current need or future anticipated situation which without action would result in GB entering an emergency state. Under these circumstances the ESO will follow procedures to be determined in the operational agreements between parties to apply reduced ramp-rates to all market based transfer programs on all the affected interconnectors.
- e. For transparency purposes, the ESO will publish information on the situation leading-up-to the need to reduce ramping-rates and the specific actions followed until operations were returned to normal ramping-rules.

LFCBOM Article 2 - SOGL Article 119(c) - “ramping restrictions for active power output in accordance with SOGL Article 137(4)”

1. This Article of the LFCBOM permits the ESO to define limits on all controllable plant connected to the electrical system according to the SGU definition of SOGL Article 2(1). However for the purpose of day-1 implementation the ESO does not seek to change the current Grid Code/Distribution Code and maintains the current rules for grid users already defined.

2. Ramping restrictions for some GB grid users are defined in the GB Grid Code BC1A.1.1 which states for BM Units:
3. “The input or output reflected in the Physical Notification for a single BM Unit (or the aggregate Physical Notifications for a collection of BM Units at a Grid Entry Point or Grid Supply Point or to be transferred across an External Interconnection, owned or controlled by a single BM Participant) must comply with the following limits regarding maximum rates of change, either for a single change or a series of related changes :
 - a. for a change of up to 300MW no limit;
 - b. for a change greater than 300MW and less than 1000MW 50MW per minute;
 - c. for a change of 1000MW or more 40MW per minute, unless prior arrangements have been discussed and agreed with NGET.

This limitation is not intended to limit the Run-Up or Run-Down Rates provided as Dynamic Parameters.” – end of quote from Grid Code, Issue 5, revision 22.

LFCBOM Article 3 - SOGL Article 119(h) - “the FRR dimensioning rules in accordance with SOGL Article 157(1)”

1. Frequency Restoration Reserves [FRR] are needed to recover system frequency after a secured event.
2. Since GB does not operate an automatic Frequency Restoration Process (as defined by SOGL Article 145(4), 100% of the needs of FRR dimensioning must be met by a manual Frequency Restoration Process.
3. GB response services used for frequency restoration must act collectively to recover the frequency to the 500 mHz frequency recovery range, within the 1 minute defined time to recover frequency.
4. The National Electricity Transmission System (NETS) is designed in accordance with GB electricity code, National Electricity Transmission System Security and Quality of Supply Standard (NETS SQSS) section 2.5. This sets forth Limits to Loss of Power Infeed Risks, against secured events listed in NETS SQSS section 2.6, at the infrequent infeed loss risk of 1800MW.
5. Whilst 1800MW is the theoretical maximum infeed loss which can occur when units of that MW size are connected to the network and operating at their maximum operating level, it would be uneconomical to secure against this whilst there is no operating equipment capable of triggering such a loss connected to the NETS. For this reason the Grid Code in section BC1.5.4 sets out the requirements for reserve holding with BC1.5.4(b) identifying specific secured losses which must be covered at any given time. Additionally, these reserves are used manage the imbalance of generation and demand in real time including market imbalance and the ramping of generators and interconnectors.
6. At any time the ESO must ensure that the combined technical characteristic of all GB response services meet the technical characteristic needed to meet the FRR dimensioning requirements of SOGL article 157.
7. The ESO must ensure that there is the right level of FRR procured to meet the time varying FRR capacity requirement. The ESO determines in advance the FCR requirement across the range of potential system conditions using statistical and mathematical models which

are regularly reviewed. Using this predetermined range of requirements the ENCC study the prevalent system conditions and select the relevant requirement. This is then regularly updated to reflect changes in system conditions and needs through to real time.

8. The ESO requirements vary according to: system demand, system inertia, the largest potential loss of infeed & demand and prevailing system conditions. Network connectivity, congestion and inherent risks and limitations of assets may also warrant the ESO adjusting the total holding, location and distribution of holding of FRR amongst service providers.
9. A baseline of Balancing Services for FRR is procured ahead of real time where they can demonstrate an expected cost saving against mandatory services.
10. Closer to real time, the ESO makes an assessment on the basis of system operability and economics of the appropriate balance between actively managing the magnitude of credible losses of infeed and demand, the amount of system inertia and the requirement for FCR.
11. Market parties are made aware of the FRR capacity that The ESO has determined through the report required as part of the Electricity Transparency Regulation in Article 17(1)(b) and through obligations to publish information coming from SOGL Article 187. This information will be published on the [ENTSO-E market information transparency platform](#).

Not in the GB LFBOM - SOGL Article 119(q) - “coordination actions aiming to reduce the Frequency Restoration Control Error as defined in SOGL Article 152(14)”

1. This Article does not apply in GB because there is a single LFC Area in a single LCF Block within GB and hence no other TSO to coordinate actions with within the GB synchronous area.
2. The ESO will coordinate with other electricity system operators connected via HVDC interconnectors. This is defined within the GB Grid Code in BC.2.9.6.

LFCBOM Article 4 - SOGL Article 119(r) - “measures to reduce the Frequency Restoration Control Error (FRCE) by requiring changes in the active power production or consumption of power generating modules and demand units in accordance with SOGL Article 152(16)”

1. The Frequency Restoration Control Error is the MW imbalance relative to the frequency deviation.
2. Within GB, NGET makes best use of the tools it has available to it in order to ensure that frequency quality and maintaining the dimensioning requirement of FCR and FRR.
3. Under normal balancing conditions the Frequency Restoration Control Error can be managed using standard services from BM and ancillary service providers. This includes dynamic and static frequency response, fast reserve, STOR and bids and offers in the balancing mechanism.
4. In the event that the standard set of services is insufficient such as tight margin conditions or multiple plant failures NGET would issue the appropriate system warnings to allow access to additional tools. The system warnings are ‘Electricity Margin Notice’, ‘High Risk of Demand Reduction’, ‘Demand Control Imminent’ and ‘Risk of System Disturbance’. Also

included in this category is the 'System Negative Reserve Active Power Margin' notice. These tools allow NGET to issue Emergency Instructions on any connected and controllable demand, generation or interconnector unit.

5. System warnings and notices are defined in the Grid Code [issue 5, revision 22] section BC1.5.4 and OC7.4.8, whilst emergency actions are defined in BC2.9 and OC6.5.

TITLE 3 - Explanatory text to accompany each Article in the LFCBOM document that is NOT subject to NRA approval

Not in the GB LFCBOM - SOGL Article 119(a) – “where the LFC block consists of more than one LFC area, FRCE target parameters for each LFC area defined in accordance with SOGL Article 128(4)”

1. This article is not applicable to this document since the LF Block Structure has a single LF Block and single LF Area within the Synchronous Area of GB.

LFCBOM Article 5 - SOGL Article 119 (b) – “LFC block monitor in accordance with SOGL Article 134(1)”

1. The ESO performs the role of the LFC block monitor in GB fulfilling the obligations of SOGL Article 134(2),(3)&(4).

Not in the GB LFCBOM - SOGL Article 119 (d) – “where the LFC block is operated by more than one TSO, the specific allocation of responsibilities between TSOs within the LFC block in accordance with SOGL Article 141(9)”

1. This article is not applicable to this document since the GB LFC Block is operated by the ESO alone.

Not in the GB LFCBOM - SOGL Article 119 (e) – “if applicable, appointment of the TSO responsible for the tasks in SOGL Article 145(6)”

1. This text does not apply to GB, there is only a single LFC Area within the GB LFC Block. The ESO monitors and manages the FRCE of the GB LFC Block.

LFCBOM Article 6 - SOGL Article 119 (f) – “additional requirements for the availability, reliability and redundancy of technical infrastructure defined in accordance with SOGL Article 151(3)”

1. All requirements for the technical infrastructure are defined in the Synchronous Area Operational Methodologies document, Article 24.

Not in the GB LFCBOM - SOGL Article 119 (g) – “operational procedures in case of exhausted FRR and RR in accordance with SOGL Article 152(8)”

1. The procedures for FRR and RR follow from the same over-arching requirements that drive the FCR requirement defined in the Synchronous Area Operational Methodologies document, Article 21 and Article 14 in this document.
2. As a background: SOGL Article 152 considers the how evolving ‘system states’ affect operation of Load Frequency Control. Article 152(7) is concerned with the ensuring that the ESO has sufficient mechanisms and measures to maintain and regain sufficient FRR and RR to meet the dimensioning requirement. In the case of significant short-fall in either FRR or RR reserves the management of frequency-control will become difficult. To avoid this the TSOs are mandated to specify mechanisms and procedures in their synchronous area.
3. Within GB the ESO has related this Article to measures in the GB industry codes that significantly reduce the risk of there being insufficient or exhausted FRR or RR capacity in operational timescales and secondly the ESO has related this Article with the operational activities required to deal with the issue in operational timescales should there be a significant risk of FCR erosion that would lead to exhaustion and cannot be controlled using mechanisms defined in the ‘normal’ operational and market processes. These principles are present within the GB industry frameworks:
 - a. Ensuring sufficient capacity is made available to the ESO:
 - i. The obligation for certain grid users to have the capability to provide certain FRR services (namely ‘Secondary’ response) to the ESO can be found in the Grid Code CC.A.3, CC.6.3.7, CC.6.3.12, CC.6.3.13, CC.6.3.14, and BC3.5.1. The CC.A.3 details which plant the obligation falls to as well as plant operating range, minimum frequency response profile, testing and repeatability of response. Specific exclusions are included in CC.6.3.7(f) and also in BC3.5.4(e) and (f).
 - ii. The obligation for certain grid users to make certain FRR services (namely ‘Secondary’ response) at the disposition of the ESO is detailed in the Grid Code in BC 3 (more specifically BC3.5, BC3.6 and BC3.7)
 1. All plant identified in BC3.5.2 that is producing active power must provide Limited Sensitivity Mode frequency services as defined in Grid Code CC.6.3.3 and ECC.6.3.3.
 2. All plant identified in BC3.5.4(a) must offer to provide FRR services and accept instructions to make such services active.
 - b. Emergency measures taken in operational timescales in the case where FRR or RR is eroded below the dimensioning requirement:
 - i. The GB electricity system operator, The ESO, continuously monitors the electricity system’s immediate and future needs in terms of Frequency Restoration Reserve and Replacement Reserve dimensioning requirements. The ESO also reviews the physical and contractual availability of FRR capable units and groups as well as their status.

- ii. Where additional FRR or RR capacity is required, either because of changing circumstances or because of equipment failure the SO will act to ensure that the need for FRR and RR matches the available FRR and RR.
- iii. Where possible this will be performed by calling upon units or groups that are immediately ready to provide FRR or RR; or for example by using BM start-up contract (with sufficient notice).
- iv. Where the above can be achieved through commercially tendered and offered services these will be used. However, where this is not possible, emergency instructions will be utilised to instruct any controllable equipment to allow the configuration of operating plant to be adjusted or system need to be altered to resolve the problem:
 1. The Grid Code defines in OC6.5 operations requiring demand-control including issuing of warnings and then issuing demand control instructions. Network Operators must follow the ESO's instructions as defined in OC6.7.1
 2. More generally the ESO may issue system warnings as defined in OC7.4.8 and require emergency actions as defined in BC2.9

LFCBOM Article 7 - SOGL Article 119 (i) – “the RR dimensioning rules defined in accordance with SOGL Article 160(2)”

1. The procedures for FRR and RR follow from the same over-arching requirements that drive the FCR requirement defined in the Synchronous Area Operational Methodologies document, Article 21 and Article 13 in this document.
2. For procurement requirements, the RR capacity requirement is calculated twice a year, once for BST and once for GMT.
3. The RR capacity requirement is calculated by taking multiple years of historic data, partitioning by time-of-day, day-of-week, time-of-year and calculating a specific quantile. The reserve levels are determined in such a way that the risk of a loss of load event due to a reserve shortfall is uniform across all settlement periods in the year and consistent with the SQSS / SOGL.
 - a. The National Electricity Transmission System (NETS) is designed in accordance with GB electricity code, National Electricity Transmission System Security and Quality of Supply Standard (NETS SQSS) section 2.5. This sets forth Limits to Loss of Power Infeed Risks, against secured events listed in NETS SQSS section 2.6, at the infrequent infeed loss risk of 1800MW.
 - b. Whilst 1800MW is the theoretical maximum infeed loss which can occur when units of that MW size are connected to the network and operating at their maximum operating level, it would be uneconomical to secure against this whilst there is no operating equipment capable of triggering such a loss connected to the NETS. For this reason, the Grid Code in section BC1.5.4 sets out the requirements for reserve holding with BC1.5.4(b) identifying specific secured losses which must be covered at

any given time. Additionally, these reserves are used manage the imbalance of generation and demand in real time including market imbalance and the ramping of generators and interconnectors.

4. Thus, the historic demand and generation losses (up to 7 years of historic losses) are analysed and RR is set such that the reserve required is sufficiently able to cover the losses that reflects the risk of a loss of load event.
5. The historic demand and generation losses are analysed and RR is set such that the reserve required is sufficiently able to cover the losses that occurred for at least 99.7% of the time for each cardinal point. (SOGL sets a lower target of 99%).
6. Within control timescales in GB evaluation of RR capacity holding is performed on a continuous basis. Local and National requirements for RR may be optimised continuously as the operating environment changes, subject to the NGSO having the operational and market tools to operate this flexibly. These requirements vary according to the largest potential loss of demand or generation; specific inertia criteria; regional requirements due to network configuration/congestion and other factors.
7. The ESO evaluates the evolution of the forecast operating conditions and provisional market data submitted by connected parties to ensure that sufficient capacity and flexibility is present or that balancing service options remain available to correct this ahead of real-time. The ESO uses mathematical and modelling tools to determine the overall requirements, risks and costs of each option to determine the least regret action and timing of intervention to minimise the impact of forecasting errors and market evolution during planning timescales.
8. The RR requirement used to drive system operator actions ensures that the SQSS / SOGL requirements are not violated.
9. Market parties are made aware of the RR capacity that The ESO has determined through the report required as part of the Electricity Transparency Regulation in Article 17(1)(b) and through obligations to publish information coming from SOGL Article 187. This information will be published on the [ENTSO-E market information transparency platform \(MIT\)](#).

Not in the GB LFCBOM - SOGL Article 119 (j) – “where the LFC block is operated by more than one TSO, the specific allocation of responsibilities defined in accordance with SOGL Article 157(3), and, if applicable, the specific allocation of responsibilities defined in accordance SOGL Article 160(6)”

1. This article is not applicable to GB since the LFC Block is operated by the ESO alone.

LFCBOM Article 8 - SOGL Article 119 (k) – “the escalation procedure defined in accordance with SOGL Article 157(4) and, if applicable, the escalation procedure defined in accordance with SOGL Article 160(7)”

1. The ESO continually assess the level of FRR that is being held. If at any point the level of FCR/FRR cannot be achieved with a combination of the plant available and the contracts available, then a warning is sent to the market via the system warning escalation process. The warning process can be started as far ahead of time as day ahead. These warnings become more severe until the final warning leads to disconnection of generation, demand or interconnection utilising Emergency Instruction under the provisions of the Grid Code.
 - a. The Grid Code defines in OC6.5 operations requiring demand-control including issuing of warnings and then issuing demand control instructions. Network Operators must follow the ESO's instructions as defined in OC6.7.1
2. If a generation shortfall is only found close to real time, then the final warning of "demand control imminent" can be issued without delay; all DNO's must be able to react to this by have 5% of their demand set up to be disconnected at all times.
 - a. More generally the ESO may issue system warnings as defined in OC7.4.8 and require emergency actions as defined in BC2.9; whilst Network Operators must follow the ESO's instructions as defined in OC6.7.1

LFCBOM Article 9 - SOGL Article 119 (1) – “the FRR availability requirements , the requirements on the control quality defined in accordance with SOGL Article 158(2), and if applicable, the RR availability requirements and the requirements on the control quality defined in accordance with SOGL Article 161(2)”

1. FRR provision in GB is either via modules, units or groups connected to the GB electricity system or contracts agreed between the ESO and a provider through sharing or exchange agreements with other TSOs.
2. BM Units in GB (under BSC Section K-3; section 3.1.1 and definition in the Grid Code) are obligated to be able to declare availability of Balancing Mechanism aligned FRR services and data submitted according to Grid Code BC1.4 permits availability of those services to be determined. Information received under BC1 and BC2 in operational timescales as well as OC2 data in operational planning timescales, allows the ESO to determine how much GB 'secondary response, aligned FRR service will be available from response providers.
3. Contractual availability of A/S providers is contained within A/S contractual information. National Grid sets its base requirements before each tender round, sometimes flexibility in the response is permitted and forms part of the contract awarding and provider selection criteria. A/S contract holders can declare themselves unavailable during operational planning timescales.
4. The ESO reviews capacity, reliability and technical performance of available units and factors this into security assessments and unit selection across all timescales.

Not in the LFCBOM - SOGL Article 119 (m) – “if applicable, any limits on the exchange of FCR between the LFC areas of the different LFC blocks within the CE synchronous area and the exchange of FRR or RR between the LFC areas of an LFC block of a synchronous area consisting of more than one LFC block defined in accordance with SOGL Article 163(2), SOGL Article 167 and SOGL Article 169(2)”

1. This article is not applicable to this document.

Not in the LFCBOM - SOGL Article 119 (n) – “the roles and the responsibilities of the reserve connecting TSO, the reserve receiving TSO and of the affected TSO for the exchange of FRR and/or RR with TSOs of other LFC blocks defined in accordance with Article 165(6)”

1. Not applicable in GB as there is only one LFC Block defined for GB.

Not in the LFCBOM - SOGL Article 119 (o) – “the roles and the responsibilities of the control capability providing TSO, the control capability receiving TSO and of the affected TSO for the sharing of FRR and/or RR defined in accordance with SOGL Article 166(7)”

1. Not applicable in GB as there is only one LFC Block defined for GB.

LFCBOM Article 10 - SOGL Article 119 (p) – “roles and the responsibilities of the control capability providing TSO, the control capability receiving TSO and of the affected TSO for the sharing of FRR and RR between synchronous areas in accordance with SOGL Article 175(2)”

1. This part of SOGL concerns itself with ensuring that receipt and provision of cross-border services does not impact on the dimensioning process or the availability, reliability and effectiveness of the overall Process Activation Structure. Thus, to be clear with regards the impact the cross-border process have on GB management of LFCR:
 - a. All controls relative to ensuring GB security and compliance with frequency quality targets and reserve management will be applied by the ESO during the design phase and operational phase of cross-border services. The relevant controls, limits and procedures are documented in ‘agreements’ with the involved TSO and interconnector parties.
 - b. No other TSO is permitted to directly instruct reserve providing modules, units or groups connected to the GB system and so for GB, the ESO is the sole reserve instructing TSO.
 - c. The ESO will when functioning in the role of the Capacity Receiving TSO consider the reliability of the service to determine the degree to which it may be considered

a firm part of the GB capacity holding that meets the dimensioning requirements for FRR or RR.

- d. The ESO will when functioning in the role of the Capacity Connecting TSO consider the impact of another TSO activating a given capacity according to the agreed activation processes on the frequency quality; on FRCE, the functioning of the wider FCP, FRP, RRP in GB and general system security.

Further background on the SOGL principles:

2. Each cross-border reserve service involving the ESO and one or more foreign TSO and one or more HVDC interconnector will have these roles and principles defined in operational agreements. The roles defined in this Article are not 'static' but depend on specific activation sequence and which TSO is 'playing' the role of connecting, affected or receiving at any given time. The trigger to this sequence can be a simple TSO need or be extended to cover considerations beyond SOGL and the subject of EBGL.
3. Sharing of Reserves is a concept which allows a TSO to take a cross-border activation process into account while organising the availability of the required Active Power Reserves. This means that Sharing of Reserves cannot be technically linked to a specific Reserve Providing Unit or a Reserve Providing Group. Generally speaking, sharing of reserves provides a control capability offered by one TSO to another without ensuring the availability of additional corresponding Reserve Capacity (as it is shared it can suffer from a greater number of reasons as to why it may be unavailable; i.e. already in use by another TSO). The Exchange of Reserves provides a control capability and additional corresponding Reserve Capacity at the same time (since the exchanged reserves are now exclusively for the use of the receiving TSO).
4. In order to define clear and consistent responsibilities for TSOs involved in Exchange of Reserves or Sharing of Reserves, the SOGL introduces the respective roles for the involved TSOs.
5. Reserve Connecting TSO and reserve receiving TSO
 - a. In context of Exchange of Reserves the role of the Reserve Connecting TSO does not change but is supplemented with an additional meaning:
 - i. The Reserve Connecting TSO is still the TSO which operates the Monitoring Area, LFC Area or LFC Block to which a Reserve Providing Unit or a Reserve Providing Group is physically connected to while a certain amount of the Reserve Capacity is required by a different TSO, the Reserve Receiving TSO, to fulfil its dimensioning requirements.
 - ii. The Reserve Receiving TSO means the TSO involved in an exchange with a Reserve Connecting TSO and/or a Reserve Providing Unit or a Reserve Providing Group connected to another Monitoring or LFC Area.
6. Control capability providing and control capability receiving TSO:
 - a. The roles of Control Capability Providing TSO and Control Capability Receiving TSO are defined as follows:

- i. Control Capability Providing TSO means the TSO which shall trigger the activation of its Reserve Capacity for a Control Capability Receiving TSO under conditions of an agreement for the Sharing of Reserves.
 - ii. Control Capability Receiving TSO means the TSO calculating Reserve Capacity by taking into account Reserve Capacity which is accessible through a Control Capability Providing TSO under conditions of an agreement for the Sharing of Reserves.
- b. Therefore, the respective terms describe the relationship in context of Sharing of Reserves between two TSOs enabling the NC LFCR to directly and explicitly target the respective obligations without inconsistencies with the roles of the Reserve Connecting TSO, the Reserve Receiving TSO and the Reserve Instructing TSO.
- c. The Control Capability Providing and Receiving TSOs shall follow the Notification Process for the Sharing of Reserves.

7. Affected TSO

- a. In addition to the Reserve Connecting TSO and the Reserve Receiving TSO for the Exchange of Reserves and the Control Capability Providing TSO and Control Capability Receiving TSO for the Sharing of Reserves, any Affected TSO has the right to refuse respectively the Exchange or Sharing of Reserves in the case the activation of the concerned Reserve Capacity would result in power flows in violation with the Operational Security Limits.