

LFC Block Operational Agreement (LBCBOA) Ireland and Northern Ireland (also incorporating LFC and Monitoring area operational agreements)

Revised Draft for Consultation
12 July 2019

Notice

This document, provided by EirGrid and SONI, is a revised draft of the LFCBOA, following the Regulatory Authorities Request for Amendment which was published on 24 June 2019 on the CRU¹ and Utility Regulator² websites. This draft LFCBOA is published for consultation prior to the submission of the proposal for the IE/NI LFC Block Operational Agreement in accordance with Article 119 of Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation. Title 4 of this document also contains the proposed LFC area operational agreement in accordance with Article 120 and the proposed Monitoring area operational agreement in accordance with Article 121.

¹ https://www.cru.ie/document_group/eu-electricity-network-codes/

² <https://www.uregni.gov.uk/publications/request-amendment-tso-proposal-saoa-and-lfchoa-agreements>



Disclaimer

EirGrid as the Transmission System Operator (TSO) for Ireland and SONI Ltd as the Transmission System Operator (TSO) for Northern Ireland make no warranties or representations of any kind with respect to the information contained in this document. We accept no liability for any loss or damage arising from the use of this document or any reliance on the information it contains. The use of information contained within this consultation paper for any form of decision making is done so at the user's sole risk.

For Consultation

Contents

Introduction	5
Whereas	5
TITLE 1 General Provisions	6
Article 1 Subject matter and scope.....	6
Article 2 Definitions and interpretation.....	6
TITLE 2 Methodologies, Conditions and Values jointly developed by EirGrid and SONI to satisfy the needs of the SOGL within the LFCBOA for IE/NI, which are subject to regulatory authority approval	9
Article 3 Ramping restrictions for active power output in accordance with SOGL Article 137(3) and (4).....	9
Article 4 The FRR dimensioning rules in accordance with SOGL Article 157(1) and 157(2)	11
Article 5 Coordination actions aiming to reduce the Frequency Restoration Control Error as defined in SOGL Article 152(14).....	12
Article 6 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).	13
TITLE 3 Methodologies, Conditions and Values jointly developed by EirGrid and SONI within LFCBOA for IE/NI to meet the requirements of the SOGL but not requiring regulatory authority approval	14
Article 7 LFC block monitor in accordance with SOGL Article 134	14
Article 8 Allocation of responsibilities in accordance with SOGL Article 141(9)	14
Article 9 Additional requirements for the availability, reliability and redundancy of technical infrastructure defined in accordance with SOGL Article 151(3).....	15
Article 10 Operational procedures to be applied in the case of exhausted FRR and RR in accordance with SOGL Article 152(8).....	15
Article 11 RR dimensioning rules in accordance with SOGL Article 160(2)	17
Article 12 Allocation of TSO responsibilities associated with FRR dimensioning in accordance with SOGL Article 157(3) and RR dimensioning in accordance with SOGL Article 160(6)	18
1. EirGrid and SONI consider the total requirements for FRR in Ireland and Northern Ireland as defined by the dimensioning rules. The TSOs publish the FRR requirements within the Operating Reserve Requirements section of the Operational Constraints Update. EirGrid and SONI utilise scheduling and dispatch optimisation software to regularly calculate the most economic allocation of FRR within the synchronous area subject to the limitations imposed by tie line operational constraints and frequency response availability and limits on the DC interconnectors. FRR sharing with the GB synchronous area shall also be included within this optimisation process.	18
Article 13 Escalation procedure for managing severe risk of insufficient FRR or RR in accordance with SOGL Articles 157(4) and 160(7)	18

Article 14	Requirements for FRR availability and control quality in accordance with SOGL Articles 158(2) and 161(2)	19
Article 15	TSO roles and responsibilities for the exchange of FRR and/or RR in accordance with SOGL Article 165(6).....	19
Article 16	TSO roles and responsibilities for the sharing of FRR and/or RR in accordance with SOGL Article 166(7).....	20
Article 17	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 Article 175(2).....	20
TITLE 4	Additional Agreements.....	21
Article 18	LFC area operational agreement in accordance with Article 120.....	21
Article 19	Monitoring area operational agreement in accordance with Article 121 22	
TITLE 5	Final Provisions	23
Article 20	Timescale for implementation.....	23
Article 21	Language.....	23
Appendix 1 – Operational Constraints process.....		24

Introduction

This LFC Block Operational Agreement (hereafter referred to as “LFCBOA”) document applies to the Block of Ireland (IE) and Northern Ireland (NI) and contains the Agreement required by Article 119 of Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation (hereafter referred to as “SOGL”). It also contains the LFC and Monitoring area operational agreements required under Article 120 and 121 of SOGL.

This LFCBOA is implemented in IE and NI taking into account:

Whereas

1. This proposal was jointly developed by EirGrid and System Operator Northern Ireland (hereafter referred to as “SONI”) regarding a LFCBOA document for IE/NI.
2. This LFCBOA recognises the general principles and goals established in SOGL as well as Commission Regulation (EU) 2015/1222 establishing a guideline on capacity allocation and congestion management (hereafter referred to as “CACM”), and Regulation (EC) No 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity (hereafter referred to as “Regulation (EC) No 714/2009”). SOGL aims to safeguard operational security, frequency quality and the efficient use of the interconnected system and resources.
3. SOGL, Part IV, entitled Load Frequency Control & Reserves recognises that relatively small synchronous areas such as in IE/NI require operational flexibility when compared with larger synchronous areas such as continental Europe as well as specific time varying influence of network connectivity and technology in the energy mix in determining how system operators’ processes and reserve services meet the system quality criteria. This flexibility is achieved through the development of agreements and methodologies.
4. According to Article 6 (6) of the SOGL, the expected impact of the IE/NI LFCBOA proposal on the objectives of the SOGL shall be described. It is presented below. The obligations described in the LFCBOA are intended to assist TSOs in IE/NI to deliver the objectives of the SOGL. In particular the LFCBOA serves the objective of ensuring the conditions for maintaining a frequency quality level for the synchronous area IE/NI; for determining common load-frequency control processes and control structures within IE/NI; ensuring conditions for maintaining operational security; the publication of IE/NI methodologies and specific values in the common language of SOGL; promoting transparency and reliability of information on transmission system operation; facilitating greater cross-border cooperation and the efficient operation of the electricity transmission system in the Union.
5. Furthermore, the methodologies contained in this LFCBOA proposal shall ensure application of the principles of proportionality and non-discrimination; transparency; optimisation between the highest overall efficiency and lowest total costs for all industry stakeholders

and consumers; and use of market-based mechanisms as far as possible, to promote frequency quality and operational security.

6. In conclusion, the methodologies contained in this LFCBOA proposal shall contribute to the general objectives of the SOGL to the benefit of all TSOs, the Agency, regulatory authorities, market participants and the end consumers.

TITLE 1 General Provisions

Article 1 Subject matter and scope

1. This LFCBOA for Ireland and Northern Ireland contains:
 - a. Title 2: Those requirements referenced in both SOGL Article 119(1) and SOGL Article 6(3)(e). These requirements are subject to approval by the regulatory authorities for Ireland and Northern Ireland and public consultation from Article 11;
 - b. Title 3: Those requirements referenced in SOGL Article 119(1) but not mentioned in SOGL Article 6 or SOGL Article 11. These requirements are neither subject to regulatory approval nor public consultation; and
 - c. Title 4: Those requirements referenced in SOGL Articles 120 and 121. These requirements are not subject to regulatory approval or public consultation.

Article 2 Definitions and interpretation

1. For the purposes of this proposal, the terms used shall have the meaning of the definitions included in Article 3 of SOGL, Article 2 of CACM and the other items of legislation referenced therein.
2. EirGrid and SONI may use existing definitions, terminology and understandings to deliver the requirements of the SOGL within this LFCBOA as detailed in Table 1.

Terminology used in the System Operations Guideline (SOGL)	Interpretation based on terms normally used by EirGrid and SONI
FCR – Frequency Containment Reserve	Shall include Primary Operating Reserve (POR) and Secondary Operating Reserve (SOR) as defined in the EirGrid ³ and SONI ⁴ Grid Codes.

³ [EirGrid Grid Code](#)

⁴ [SONI Grid Code](#)

FRR – Frequency Restoration Reserve	At present includes Tertiary Operating Reserve 1 (TOR1) and Tertiary Operating Reserve 2 (TOR2) as defined in the EirGrid and SONI Grid Codes. With ongoing implementation of Network Codes, in particular Electricity Balancing, future refinements are possible to ensure alignment with Network Codes.
FRR – Frequency Restoration Reserve	At present includes Tertiary Operating Reserve 1 (TOR1) and Tertiary Operating Reserve 2 (TOR2) as defined in the EirGrid and SONI Grid Codes. With ongoing implementation of Network Codes, in particular Electricity Balancing, future refinements are possible to ensure alignment with Network Codes.
mFRR – Manual Frequency Restoration Reserves	Means FRR with manual activation.
aFRR – Automatic Frequency Restoration Reserves	<p>Means FRR that can be activated by an automatic control device.</p> <p>This device might be a load frequency controller which continually monitors the area control error (the difference between scheduled cross border exchange and the actual cross border exchange) corrected for frequency and sends setpoints to FRR providers to increase or decrease their output, based on a merit order, to return the area control error to zero.</p> <p>aFRR activated by a load frequency controller are currently not used in the IE/NI synchronous area. This is subject to a cost benefit analysis being carried as required by SOGL (Article 145(2)).</p>
RR – Replacement Reserve	At present includes Replacement Reserve (RR) as defined in the EirGrid and SONI Grid Codes. With ongoing implementation of Network Codes, in particular Electricity Balancing, future refinements are possible to ensure alignment with Network Codes.

Dimensioning incident for the purpose of dimensioning FRR	In IE/NI this is typically referred to as the imbalance that may arise from the loss of the largest single infeed (or outfeed) when determining the requirements for reserve scheduling.
Reserve providing unit	Any provider that has the technical capability to provide reserves, FCR (POR, SOR), FRR (TOR1, TOR2) and RR, having met the applicable Network Code requirements including the additional properties specified in article 4 of the SAOA and having successfully completed the required performance tests.
Demand Unit	Demand Side Unit as defined in the EirGrid and SONI Grid Codes and in the ESBN and NIE Distribution Codes; or An Individual Demand Site or Aggregated Demand Site with a Demand Side Unit MW Capacity of at least 4 MW. The Demand Side Unit shall be subject to Central Dispatch.

Table 1 Definitions 1

Network Code Definitions	
PGM - Power Generating Module	means either a synchronous power-generating module or a power park module
Demand Unit	means an indivisible set of installations containing equipment which can be actively controlled by a demand facility owner or by a CDSO, either individually or commonly as part of demand aggregation through a third party;
Demand Facility	means a facility which consumes electrical energy and is connected at one or more connection points to the transmission or distribution system. A distribution system and/or auxiliary supplies of a power generating module do not constitute a demand facility;
Cross border sharing and exchange of reserves categories FCR, FRR and RR.	'exchange of reserves' means the possibility of a TSO to access reserve capacity connected to

	<p>another LFC area, LFC block, or synchronous area to fulfil its reserve requirements resulting from its own reserve dimensioning process of either FCR, FRR or RR and where that reserve capacity is exclusively for that TSO, and is not taken into account by any other TSO to fulfil its reserve requirements resulting from their respective reserve dimensioning processes;</p> <ul style="list-style-type: none"> • ‘sharing of reserves’ means a mechanism in which more than one TSO takes the same reserve capacity, being FCR, FRR or RR, into account to fulfil their respective reserve requirements resulting from their reserve dimensioning processes;
--	--

Table 2 – Definitions 2

TITLE 2

Methodologies, Conditions and Values jointly developed by EirGrid and SONI to satisfy the needs of the SOGL within the LFCBOA for IE/NI, which are subject to regulatory authority approval

Article 3 Ramping restrictions for active power output in accordance with SOGL Article 137(3) and (4)

1. The maximum aggregate ramp rate of interconnectors between IE/NI and other synchronous areas shall be provided in the Operational Constraints Update⁵.
2. EirGrid and SONI acting prudently may restrict the aggregate ramp rates of all interconnectors between IE/NI and another synchronous area to a level that is below the level detailed in the Operational Constraints Update in order to prevent the IE/NI LFC Block from entering into or remaining in an emergency state. The reasons for applying this restriction shall be transparent.
3. The maximum ramping rate for all HVDC interconnectors connecting the synchronous area IE/NI to other synchronous areas is 10 MW/min. The ramp rate on EWIC is 5 MW/min and the ramp rate on Moyle is 5 MW/min. If one interconnector is on outage

⁵Latest update is at [Library section on www.eirgridgroup.com](http://www.eirgridgroup.com) or <https://www.sem-o.com/publications/general-publications/>

the ramp rate on the in service interconnector can be increased up to a maximum of 10 MW/min.

4. The ramp rate restrictions shall not apply for the cross border activation of FCR, FRR and RR.

	Gain (MW/Hz)	Ramp Rate (MW/min)
EWIC	500	2,400
Moyle	500	

Table 3

5. Central dispatch is utilised in synchronous area IE/NI removing the need for the TSOs to specify additional limitations on ramping periods, ramping rates, and ramping start times of centrally dispatched Generators, Pumped Storage Plant Demand, Energy Storage Power Station Demand, Demand Side Units, and Aggregated Generating Units.
6. The process for the calculation of the Operational Constraint Update is available on the SEM-O website⁶. An extract of the process map and process steps is also available in Appendix 1.
7. To determine restrictions on the maximum ramping rates for HVDC interconnectors EirGrid and SONI will undertake system frequency stability studies. The scenarios for the studies will cover a range of and rates of change of system demand, renewable generation output and generation unit output.
8. Based on an analysis of the outputs of the power system frequency stability studies, EirGrid and SONI will decide if the ramp rate limit needs amending.
9. A provisional operating policy will be developed to reflect the new limit, respecting the requirements of SOGL Article 56. The provisional operating policy will contain the operating rules, including:
 - a. Action to be taken for any change from normal system behaviour;
 - b. Actions to be taken in the event of system faults;
 - c. Recording any change from normal system behaviour;
 - d. When the trial should be suspended (system testing, weather alerts, system alerts, loss of critical IT or communications equipment).

⁶ https://www.sem-o.com/documents/general-publications/BP_SO_02.2_System_Constraints_Calculation.pdf

10. During the period of operation under the provisional operating policy actual real time data will be compared to the study outputs for verification of the accuracy of the study tool.
11. Following conclusion of the period of operation under the provisional operating policy a review of the results will be carried out, the outcome of which will be a decision by EirGrid and SONI as to whether the new limit on the maximum ramping rates for HVDC interconnectors will be put forward to become “Official” operating policy.

Article 4 The FRR dimensioning rules in accordance with SOGL Article 157(1) and 157(2)

1. EirGrid and SONI do not operate an aFRR process; consequently all FRR in the load frequency control block is mFRR (manual).
2. EirGrid and SONI shall jointly determine the reserve capacity for FRR, which will be 100% of the dimensioning incident in the positive and negative directions. The dimensioning incident will be the largest single infeed or outfeed.
3. EirGrid and SONI will dimension FRR on a day-ahead basis in both the positive and negative directions. Currently negative reserve is not disaggregated. To ensure compliance with the requirements of the SOGL negative reserves will have to be split into FCR, FRR and RR. This will form part of the current review of the negative reserve policy. This required reserve will be updated both day ahead and in-day based on more accurate demand forecasts, renewable forecasts, interconnector schedule information and both active power and reserve availability declarations.
4. EirGrid and SONI have a geographical limitation on the distribution of FRR. The current values of the limits are published in the Operational Constraints Update⁷. This geographical limit has been determined on an experiential basis following the reconnection of the North-South tie line.
5. To assess the risk of non-delivery of FRR shared between synchronous areas:
 - a. Each TSO connected to a HVDC interconnector shall exchange information relating to operations and/or events on the HVDC interconnector, either transmission system, or other parties connected to these systems that have an effect on either transmission system or EWIC itself;
 - b. The availability of arming the FRR service is assumed unless real time transfers prevent this or the service has been specifically withdrawn; and

⁷ Latest update is at [Library section on www.eirgridgroup.com](http://www.eirgridgroup.com) or <https://www.sem-o.com/publications/general-publications/>

- c. Arming or disarming the service will be agreed between the control capability providing TSO and the control capability receiving TSO.

Article 5 Coordination actions aiming to reduce the Frequency Restoration Control Error as defined in SOGL Article 152(14)

1. The frequency restoration control error for EirGrid and SONI is the frequency deviation.
2. EirGrid shall undertake the role of LFC block monitor. When SONI is lead monitoring TSO and in the event that EirGrid is unable to fulfil these obligations, SONI will undertake the duties of LFC block monitor in coordination with EirGrid.
3. EirGrid and SONI will initiate the relevant actions from those listed in point 3 below, to endeavour to reduce the FRCE prior to violating the level 2 FRCE range, equal to or larger than 500 mHz, in paragraph 12 of Article 152 of the SOGL.
4. On the identification of any violation of the level 2 FRCE range, equal to or larger than 500 mHz, in paragraph 12 of Article 152 of the SOGL, coordinated actions will be implemented. As central dispatch is utilised in synchronous area IE/NI EirGrid and SONI will begin re-dispatching centrally dispatched generation and demand side units before the frequency deviation exceeds the level 2 FRCE range. This re-dispatching will respect priority dispatch. Based on the expected demand and renewable electricity generation trajectories, the increase or reduction in MW required and the time required to start units EirGrid and SONI may synchronise or desynchronise centrally dispatched generation or demand side units. The following coordinated actions will be implemented, the lead monitoring TSO at the time will initiate actions a, b and e, consult the other TSO on actions c and d and initiate discussion on actions f, g and h:
 - a. Issuing set points, via the wind dispatch tool in the energy management system, to reduce curtailment of wind generation to increase active power production to reduce the frequency
 - b. Issuing instructions to either increase or decrease active power production or consumption of centrally dispatched generation or demand side units to reduce the frequency deviation;
 - c. Issuing instructions to synchronise centrally dispatched generation or demand side units to provide additional options to either increase active power production or decrease consumption to reduce the frequency deviation;
 - d. Issuing instructions to desynchronise centrally dispatched generation or demand side units to provide additional options to either decrease active power production or increase consumption to reduce the frequency deviation;

- e. Issue set points, via the wind dispatch tool in the energy management system, to curtailing decrease active power production to reduce the frequency deviation.
- f. Requesting an emergency assistance on a HVDC interconnector to change the active power flowing on the HVDC interconnector, to reduce the frequency deviation;
- g. Issuing a HVDC interconnector emergency instruction, to change the active power flowing on the HVDC interconnector towards zero, to reduce the frequency deviation;
- h. Emergency load shedding to reduce frequency deviation;
- i. Enabling of special protection schemes to reduce the active power output or trip generation;
- j. High frequency tripping of wind generation to reduce frequency deviation; and
- k. Under-frequency load shedding to reduce frequency deviation.

Article 6 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 for EirGrid and SONI is the frequency deviation.
2. EirGrid shall undertake the role of LFC block monitor. When SONI is lead monitoring TSO and in the event that EirGrid is unable to fulfil these obligations, SONI will undertake the duties of LFC block monitor in coordination with EirGrid.
3. EirGrid and SONI will initiate the relevant actions from those listed in point 3 below, to endeavour to reduce the FRCE prior to violating the level 2 FRCE range, equal to or larger than 500 mHz, in paragraph 12 of Article 152 of the SOGL.
4. On the identification of any violation of the level 2 FRCE range, equal to or larger than 500 mHz, in paragraph 12 of Article 152 of the SOGL, coordinated actions will be implemented. As central dispatch is utilised in synchronous area IE/NI EirGrid and SONI will begin re-dispatching centrally dispatched generation and demand side units before the frequency deviation exceeds the level 2 FRCE range. This re-dispatching will respect priority dispatch. Based on the expected demand and renewable electricity generation trajectories, the increase or reduction in MW required and the time required to start units EirGrid and SONI may synchronise or desynchronise centrally dispatched generation or demand side units. The lead monitoring TSO at the time will initiate actions a, b and e, coordinate with the other TSO on actions c and d and in coordination with the other TSO initiate discussion on action g:

- a. Issuing set points, via the wind dispatch tool in the energy management system, to reduce curtailment of wind generation to increase active power production to reduce the frequency;
- b. Issuing instructions to either increase or decrease active power production or consumption of centrally dispatched generation or demand side units to reduce the frequency deviation;
- c. Issuing instructions to synchronise centrally dispatched generation or demand side units to provide additional options to either increase active power production or decrease consumption to reduce the frequency deviation;
- d. Issuing instructions to desynchronise centrally dispatched generation or demand side units to provide additional options to either decrease active power production or increase consumption to reduce the frequency deviation;
- e. Issue set points, via the wind dispatch tool in the energy management system, to curtailing wind generation to increase active power production to reduce the frequency deviation; and
- f. Enabling of special protection schemes to reduce the active power output or trip generation to reduce frequency deviation.

TITLE 3

Methodologies, Conditions and Values jointly developed by EirGrid and SONI within LFCBOA for IE/NI to meet the requirements of the SOGL but not requiring regulatory authority approval

Article 7 LFC block monitor in accordance with SOGL Article 134

1. EirGrid shall undertake the role of LFC block monitor and discharge the obligations described in SOGL Article 134. In the event that EirGrid is unable to fulfil these obligations, SONI will undertake the duties of LFC block monitor in coordination with EirGrid. This activity shall be conducted with the cooperation of both EirGrid and SONI.

Article 8 Allocation of responsibilities in accordance with SOGL Article 141(9)

1. EirGrid and SONI acting in conjunction with each other from a load frequency control and reserves perspective, will dimension FRR and RR capacity to ensure there are appropriate reserves to ensure that the LFC block FRCE target parameters are achieved.
2. EirGrid and SONI consider the total requirements for FRR and RR in IE and NI as defined by the FRR dimensioning rules. The TSOs publish the FRR requirements within the Operating

Reserve Requirements section of the Operational Constraints Update. The TSOs publish the RR requirements within the System Constraints section of the Operational Constraints Update.

3. EirGrid and SONI utilise scheduling and dispatch optimisation software which respects the FRR and RR dimensioning rules.
4. The required FRR and RR are initially scheduled for each half hour on a day ahead basis, subject to the limitations imposed by tie line operational constraints. This required reserve is updated both day-ahead and in-day based on more accurate demand, renewable and interconnector schedule information. FRR sharing with the GB synchronous area shall also be included within this optimisation process.
5. The optimisation of FRR shall be based on the declared availability, technical parameters and commercial offers submitted to EirGrid and SONI by market participants in respect of their FRR providing units. Provision of FRR and RR shall respect the minimum jurisdictional limits for FRR and RR as detailed in the Operational Constraints Update.
6. To ensure compliance with the FRR and RR dimensioning rules EirGrid and SONI will:
 - a. Monitor the FRR and RR declarations of reserve providers and the energy levels of energy limited FRR and RR providers to maintain awareness of the real time availability of FRR and RR;
 - b. Continually monitor the required and actual FRR using the energy management system. The energy management system provides both visual and audible reserve shortage indications; and
 - c. Monitor the output of the dynamic stability assessment tool to ensure system frequency stability is maintained in real time.

Article 9 Additional requirements for the availability, reliability and redundancy of technical infrastructure defined in accordance with SOGL Article 151(3)

EirGrid and SONI are not proposing any additional requirements.

Article 10 Operational procedures to be applied in the case of exhausted FRR and RR in accordance with SOGL Article 152(8)

1. The EirGrid and SONI grid codes and the Ireland distribution code require certain generators connected to the transmission system, centrally dispatched generating units connected to the distribution network and generators >2MW connected at 110 kV level on the distribution system to provide FRR and RR. It is expected that under the network codes increased capabilities from small scale providers will be available to be considered.
2. The required FRR is initially scheduled for each half hour on a day-ahead basis. This required reserve is updated both day-ahead and in-day based on more accurate demand, renewable and interconnector schedule information.

3. EirGrid and SONI will monitor the declared availabilities of centrally dispatched generation and demand side units to maintain awareness of the real time availability of RR.
4. EirGrid and SONI will monitor the availability of and the FRR and RR declarations of reserve providers and the energy levels of energy limited FRR and RR providers to maintain awareness of the real time availability of FRR and RR.
5. Issue Alerts both local and using the ENTSO-E Awareness System (Market Operations, CRU and UR are to be informed for Amber Alert – Level 2 and higher):
 - a. Local Alerts
 - i. Amber Alert - Level 1 signal should be initiated by EirGrid or SONI when the System enters an alert state that is characterised by:
 Total system availability + Any additional tie line flow from IE or NI + Emergency Assistance over EWIC or Moyle – Peak Demand < Largest Infeed
 - ii. The Amber Alert - Level 2 signal should be initiated by EirGrid or SONI when the System enters an alert state that is characterised by:
 When the system margin (i.e. the available plant + Emergency Assistance less the predicted peak demand) is less than the jurisdictional primary spinning reserve requirement
 - b. ENTSO-E awareness system
 - i. The Alert state should be initiated when the TSO’s reserve capacity is reduced by more than 20% for longer than 30 minutes and there are no means to compensate for that reduction in real time system operation (article 18(2)(b)).
 - ii. The Alert state should be initiated when the frequency enters the alert area as outlined in the illustration below in Figure 1, as defined in Article 18 of SOGL.

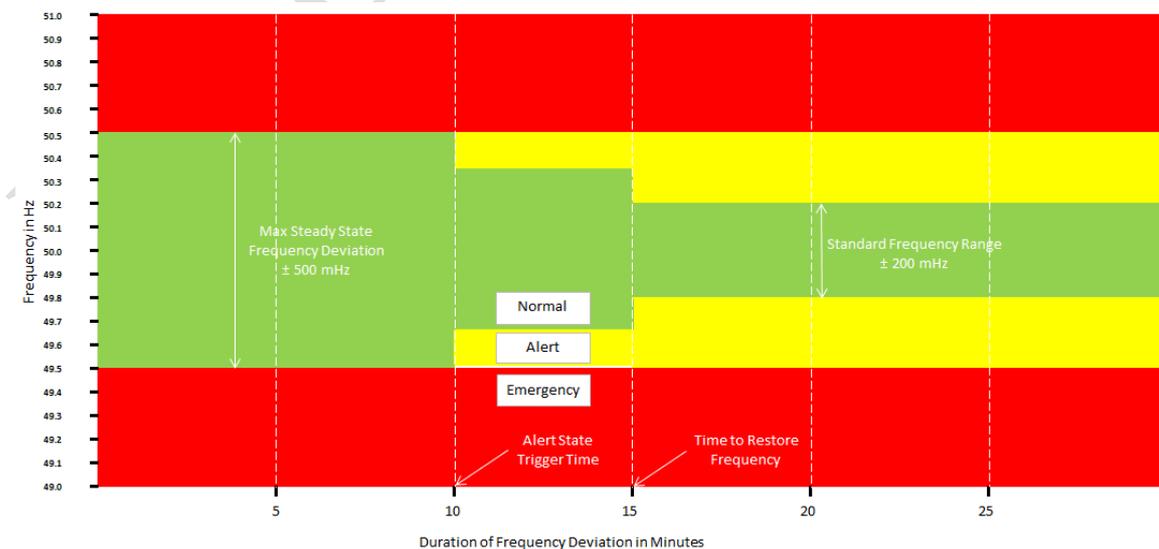


Figure 1 System States

6. In the case of exhausted FRR and RR EirGrid and SONI will make use of but may not be limited to the following:
 - a. Redispatching centrally dispatched generators and / or demand side units to increase reserve provision;
 - b. Reduce the size of the dimensioning incident to reduce the reserve requirement;
 - c. Synchronise additional units to increase reserve provision;
 - d. Curtail or uncurtail wind to allow for increased reserve provision;
 - e. Recall generators from outage;
 - f. Recall transmission system elements from outage to reduce congestion;
 - g. If possible request generation and / or demand side units to maximise their output;
 - h. Issue HVDC emergency assistance and / or emergency instruction;
 - i. Decide on the requirement to issue a public appeal to reduce demand; and
 - j. Invoke emergency load shedding.

Article 11 RR dimensioning rules in accordance with SOGL Article 160(2)

1. EirGrid and SONI acting in conjunction with each other consider the overall RR requirement for the IE/NI synchronous area. Due to the current north south tie line operational constraint, EirGrid maintains a minimum level of RR in Ireland and SONI maintains a minimum level of RR in Northern Ireland. The current values of the limits are published in the Operational Constraints Update as part of the Active Northern Ireland Constraints table and the Active Ireland Constraints table.
2. The RR dimension rule is to ensure that there are adequate replacement reserves to restore the required amount of the FCR and the required amount of FRR in the positive direction.
3. Currently negative reserve is not disaggregated. To ensure compliance with the requirements of the SOGL negative reserves will have to be split into FCR, FRR and RR. This will form part of the current review of the negative reserve policy.
4. At present the Cross Border Balancing and Coordinated Third Party trading processes to enable sharing or exchange of RR require more than the 20 minutes full activation time of RR to complete. For this reason EirGrid and SONI at present apply a zero limit for sharing or exchange of RR as there is no exchange or sharing of replacement reserve between synchronous areas IE/NI and GB. With the implementation of the Electricity Balancing Guideline the RR trading processes will have to be modified to provide the ability to share and exchange RR.

Article 12 Allocation of TSO responsibilities associated with FRR dimensioning in accordance with SOGL Article 157(3) and RR dimensioning in accordance with SOGL Article 160(6)

1. EirGrid and SONI consider the total requirements for FRR in Ireland and Northern Ireland as defined by the dimensioning rules. The TSOs publish the FRR requirements within the Operating Reserve Requirements section of the Operational Constraints Update. EirGrid and SONI utilise scheduling and dispatch optimisation software to regularly calculate the most economic allocation of FRR within the synchronous area subject to the limitations imposed by tie line operational constraints and frequency response availability and limits on the DC interconnectors. FRR sharing with the GB synchronous area shall also be included within this optimisation process.
2. EirGrid and SONI act in conjunction with each other to ensure the secure operation of the IE/NI synchronous area from a load frequency control and reserves perspective. Both EirGrid and SONI shall continually maintain the ability to monitor, dispatch and schedule on an individual monitoring area and all-island synchronous area level.
3. At any one time when operating on an all-island basis either EirGrid or SONI will be nominated as the lead monitor.
4. Both EirGrid and SONI will continually monitor the FRCE (frequency deviation) and the available FRR. The lead monitor at that time will ensure compliance with the FRR dimensioning rules and when required activate the FRR process by issuing dispatch instructions. In the scheduling timeframe the non-lead monitor TSO will utilise the scheduling and dispatch optimisation software to determine the required FRR up to the end of the current day and when the market data is available up to the end of the next day.
5. Both EirGrid and SONI will continually monitor the available RR. The lead monitor at that time will ensure compliance with the RR dimensioning rules and when required activate the RR process by issuing dispatch instructions. In the scheduling timeframe the non-lead monitor TSO will ensure that the scheduling and dispatch optimisation software schedules the required RR.

Article 13 Escalation procedure for managing severe risk of insufficient FRR or RR in accordance with SOGL Articles 157(4) and 160(7)

1. To manage the severe risk of insufficient FRR and RR the EirGrid and SONI will make use of but may not be limited to the following:
 - a. Recall generators from outage;

- b. Recall transmission system elements from outage to reduce congestion;
- c. Place the Distribution Control Centres on alert for load shedding;
- d. Issue Alerts both local and using the ENTSO-E Awareness System (Market Operations, CRU and UR are to be informed);
- e. Decide on the need for a public appeal for load reduction;
- f. Implement load shedding – decide on type; and
- g. Review situation for following days and advise Distribution Control Centres if rota load shedding will be required.

Article 14 Requirements for FRR availability and control quality in accordance with SOGL Articles 158(2) and 161(2)

1. FRR availability shall be assessed by EirGrid and SONI using the data submitted as required under the Scheduling and Dispatch Code SDC of the EirGrid Grid Code and SONI Grid Code, specifically the availability declarations, technical parameters and the active power output of reserve providers.
2. FRR control quality shall be monitored in accordance with the EirGrid Grid Code (OC10) and SONI Grid Code (OC11). These Grid Code sections deal with investigation and monitoring by the TSOs when dispatchable units may have failed to comply with dispatch instructions such as reserve activation. In addition, all units who wish to qualify for system service contracts must undergo performance testing.
3. The FRR / RR control quality is based on the requirements defined in the SOGL and the additional properties listed in article 4 of the SAOA and pre-qualification criteria. However, it should be noted that additional criteria may be identified as part of the EBGL and these will be confirmed in due course.
4. Reserves must be available whenever a reserve providing unit is not dispatched to 100% of availability. Alternatively, reserve providing units are required to be available to provide reserves as per their contractual requirements.

Article 15 TSO roles and responsibilities for the exchange of FRR and/or RR in accordance with SOGL Article 165(6)

1. As the IE/NI synchronous area consists of only one LFC Area and LFC block the exchange of FRR and/or RR with other LFC blocks within the synchronous area is not applicable.

Article 16 TSO roles and responsibilities for the sharing of FRR and/or RR in accordance with SOGL Article 166(7)

1. As the IE/NI synchronous area consists of only one LFC block the sharing of FRR and/or RR with other LFC blocks within the synchronous area is not applicable.

Article 17 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 Article 175(2).

1. EirGrid and SONI do not at present share RR with GB. Cross-border RR activation is not used at present as the Cross Border Balancing and Coordinated Third Party trading processes to enable activation of RR require more than the 20 minutes full activation time of RR to complete. With the implementation of the Electricity Balancing Guideline the RR trading processes will have to be modified.
2. When static frequency response is triggered for a low frequency on either EWIC or Moyle the existing transfer is increased by an agreed maximum MW value. When the frequency limited/sensitive response is triggered on either EWIC or Moyle the existing transfer is increased up to an agreed maximum MW value depending on the frequency deviation. If these additional MW flow from 5 to 15 seconds it is classed as POR. If this flow continues from 15 to 90 seconds it is classed as SOR. If it continues from 90 seconds to 5 minutes it is classed as TOR1 and from 5 to 20 minutes TOR2. The interconnector flow should be ramping back to schedule within 30 minutes.
3. Currently cross border FCR sharing must be armed to enabled to participate in cross border FRR sharing EirGrid and SONI participate in a cross border FRR sharing process with synchronous area GB, with the following roles and responsibilities:
 - a. The ability for each TSO to provide static frequency response will be assumed available to be armed unless real time transfers prevent this or the service has been specifically withdrawn.
 - b. For EWIC arming and disarming of the Static Frequency Response service using the Emergency Power Control functionality or the Frequency Control - Sensitive Mode will be agreed by both NGESO and EirGrid via a telephone conversation and confirmed using the appropriate template. EirGrid will then set the emergency power control accordingly.
 - c. For Moyle arming and disarming of the static frequency response service using the Emergency Power functionality or the Frequency Limit Control will be agreed by NGESO and SONI via a telephone conversation and confirmed using the appropriated template. SONI will then set the Emergency Power accordingly.

- d. If the static FRR service is triggered the post event commercial process to account for the energy transfer for EWIC will be initiated by EirGrid if the static frequency response has been triggered by the IE/NI frequency. The commercial process for Moyle will be initiated by SONI if the static frequency response has been triggered by the IE/NI frequency.
- e. If the static FRR service is triggered by NGESO on EWIC or Moyle the post event commercial process to account for the energy transfer will be initiated by NGESO.
- f. If the Frequency Control - Sensitive Mode on EWIC or the Frequency Limit Control on Moyle is triggered the post event commercial process to account for EWIC will be initiated by EirGrid if the frequency response has been triggered by the IE/NI frequency. The commercial process for Moyle will be initiated by SONI if the frequency response has been triggered by the IE/NI frequency.
- g. The TSO who triggered the energy transfer will initiate the process to return to schedule within 30 minutes by contacting the TSO who provided the additional energy indicating their intention to return to schedule. At the agreed return to schedule time EirGrid will set EWIC to return to schedule. At the agreed return to schedule time SONI will set Moyle to return to schedule.
- h. Each TSO shall exchange information relating to operations and/or events on each HVDC interconnector, either transmission system, or other parties connected to these systems that have an effect on either transmission system or the HVDC interconnectors themselves.

TITLE 4

Additional Agreements

Article 18 LFC area operational agreement in accordance with Article 120

1. EirGrid and SONI shall continuously monitor the FRCE of the LFC area. The FRCE for the LFC area shall be the frequency deviation.
2. EirGrid and SONI shall implement and operate a FRP for the LFC area:
 - a. The FRP shall ensure that FRR is scheduled in the IE/NI synchronous area.
 - b. Power system optimization software shall be used in order to optimize FRR:
 - i. Whilst respecting the rules described in the Operational Constraints Update;
 - ii. Based on the availability declarations, technical parameters and commercial offers submitted by market participants in respect of their generating units and demand side units; and
 - iii. Sharing of FRR with synchronous area GB shall be considered.
 - c. Process Activation Structure for mFRR shall include the following:

- i. A frequency restoration process activated by instructions issued by EirGrid and SONI which will use mFRR to ensure compliance with the FRCE target parameters.
3. EirGrid and SONI shall endeavour to fulfil the FRCE target parameters of the LFC area as defined in SOGL Article 128.
4. EirGrid and SONI shall implement the following processes referred to in SOGL Article 140(2).
 - a. A reserve replacement process:
 - i. The RRP shall ensure that RR is scheduled in the IE/NI synchronous area to ensure that operating security standards are maintained, subject to the availability declarations and technical parameters of market participants in respect of their generating units and demand side units.
 - ii. Process Activation Structure for replacement reserves shall include a reserve replacement process activated by instructions issued by EirGrid and SONI which will use RR to replace the activated FCR and mFRR.
 - b. A time control process.
5. Both TSOs of the IE/NI LFC area shall provide the LFC block monitor with the LFC area measurements necessary for collecting frequency quality evaluation data for the LFC block.
6. At any time in all-island operation either EirGrid or SONI will be designated as the lead monitoring TSO. The lead monitoring TSO shall be responsible for the implementation and operation of the frequency restoration process.
7. EirGrid and SONI shall ensure that the frequency restoration process of the IE/NI LFC area enables control of the active power interchange of each monitoring area to a value determined as secure based on a real-time operational security analysis.
8. EirGrid and SONI shall:
 - a. Ensure a sufficient quality and availability of the FRCE; and
 - b. Take action in case of FRCE unavailability.

Article 19 Monitoring area operational agreement in accordance with Article 121

9. For their respective monitoring areas EirGrid and SONI shall continuously monitor and if necessary calculate the real-time active power interchange of the monitoring area.

TITLE 5
Final Provisions

Article 20 **Timescale for implementation**

1. The LFCBOA will enter into force three months after the approval of the methodologies & conditions contained in Title 2 by the National Regulatory Authorities of Ireland and Northern Ireland, in accordance with SOGL Article 119(2).
2. EirGrid and SONI shall share the contents of the LFCBOA with the National Regulatory Authorities of Ireland and Northern Ireland.

Article 21 **Language**

1. The reference language for this LFCBOA shall be English.

For Consultation

Appendix 1 – Operational Constraints process

For Consultation



Process Steps:

#	Step	Step Description	Responsible Role	Outputs	Indicative Timing/Frequency	System
1	Trigger: Constraint Update Required/System Constraints Calculation	The trigger for this process may be the Near Time process of 'System Constraints Calculation' or an update to a permanent constraint following analysis. The requirement for a new constraint can arise from a number of areas e.g. studies carried out in Innovation. All updates (whether it be new constraints, modification or deletion of existing) must come through the RT Team Lead/Assistant Manager, who will review and assess the required action. If it is triggered following 'Systems Constraints Calculation' process go to step 2. If it is based from other studies go to step 11.	Real Time Team Lead/Assistant Manager/Near Time	N/A	Weekly and ad hoc as required	N/A
2	Review updated Weekly Constraints Report	Real Time Team Lead/Assistant Manager will review the Weekly Constraints Report.	Real Time Team Lead/Assistant Manager	N/A	As required	N/A
3	Request updated Weekly Constraints Report to be published to the website	Real Time Team Lead/Assistant Manager will request that the updated Weekly Constraints Report to be published to the TSO area of the I-SEM website.	Real Time Team Lead/Assistant Manager	N/A	As required	N/A
4	Review updated Weekly Constraints Report	Review the updated Weekly Constraints Report to identify any amendments or	Real Time – Control Centre	N/A	As required	N/A

#	Step	Step Description	Responsible Role	Outputs	Indicative Timing/Frequency	System
		updates that need to be applied to the scheduling runs.				
5	Modification to 'NB Type' or 'MW Type' values?	<p>Is the update a modification to a 'NB Type' or a 'MW Type'? -</p> <ul style="list-style-type: none"> 'NB Type' refers to number of units, e.g. 1, 2 or 3 and just requires a unit to be ON to satisfy the constraint. 'MW Type' is a range that a unit or a group of units must be between to satisfy the constraint. E.g. 600 MW > X < 800 MW. <p>If it is to a 'NB Type' go to step 6. If it is to a 'MW Type' go to step 7.</p>	Real Time – Control Centre	N/A	As required	N/A
6	Implement in Group Constraints Manager for all applicable runs	Implement changes from Weekly Constraints Report in Group Constraints Manager in MMS for all relevant scheduling runs (LTS, RTC, and RTD). Once this step has been completed the process ends and no further action is required.	Real Time – Control Centre	GCM updated	As required	Group Constraints Manager (MMS)
7	Compare and monitor Network Security Monitor constraint against Weekly Constraints Report	Compare and monitor Network Security Monitor constraint against Weekly Constraints Report to ensure that MW values are within the correct range.	Real Time – Control Centre	N/A	As required	Network Security Monitor (MMS)

#	Step	Step Description	Responsible Role	Outputs	Indicative Timing/Frequency	System
8	NSM working & Results acceptable?	Are the results acceptable & Network Security Monitor working as expected? If yes, the process ends and no further action is required. If no go to step 9.	Real Time – Control Centre	N/A	As required	Network Security Monitor (MMS)
9	Manual Entry of Constraint Data in Group Constraints Manager in MMS & Disable NSM	If the results from the comparison are not acceptable and the Network Security Monitor is not performing as expected, the Real Time User will have to manually enter the constraint into MMS via the Group Constraints Manager functionality. The process ends once this step is complete and no further action is required.	Real Time – Control Centre	GCM updated	As required	Group Constraints Manager (MMS)
10	Log reasons for manual entry & disablement of Network Security Monitor	If the constraint has been entered manually and Network Security Monitor disabled, the reasons for this must be logged for future reference.	Real Time – Control Centre	GCM updated	As required	All Island Contact Centre Log
11	Review proposed update (modification/new/deletion)	If the proposed update has come from analysis performed outside of the System Constraints Calculation process, the Real Time Team Lead/Assistant Manager will review the proposal before making any operational updates.	Real Time Team Lead/Assistant Manager	N/A	As required	N/A
12	Agree with proposal?	If the Real Time Team Lead/Assistant Manager agrees with the proposal, go to step 14.	Real Time Team Lead/Assistant Manager	N/A	As required	N/A

#	Step	Step Description	Responsible Role	Outputs	Indicative Timing/Frequency	System
		If they do not agree with it or have follow-up questions go to step 13.				
13	Discuss proposal & agree amendments with relevant area	Real Time Team Lead/Assistant Manager should discuss the proposal with the relevant team proposing the change, e.g. Innovation and make amendments, if required.	Real Time Team Lead/Assistant Manager	N/A	As required	N/A
14	Manager Approval required?	If the Real Time Team Lead/Assistant Manager is satisfied with the proposed change, they need to assess if Real Time Manager approval for the change. Manager approval is required for new constraints and deletion of existing ones. If Manager approval is required go to step 18. If it is not required go to step 15.	Real Time Team Lead/Assistant Manager	N/A	As required	N/A
15	Update Operational Constraints Update document & review with Near Time & System Support	As part of updating the Operational Constraints Update document, Real Time will seek Near Time and System Support to review updates being made at an operational level.	Real Time Team Lead/Assistant Manager	N/A	As required (no more than weekly)	N/A
16	Request updated Operational Constraints Update document is published to website	The updated Operational Constraints Update document is then published to EirGrid and SONI websites.	Real Time Team Lead/Assistant Manager	Operational Constraints Update document updated and published	As required	Website

#	Step	Step Description	Responsible Role	Outputs	Indicative Timing/Frequency	System
17	Implement in Group Constraint Manager	Control Centre staff implements the changes in Group Constraints Manager in MMS once they have been approved by the Real Time Management for all scheduling runs.	Real Time – Control Centre	GCM updated	As required	Group Constraints Manager (MMS)
18	Seek approval from Real Time Manager	If the request is for a new constraint, then approval from the Real Time Manager is required. Real Time Team Lead/Assistant Manager should contact Real Time Manager and request approval.	Real Time Manager	Approval requested	As required	Email
19	Review new constraint	Review new constraint request, assess and approve, if satisfied.	Real Time Manager	N/A	As required	Email
20	Approve?	If the Real Time Manager approves the modification request go to step 15. If not, the process ends and modification cannot be implemented without the required approval.	Real Time Manager	N/A	As required	Email

For Confidentiality