Operational Agreements for Ireland and Northern Ireland Synchronous Area

Schedule 1: Synchronous Area Operational Agreement (SAOA)

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Final version 1.0

Notice
This document provided by EirGrid and SONI is the final version of the SAOA following

- the Regulatory Authorities Request for Amendment which was published on 24 June 2019 on the CRU[1] and Utility Regulator[2] websites,
- the consultation[3] period from 15/7/2019 until 14/8/2019, and
- the CRU[4] and Utility Regulator[5] Decision on the Title 2 methodologies published on 15/11/2019.

Title 3 methodologies did not require regulatory approval.

[1] https://www.cru.ie/document_group/eu-electricity-network-codes/
[2] https://www.uregni.gov.uk/publications/request-amendment-tso-proposal-saoa-and-lfcboa-agreements
[3] https://consultations.entsoe.eu/entso-e-general/consultation-for-revised-ie-ni-saoa-lfcboa/
[4] https://www.cru.ie/document_group/eu-electricity-network-codes/
[5] https://www.uregni.gov.uk/publications/approval-sonis-submission-amended-synchronous-area-operational-agreement-load-frequency

EIRGRID SONI

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Introduction

This Synchronous Area Operational Agreement (hereafter referred to as "SAOA") applies to the Synchronous Area IE/NI and contains agreement required by Article 118 of Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation (hereafter referred to as "SOGL").

This SAOA is implemented in the Synchronous Area IE/NI taking into account:

Whereas

1. This document is a proposal jointly developed by EirGrid and the System Operator Northern Ireland (hereafter referred to as "SONI") regarding a SAOA for the Synchronous Area IE/NI. It recognises that the transmission systems of Ireland and NI are electrically connected and synchronised. EirGrid and SONI shall work closely as required by the respective TSO licences to ensure that security standards are maintained on the Synchronous Area IE/NI.

2. This proposal takes into account the general principles and goals set 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"). The goal of SOGL is to safeguard operational security, frequency quality and the efficient use of the interconnected system and resources.

3. SOGL, Part IV, Load Frequency Control & Reserves section, recognises the need for a degree of flexibility to cater for physics of scale in different synchronous areas as well as specific time varying influence of network connectivity and technology in the energy mix in determining how system operators' processes and the reserve provider 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 SAOA proposal on the objectives of the SOGL has to be described. This is presented below. The SAOA proposal generally contributes to the achievement of the objectives of the SOGL. In particular this SAOA 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 methods and specific values in the common language of SOGL promotes 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 SAOA proposal shall ensure the 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. This agreement works in harmony with those aspects addressing all-island transmission system operation within the existing System Operator Agreement[6] as required under condition number 4 of the EirGrid TSO licence and condition number 24 of the SONI TSO licence.
7. In conclusion, the methodologies contained in this SAOA proposal shall contribute to the general objectives of the SOGL to the benefit of all TSOs, the Agency, regulatory authorities, SEM participants and the end consumers.

TITLE 1
General Provisions

Article 1 Subject matter and scope

1. This Synchronous Area Operational Agreement (SAOA) document for Synchronous Area IE/NI contains:
   a. Title 2: Those Articles referenced from both SOGL Articles 118(1) and 6(3)(d). These are subject to public consultation in accordance with SOGL Article 11 and approval by the regulatory authorities of Ireland and Northern Ireland; and
   b. Title 3: Those articles referenced in SOGL Article 118(1) but not found in SOGL Articles 6 or 11. These articles are neither subject to regulatory approval nor public consultation.
2. Any modification of Title 2 Articles requires public consultation in accordance with SOGL Article 11 and approval by the regulatory authorities of Ireland and Northern Ireland.

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 Regulation 2017/1485 (SOGL), Article 2 of Regulation 2015/1222 (CACM) and the other items of legislation referenced therein.

[6] System Operator Agreement: http://www.soni.ltd.uk/media/System-Operator-Agreement.pdf

2. The terms and definitions used by EirGrid and SONI in existing methodologies, policies, procedures and agreements may differ from those used within SOGL. The following interpretation shall be used within this SAOA.

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 and SONI Grid 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[7][8]. With ongoing implementation of Network Codes, in particular Electricity Balancing, future refinements are possible to ensure alignment with Network Codes.
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.
Reference incident for the purposes of dimensioning FCR	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	In the SAOA we are only referring to a subset of Demand Units which are defined as Demand Side Units in the EirGrid and SONI Grid Codes and in the ESBN and NIEN Distribution Codes. The definition of a Demand Side Unit is; 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. With the implementation of the Demand Connection Code and the HVDC Connection Code future

[7] SONI Grid Code,
[8] EirGrid Grid Code

	refinements are possible.
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 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; '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 1: SOGL Interpretation

Table 2 below maps the existing products to SOGL. With ongoing implementation of EBGL, future refinements to the mapping are possible.

DS3 balancing Service	Existing Scheduled and Dispatched products	SOGL	EBGL specific product	EBGL standard product balancing capacity	EBGL standard product balancing energy
SIR	Inertia	N/A	N/A	N/A	N/A
FFR (2-10 sec)	MMS Reports On	N/A	N/A	N/A	N/A
POR (5-15sec)	POR (5-15sec)	FCR	N/A	N/A	FCR
SOR (15-90sec)	SOR (15-90sec)	FCR	N/A	N/A	FCR
TOR1 (90sec-5min)	TOR (90sec-5min)	FRR	N/A	N/A	mFRR (12.5 min FAT)
TOR2 (5-20min)	TOR (5-20min)	FRR	N/A	N/A	mFRR (12.5 min FAT) RR (30min FAT)
RRS (20min-1hr)	RR (20min-4hrs)	RR	N/A	N/A	mFRR (12.5 min FAT) RR (30min FAT)
RRD (20min-1hr)	RR (20min-4hrs)	RR	N/A	N/A	mFRR (12.5 min FAT) RR (30min FAT)
RM1	MMS Reports On	N/A	N/A	N/A	N/A
RM3	MMS Reports On	N/A	N/A	N/A	N/A
RM8	MMS Reports On	N/A	N/A	N/A	N/A

Table 2: Existing Products Mapping Table

In this SAOA central dispatch refers to: The process of Scheduling and issuing Dispatch Instructions directly to a Control Facility by the TSO. All Dispatchable PPMs, Interconnectors, Pumped Storage Plant Demand, Energy Storage Power Station Demand, Demand Side Units, and Aggregated Generating Units of 4 MW or more are subject to Central Dispatch. In relation to all other Generation Units, the thresholds at which they are subject to central dispatch are those that currently apply in the EirGrid and SONI grid codes glossaries, where the thresholds are specified. It is envisioned that with ongoing implementation of the Network Codes future refinements maybe required to ensure alignment with the Network Codes.

The methodologies, conditions and values in this SAOA will augment and where necessary replace those developed from the requirements of the existing System Operator Agreement, in particular but not limited to:

- Schedule 11 Inter Jurisdictional Procedures covering the operational and commercial arrangements for the North-South Tie-Lines related to operational reserve, operating plant shortfall and inter control centre communications.
- Schedule 12 which requires the TSOs to liaise with each other in Scheduling and dispatching generation output to match demand on the island of Ireland taking into account amongst other issues the requirement to provide operational reserves to maintain system security, energy limits for energy limited plant and electricity delivered to the All-Island Networks from generation sets not subject to central dispatch.

TITLE 2

Methodologies, Conditions and Values developed jointly by EirGrid and SONI to satisfy the SOGL requirements within the SAOA for IE/NI, which are subject to approval by the NRAs of IE and NI

Article 3 The dimensioning rules for FCR in accordance with SOGL Article 153

1. EirGrid and SONI acting in conjunction with each other, from a load frequency control and reserves perspective, will dimension FCR capacity to ensure there are appropriate reserves to ensure that the synchronous area frequency quality defining parameters and the frequency quality target parameter are achieved.
2. EirGrid and SONI acting in conjunction with each other shall ensure that there are at least sufficient FCR to cover the largest imbalance that may arise from the loss of the reference incident, in both the positive and negative directions.
3. EirGrid and SONI utilise scheduling and dispatch optimisation software to calculate the required FCR based on the dimensioning rule in point 1 and 2 above. The Balancing Market Principles Statement, published on the Single Electricity Market Operator (SEMO) web site, provides a detailed guide to scheduling and dispatch under the single

electricity market arrangements. EirGrid and SONI acting in conjunction with each other will aim to complete Long Term Scheduling runs at regular times. The exact timing of each run can vary due to the dependence on the available key inputs such as, European Market Results and new renewables forecasts. Additional scheduling runs will be carried out following significant unplanned events. The results of these scheduling runs will be updates to the required FCR. EirGrid and SONI use a dynamic stability assessment tool which runs in real time. This tool includes frequency stability analysis which, using real time information from the energy management system, calculates the frequency nadir and zenith from the most severe loss of infeed or outfeed. If required to ensure system security EirGrid and SONI use the output of the frequency stability analysis to modify the output of the scheduling run by:

a. reducing the size of the reference incident; or

b. increasing the actual FCR.

At times of significant increased risk, such as generator testing with a high probability of tripping, EirGrid and SONI will schedule additional FCR to ensure the frequency quality defining parameters are respected.

4. It is expected that under the network codes and the Clean Energy Package increased capabilities from small scale providers will become available and will have to be considered. The present method of extrapolating the expected output of small scale providers from the outputs of larger providers using existing and expected ambient conditions will require enhancement. Smart metering and knowledge of connection location combined with local ambient condition sensors would augment the existing forecasts.

5. To ensure meeting the frequency quality defining parameters and the frequency quality target parameter EirGrid and SONI will use the following inputs in the FCR dimensioning process:

    a. the largest imbalance that may arise from the loss of the reference incident, in both the positive and negative directions;

    b. Frequency response of load;

    c. The required level of inertia on the system, based on system stability studies calibrated from real time system events, to reduce the rate of change of frequency;

    d. No reserve contribution from the largest single infeed can be considered in the positive direction. No reserve contribution from the largest single outfeed can be considered in the negative directions; and

    e. The predicted frequency drop or rise on the loss of the reference incident as may be determined using a dynamic model of the power system.

6. The determination of FCR reserve requirements for EirGrid and SONI was established experientially with the reconnection of the North-South tie line in 1995. Since then operational judgement and consideration has evolved the need for FCR requirements.

7. More generally with increasing renewable electricity generation (RES-E) a series of detailed technical analysis has and is been undertaken to review the needs to meet the resilience of the power system. These studies have and will include frequency stability studies. The scenarios for the studies cover a range of system demand, renewable generation output and interconnector transfers representing the existing system to future portfolios consistent with the respective public policy objectives.

8. Based on an analysis of the outputs of these resilience studies, EirGrid and SONI will decide if the system FCR volume requirements need amending.

9. Where EirGrid and SONI make that decision to proceed with a trial of the new limit, a "provisional operating policy" will be developed to reflect the updated FCR minimum provision, 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; and

    d. When the trial should be suspended (system testing, weather alerts, system alerts, loss of critical IT or communications equipment).

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 studies 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 requirement for minimum volumes of FCR provision be put forward for approval to become "Official" operating policy.

12. The initial shares of FCR capacity required across the synchronous area of IE/NI will be calculated as per SOGL article 153(2)(d). Subsequently these initial shares can be, subject to a minimum level of FCR being held individually in both EirGrid and SONI, sourced on a synchronous area basis, subject to the limitations imposed by tie line operational constraints, ensuring achievement of the frequency quality defining parameters and the frequency quality target parameter. The minimum level of FCR in EirGrid and SONI is stated in the table in Article 8 of this SAOA.

13. The Operational Constraints Update published and updated regularly by EirGrid and SONI[9] shows the operating reserve requirements on an all-island basis and in each jurisdiction. Appendix 1 contains additional information on the operational constraints process.

Article 4 Additional properties of FCR in accordance with SOGL Article 154(2)

1. Additional properties of FCR are required for synchronous area IE/NI because FCR is divided into two products Primary Operating Reserve and Secondary Operating Reserve, and FCR providers become FRR providers after 90 seconds. The additional properties of the FCR, required to ensure that the synchronous area frequency quality defining parameters and the frequency quality target parameter are achieved, are contained in the latest version of the Grid Codes and Distribution Codes of both jurisdictions. The relevant articles of the Grid Codes and Distribution Codes can be found below. The EirGrid Grid Code and the NIE Networks Distribution Code have been updated to take into account the Commission Regulation (EU) 2016/631 of 14 April 2016 establishing a network code on requirements for grid connection of generators (Requirements for Generators (RfG) network code). The SONI Grid Code and the ESB Networks Distribution Code will have to be updated to take into account Commission Regulation (EU) 2016/631. Any modifications to these articles will follow the normal grid code review processes. The applicability of these additional properties to users is as set out in the relevant grid codes.

2. EirGrid Grid Code

Connection Conditions	Controllable PPM	System Services
	PPM1.5.3.1	
CC.7.3.1.1(u)	PPM1.5.3.2	
CC.7.3.1.3	PPM1.5.3.3	OC.4.3.4.1.2
CC.7.3.7	PPM1.5.3.4	OC.4.3.4.1.3
	PPM1.5.3.5	
CC.7.5.1.1(j)	PPM1.5.3.6	OC.4.3.4.1.5
CC.7.5.5	PPM1.5.3.7	OC.4.3.4.1.8
CC.7.5.6	PPM1.5.3.8	OC.4.3.4.1.9
	PPM1.5.3.9	OC.4.3.4.1.10
CC.7.5.7.1	PPM1.5.3.10	OC.4.3.4.1.11
	PPM1.5.3.11	
	PPM1.5.3.12	OC.4.3.4.2.2
	PPM1.5.3.13	OC.4.3.4.2.3
CC.7.5.8.4	PPM1.5.3.14	
	PPM1.5.3.15	OC.4.3.4.2.7
	PPM1.5.4.1	OC.4.3.4.2.8

[9] Latest update is at Library section on www.eirgridgroup.com or https://www.sem-o.com/publications/general-publications/

	PPM1.7.1.5	OC.4.6.3.3.1
	PPM1.7.2.3	OC.4.6.3.3.2
		OC.4.6.3.4.1

Table 3 EirGrid Grid Code References

SONI Grid Code and PPM Settings Schedule

Connection Conditions	Operating Margin	Frequency Control	WFPS and PPM setting schedule
	OC3.4.2.2.1	SDC3.4.1.1	6.5
CC.S1.1.5.2	OC3.4.2.2.2		
CC.S1.1.5.5	OC3.6		
CC.S1.2.4.2			
CC.S1.2.4.3			
CC.S2.1.3.7			
CC.S2.1.5.2			
CC.S2.2.3.4			
CC.S2.2.5.2			

Table 4 SONI Grid Code and WFPS & PPM Setting Schedule References

ESB Networks Distribution Code

	DCC11.3.2.3.4	DCC11.3.3
DCC10.5.1	DCC11.3.2.3.5	DCC11.3.4.1
DCC10.10.1.1(n)	DCC11.3.2.3.6	
	DCC11.3.2.3.7	DCC11.5.2.2
DCC11.3.2.3.1	DCC11.3.2.3.8	
DCC11.3.2.3.2	DCC11.3.2.3.9	
DCC11.3.2.3.3	DCC11.3.2.3.10	

Table 5 ESB Networks Distribution Code References

NIE Networks Distribution Code

NIEN Distribution Code	WFPS and PPM setting schedule	ENA engineering recommendation G99/NI	ENA engineering recommendation G98/NI
7.16.3	6.5	11.2	9.3
		12.2	
		13.2	

Table 6 Other Northern Ireland References

Article 5 The frequency quality defining parameters and the frequency quality target parameters in accordance with SOGL Article 127

The Frequency Quality Defining Parameters and the Frequency Quality Target Parameters for IE/NI are detailed below in Table 7and Table 8 of this SAOA in agreement with Annex III of the SOGL. At this time EirGrid and SONI are not proposing to exercise their right, according to Article 127 (7), to propose any changes to the values in the SOGL for the time to restore frequency, the alert state trigger time or the maximum number of minutes outside the standard frequency range. EirGrid and SONI do not interpret the frequency quality target parameter as a target to be achieved but will endeavour to minimise the number of minutes outside the standard frequency range to a value below this. In recent years the number of minutes outside the standard frequency range in synchronous area IE/NI is significantly less than 15,000.

	SOGL	Former Parameters
standard frequency range	± 200 mHz	± 200 mHz
maximum instantaneous frequency deviation	1000 mHz	No explicit equivalent
maximum steady-state frequency deviation	500 mHz	No explicit equivalent
time to recover frequency	1 minute	1 minute
frequency recovery range	± 500 mHz	± 500 mHz
time to restore frequency	15 minutes	No explicit equivalent
frequency restoration range	± 200 mHz	No explicit equivalent
alert state trigger time	10 minutes	No explicit equivalent

Table 7: Frequency quality defining parameters of the IE/NI synchronous area

maximum number of minutes outside the standard frequency range	15 000

Table 8: Frequency quality target parameters of the IE/NI synchronous area

Article 6 For the IE/NI synchronous area, measures to ensure the recovery of energy reservoirs in accordance with SOGL Article 156(13)(a)

1. Centrally dispatched energy limited reserve providers, who's system services contract does not prescribed energy reservoir replenishment conditions, can indicate their requirements for replenishing their energy reservoir by submitting new physical notifications and/or new commercial offer data. EirGrid and SONI will schedule and dispatch an energy limited reserve provider taking into account its physical notifications, commercial offer data and reservoir limits.
2. Non-centrally dispatched energy limited reserve providers will replenish their energy reservoirs as prescribed in their system services contracts.
3. EirGrid and SONI will take into account in the scheduling and dispatch process the depletion of energy limited reservoirs with the objective of minimising the risk to system security in real time where applicable.
4. Where system security is adversely affected EirGrid and SONI have the right to manage, through the scheduling and dispatch process, the recovery of the energy reservoirs of energy limited reserve providers in both positive and negative directions, respecting declared availability and technical parameters and taking into account physical notifications.

Article 7 If applicable, for synchronous areas other than CE, limits for the exchange of FCR between the TSOs in accordance with SOGL Article 163(2)

1. This article is not applicable as there is no exchange of FCR within the IE/NI synchronous area. For the purpose of scheduling, dispatch and provision of reserves, EirGrid and SONI act in conjunction with each other to operate the synchronous area as one load frequency control block and one load frequency control area making sure there are appropriate reserves to ensure that the synchronous area frequency quality defining parameters, SOGL Article(127), and the frequency quality target parameter, SOGL Article(127), are achieved. FCR is sourced on a synchronous area level as part of the integrated scheduling and dispatch process.

Article 8 The methodology to determine the minimum provision of reserve capacity on FCR in the synchronous area in accordance with Article 174(2)(b)

1. The minimum provision of reserve capacity on FCR in synchronous area IE/NI will be as per Table 9 below, any changes to these values will follow the methodology in points 3 to 7 below.

	EirGrid	SONI	SA IE/NI
07:00 – 24:00	155 MW	50 MW	205 MW
24:00 – 07:00	150 MW	50 MW	200 MW

Table 9 Minimum provision of reserve capacity

2. EirGrid and SONI consider the total requirements for FCR in Ireland and Northern Ireland as defined by the dimensioning rules. The TSOs publish the FCR 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 FCR within the synchronous area subject to the limitations imposed by tie line operational constraints, frequency response availability and limits on the DC interconnectors. FCR sharing with the GB synchronous area shall also be included within this optimisation process.

3. With increasing renewable electricity generation (RES-E) a series of detailed technical analysis has and is been undertaken to review the needs to meet the resilience of the power system. These studies have and will include frequency stability studies. The scenarios for the studies cover a range of system demand, renewable generation output and interconnector transfers representing the existing system to future portfolios consistent with the respective public policy objectives.

4. Based on an analysis of the outputs of these resilience studies, EirGrid and SONI will decide if the system minimum provision of reserve capacity on FCR in the synchronous area needs amending.

5. Where EirGrid and SONI make that decision to proceed with a trial of the new limit, a "provisional operating policy" will be developed to reflect the updated FCR minimum provision, 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; and

   d. When the trial should be suspended (system testing, weather alerts, system alerts, loss of critical IT or communications equipment).

6. 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 studies tool.

7. 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 minimum provision of reserve capacity on FCR in the synchronous area will be put forward for approval to become "Official" operating policy.

Article 9 The methodology to determine limits on the amount of exchange of FRR between synchronous areas defined in accordance with SOGL Article 176(1) and the methodology to determine limits on the amount of sharing of FRR between synchronous areas defined in accordance with SOGL Article 177(1)

1. The limits on the amount of sharing of FRR between synchronous areas IE/NI and GB are defined in Table 10 below. Any changes to these maximum values will follow the methodology in points 5 to 9 below.

	Low Frequency in IE/NI	Low Frequency in GB	High Frequency in IE/NI	High Frequency in GB
	GB to IE/NI	**IE/NI to GB**	**IE/NI to GB**	**GB to IE/NI**
EWIC	75 MW	100 MW	75 MW	100 MW
Moyle	75 MW	100 MW	75 MW	100 MW
EWIC or Moyle with the other interconnector on outage	150 MW	200 MW	150 MW	200 MW

Table 10 Maximum limits on FRR Sharing

2. While EirGrid and SONI at present do not exchange FRR between synchronous areas with the implementation of the Electricity Balancing Guideline a methodology to determine the limits on the amount of exchange of FRR between synchronous areas is required. The methodology described below, starting from point 5, will be used as both a methodology for determining limits on FRR sharing and exchange between synchronous areas.

3. 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, frequency response availability and limits on the DC interconnectors. FRR sharing, and in the future FRR exchange, with the GB synchronous area shall also be included within this optimisation process.

4. In determining the maximum amount of FRR sharing and/or exchange that can be accommodated between the GB synchronous area and the IE/NI synchronous area EirGrid and SONI will consider the following factors:
    a. The minimum provision of reserve capacity on FRR in the synchronous area;
    b. Any technical limit on FRR sharing and/or exchange;
    c. The availability of interconnector capacity to facilitate the transfer of FRR between synchronous areas;
    d. Tie Line limitations between IE and NI when there is a risk that these may restrict the ability of the TSOs to share or exchange FRR with the GB synchronous area;
    e. Whether the loss of an interconnector to the GB synchronous area constitutes the IE/NI reference incident;
    f. Whether sharing or exchange of FRR with the GB synchronous area can be accommodated by both EirGrid and SONI under expected system conditions whilst complying with their respective Operating Security Standards;
    g. The probability and impact of FRR shortfalls that could arise; and
    h. The concentration of relevant reserves in a small number of services providers.
5. The factors in 4 will form inputs into system frequency stability studies. The scenarios for the studies will cover a range of system demand, renewable generation output and interconnector transfers.
6. Based on an analysis of the outputs of the power system frequency stability studies, EirGrid and SONI will decide if the FRR sharing or exchange limits need amending.
7. 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).
8. 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.
9. 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 FRR sharing or exchange will be put forward for approval to become "Official" operating policy.

Article 10 The methodology to determine limits on the amount of exchange of RR between synchronous areas defined in accordance with SOGL Article 178(1) and the methodology to determine limits on the amount of sharing of RR between synchronous areas defined in accordance with SOGL Article 179(1).

1. 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 reserves between synchronous areas. With the implementation of the Electricity Balancing Guideline the RR trading processes will have to be modified and a methodology to determine the limits on the amount of sharing and exchange of RR between synchronous areas is required. This methodology is described in points 4 to 8 below.
2. EirGrid and SONI acting in conjunction consider the overall RR requirement for the IE/NI synchronous area. Due to the existing north south tie line operational constraint, EirGrid maintains a minimum level of RR in Ireland and SONI maintains a minimum level of RR in the NI.
3. EirGrid and SONI shall determine the maximum amount of RR sharing or exchange that could be accommodated from other synchronous areas and between Ireland and Northern Ireland by considering the following:
    a. Assessment of system stability based on studies completed via a dynamic assessment study tool, respecting the frequency quality target parameters in Article 127 and FRCE target parameters in Article 128 and ensuring operational security is not endangered;
    b. Any technical limit on sharing or exchange;
    c. The availability of interconnector capacity to facilitate the transfer of RR between synchronous areas;
    d. Tie Line limitations between IE and NI when there is a risk that these may restrict the ability of the TSOs to share or exchange RR with the GB synchronous area;
    e. Whether the loss of an interconnector to the GB synchronous area constitutes the IE/NI reference incident;

f. Whether sharing or exchanging of RR with the GB synchronous area can be accommodated by both EirGrid and SONI under expected system conditions whilst complying with their respective Operating Security Standards; and

g. The probability and impact of RR shortfalls that could arise due to sharing or exchange for economic reasons.

4. The factors in 3 will form inputs into system frequency stability studies. The scenarios for the studies will cover a range of system demand, renewable generation output and interconnector transfers.

5. Based on an analysis of the outputs of the power system frequency stability studies, EirGrid and SONI will decide if the RR sharing or exchange limits need amending.

6. 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).

7. 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.

8. 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 RR sharing or exchange will be put forward for approval to become “Official” operating policy.

TITLE 3

Methodologies, Conditions and Values developed by EirGrid and SONI within SAOA for IE/NI to meet the objectives of the SOGL but not requiring NRA approval

Article 11 Methodology to assess the risk and the evolution of the of exhaustion of FCR in synchronous area IE/NI in accordance with SOGL Article 131(2)

1. At present EirGrid and SONI do not explicitly procure a predefined quantity of FCR on a year ahead timeframe. The EirGrid and SONI grid codes, and the ESB Networks and NIE Networks distribution codes require certain generators connected to the transmission system and

distribution system to provide FCR. It is expected that under the network codes increased capabilities from small scale providers will be available to be considered.

2. EirGrid and SONI shall annually carry out an analysis, based on the previous year's data, to determine if there were any instances where the actual FCR was less than the required FCR.
3. EirGrid and SONI shall annually carry out an analysis, based on the previous year's frequency data, to identify system frequency events. For these frequency events EirGrid and SONI will determine if the required FCR was sufficient to meet our synchronous area frequency quality defining parameters.
4. The outputs of points 2 and 3 above combined with information on new connections, disconnections, expected changes to the levels of non-synchronous generation, estimated changes to the levels of microgeneration and changes to the composition of and limitations of reserve providers, will provide the inputs into an annual deterministic analysis to assess the evolution of the risk of FCR exhaustion.
5. To assess the risk of FCR exhaustion in real time or close to real time EirGrid and SONI will:
    a. Monitor the FCR declarations of reserve providers and the energy levels of energy limited FCR providers to maintain awareness of the real time availability of FCR;
    b. Updated the required FCR, both day ahead and in-day, based on more accurate demand, renewable and interconnector schedule information;
    c. Continually monitor the required and actual FCR using the energy management system. The energy management system provides both visual and audible reserve shortage indications; and
    d. Monitor the output of the dynamic stability assessment tool to ensure system frequency stability is maintained in real time.

Article 12 Proposals for synchronous area monitor in accordance with SOGL Article 133

1. EirGrid shall undertake the role of synchronous area monitor and discharge the obligations described in SOGL Article 133, Article 152(4) and 154(5).
2. In the event that EirGrid is unable to fulfil these obligations, SONI will undertake the duties of synchronous area monitor in coordination with EirGrid.

Article 13 Restrictions for the active power output of HVDC interconnectors between synchronous areas in accordance with SOGL Article 137

1. The restrictions for the active power output of HVDC interconnectors between synchronous areas by defining maximum ramping rates can be found in the LFCB Operational Agreement, Title 2, Article 3.

Article 14 Load frequency control structure in accordance with SOGL Article 139

1. The process responsibility structure for synchronous area IE/NI, in accordance with the CRU decision, dated 19th November 2018, and the Utility Regulator decision, dated 5th November 2018, shall be:
   a. 1 synchronous area,
   b. 1 load frequency control block,
   c. 1 load frequency control area, and
   d. 2 monitoring areas (1 monitoring area for IE and 1 monitoring area for NI).
2. EirGrid and SONI shall ensure that FCR is scheduled in the IE/NI synchronous area. Power system optimisation software shall be used in order to optimise FCR:
   a. Whilst respecting the applicable constraints described in the Operational Constraints Update for FCR;
   b. Based on the availability declarations, technical parameters and commercial offers submitted by SEM participants in respect of their generating units and demand side units; and
   c. Taking into account reserve providers system services capabilities.
3. EirGrid and SONI shall ensure that FRR is scheduled in the IE/NI synchronous area. Power system optimization software shall be used in order to optimise FRR:
   a. Whilst respecting the rules described in the Operational Constraints Update;
   b. Based on the availability declarations, technical parameters and commercial offers submitted by SEM participants for their generating units and demand side units; and
   c. Taking into account reserve providers system services capabilities.
4. EirGrid and SONI 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 SEM participants in respect of their generating units and demand side units, and taking into account reserve provider's system services capabilities.
5. Process Activation Structure for these reserves includes the following:

a. a frequency containment process activated by frequency deviation, which will use FCR to ensure that the synchronous area frequency quality defining parameters and the frequency quality target parameter, as set out in Table 1 of Annex III of the SOGL, are achieved;

b. a frequency restoration process activated by instructions issued by EirGrid and SONI which will use mFRR to ensure compliance with the FRCE target parameters. The maximum number of time intervals outside ±200 mHz shall be less than or equal to 3% of the time intervals per year. The maximum number of time intervals outside ±500 mHz shall be less than or equal to 1% of the time intervals per year. The FRCE is the frequency deviation;

c. a reserve replacement process activated by instructions issued by EirGrid and SONI which will use RR to replace the activated FCR and mFRR;

d. a cross border FCR and FRR activation process activated by frequency deviation; and

e. a time control process (Article 15 below).

Article 15 Methodology to reduce the electrical time deviation in accordance with SOGL Article 181

1. EirGrid and SONI shall cooperate to ensure that the synchronous time error shall not normally exceed ± 10 seconds.
2. EirGrid has been assigned the role as Synchronous Area monitor.
3. In order to correct the electrical time error deviation, EirGrid and SONI undertake the following process:
    a. EirGrid, in its role as SA monitor, agrees that the target frequency will be reset with SONI, and agree on an effective time at least 15 minutes in the future;
    b. Use an Electronic Dispatch Information Logger (EDIL) message to inform all centrally dispatched generators of the new frequency set point and the time from which it becomes effective;
    c. Reset the target frequency settings in the Energy Management System;
    d. Record timing and frequency settings in the control centre log; and
    e. To revert to 50.00 Hz, once agreed with SONI, EirGrid cancel the instruction from the EDIL Issued Instruction list and re-enter 50.000 Hz in EMS.

Article 16 Allocation of responsibilities for the operation of the IE/NI synchronous area in accordance with SOGL Article 141

1. 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.

2. At any one time when operating on an all-island basis either EirGrid or SONI will be nominated as the lead monitor.

3. Both EirGrid and SONI, using the all-island energy management system, will continuously monitor, and if required calculate, the real-time active power interchange of their individual monitoring areas.

4. 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.

5. 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.

6. Both EirGrid and SONI will continually monitor the available FCR. The lead monitor at that time will ensure there are sufficient FCR available to be activated in compliance with the FCR dimensioning rules.

Article 17 Operational procedures in the case of exhausted FCR in accordance with SOGL Article 152(7)

1. Following a system event which results in the partial or total exhaustion of FCR, EirGrid and SONI shall re-establish FCR in accordance with the levels detailed in the Operating Constraints Update for POR and SOR by dispatching sufficient additional generating units and demand side units, taking into account reserve providers system services capabilities. FCR shall be optimised using power system optimisation software as soon as reasonably practicable following the event that caused FCR to be fully or partially exhausted. The optimisation of FCR shall be based on the declared availability, technical parameters and commercial offers submitted to EirGrid or SONI by SEM participants in accordance with the EirGrid and SONI Grid Codes in respect of their FCR providing units. Provision of FCR shall

always respect the minimum jurisdictional limits for POR and SOR as detailed in the Operational Constraints Update.

2. EirGrid and SONI will monitor the active power output and FCR declarations of reserve providers and the energy levels of energy limited FCR providers to maintain awareness of the real time availability of FCR.

3. In the case of exhausted FCR the EirGrid and SONI will, acting as soon as possible, make use of but may not be limited to the following:

    a. Redispatching centrally dispatched generators, pump storage plant, energy storage power stations, aggregated generating units and / or demand side units to increase reserve provision;

    b. Reduce the size of the reference incident to reduce the reserve requirement;

    c. Synchronise additional units to increase reserve provision;

    d. Curtail wind generation or reduce the level of curtailment if wind generation is already curtailed to increase reserve provision;

    e. At present EirGrid and SONI issue both local and wide area alerts. Local alerts are issued using the energy management system and are transmitted to centrally dispatched generators and demand side units. Wide-area alerts are issued via the ENTSO-E Awareness System. Issue Alerts both local and using the ENTSO-E Awareness System(Market Operations, CRU and UR are to be informed);

        i. Local Alerts

            1. 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

            2. 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

        ii. ENTSO-E awareness system

1. 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)).

2. 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.

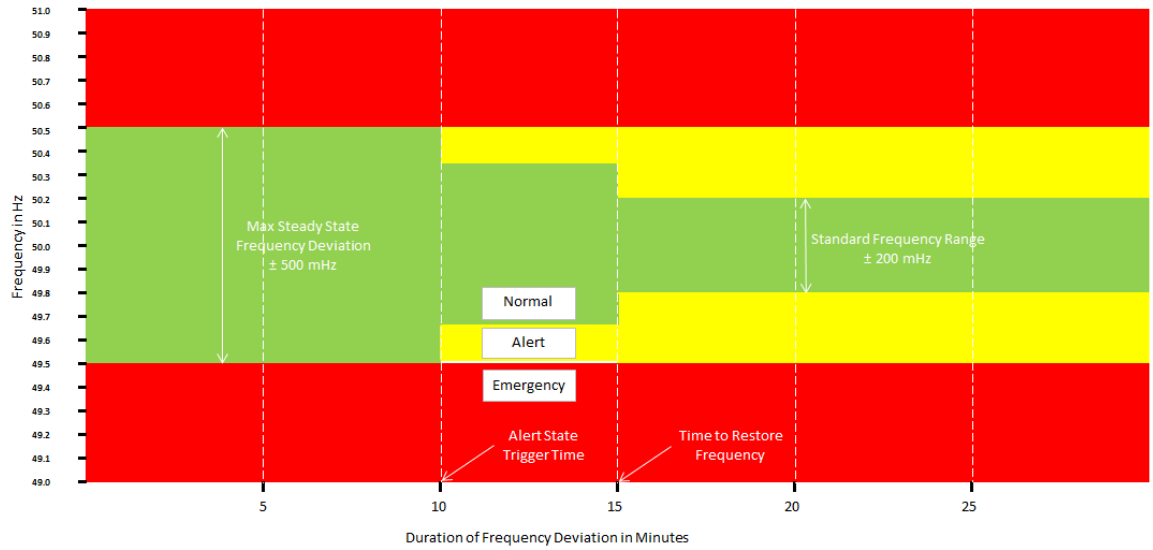


Figure 1 System Alert States

f. Recall generators from outage;

g. Recall transmission system elements from outage to reduce congestion;

h. If possible request centrally dispatched generation, pump storage plant, energy storage power stations, aggregated generating units and / or demand side units to maximise their output;

i. Issue HVDC emergency assistance and / or emergency instruction;

j. Decide on the need for a public appeal to reduce demand; and

k. Invoke planned emergency load shedding.

Article 18 Operational procedures to reduce system frequency deviation to restore the system state to normal state and limit risk of entering into an emergency state in accordance with SOGL Article 152(10)

1. For synchronous area IE/NI the FRCE is the frequency deviation and while the aim is to reduce the deviation to zero, the frequency range defining the normal state is:
    a. The steady state frequency deviation is within the standard frequency range; or
    b. The absolute value of the steady state system frequency deviation is not larger than the maximum steady state frequency deviation and the system frequency limits for the alert state are not fulfilled.
2. In order to restore system frequency to the normal state EirGrid and SONI will, acting as soon as possible, make use of but may not be limited to the following:

a. Redispatch centrally dispatched generators, pump storage plant, energy storage power stations, aggregated generating units and demand side units;

b. Synchronise or desynchronise centrally dispatched generator, pump storage plant, energy storage power stations, aggregated generating units and demand side units;

c. Curtail wind generation or reduce the level of curtailment if wind generation is already curtailed;

d. HVDC interconnector emergency assistance or emergency instruction;

e. Special protection schemes to run back or trip generation;

f. High frequency tripping of wind generation;

g. Invoke planned emergency load shedding;

h. Under-frequency load shedding; and

i. Issue Alerts both local and using the ENTSO-E Awareness System (Market Operations, CRU and UR are to be informed);

    i. Local Alerts

        1. 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

        2. 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

ii. ENTSO-E awareness system

1. 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 (SOGL article 18(2)(b)).

2. The Alert state should be initiated when the steady state frequency enters the alert area as outlined in the illustration below in Figure 2, as defined in Article 18 of SOGL.

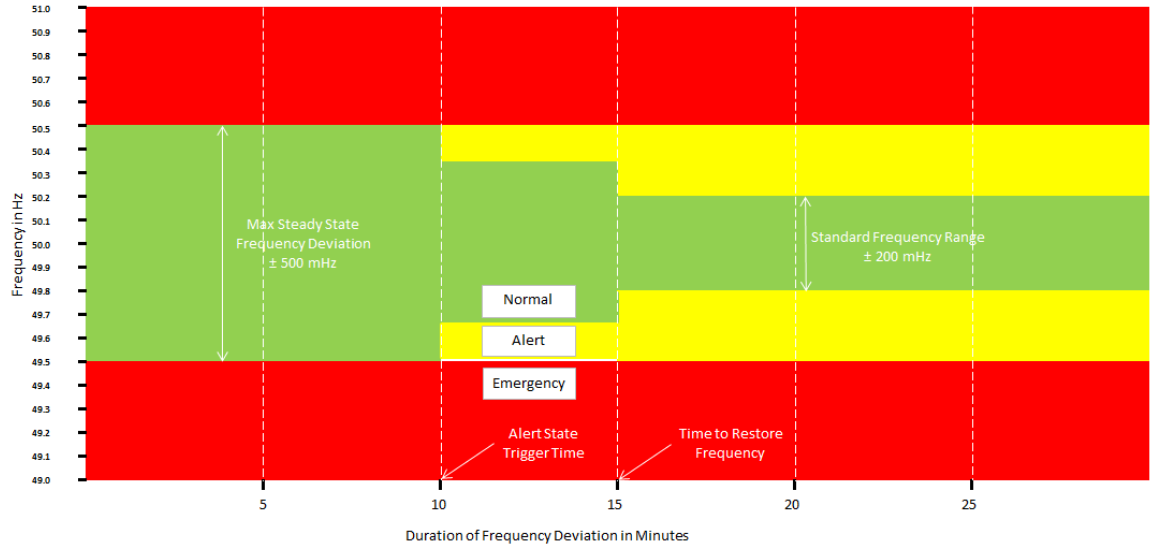


Figure 2 System Alert States

Article 19 Roles and responsibilities of TSOs implementing imbalance netting process, cross-border FRR activation or a cross-border RR activation process in accordance with SOGL Article 149(2)

1. EirGrid and SONI do not at present make use of either an imbalance netting process or a cross-border RR activation process. 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. The EWIC link can provide low and high frequency response services to both power systems. For static frequency response this functionality is implemented using Emergency Power Control (EPC) actions. The EPC actions are triggered automatically. The triggers can be either frequency thresholds or a binary digital input. The first three EPC channels are triggered exclusively by low frequency measurement; the second three EPC channels are triggered exclusively by high frequency measurement. A local frequency measurement at each converter station is used as the source of each frequency trigger. Each EPC channel has an associated active power target, which defines the MW change from the existing transfer which will occur if the EPC channel is triggered.
3. Moyle is able to provide static frequency response via the Emergency Power (EP) functionality on Moyle. The Moyle Interconnector can be configured to automatically change transfer by a predetermined amount should the frequency on either the NI or GB Transmission System fall below or rise above the trigger frequency thresholds.
4. Moyle can provide response to frequency deviation using Moyle's Frequency Limit Control (FLC) functionality. Once system frequency reaches 49.80 Hz, Moyle will start providing response with a Gain of 500 MW/Hz up to maximum agreed MW value at a frequency of 49.65Hz. This response will be maintained below this frequency value. Once the frequency rises above 49.65 Hz the response will begin decreasing (at 500 MW/Hz) until reaching 49.80 Hz when the response will have reduced to zero. The equivalent high frequency response is also enabled.
5. EWIC can provide response to frequency deviation using EWIC's Frequency Control - Sensitive Mode (FC-SM). Once system frequency reaches 49.80 Hz, EWIC will start providing response with a Gain of 500 MW/Hz up to maximum agreed MW value at a Frequency of 49.65 Hz. This response will be maintained below this frequency value. Once the frequency rises above 49.65 Hz the response will begin decreasing (at 500MW/Hz) until reaching 49.80 Hz when the response will have reduced to zero. The equivalent high frequency response is also enabled. The present frequency response settings are shown in Table 11 below.

	EWIC	Moyle
IE/NI side	Frequency Control - Sensitive Mode (trial period)	Frequency Limit Control
GB side	Static frequency response	Static frequency response

Table 11

6. When static frequency response is triggered for a low frequency on either EWIC or Moyle the existing transfer is increased or decreased 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 sec it is classed as POR. If this flow continues from 15 to 90 sec it is classed as SOR. If it continues from 90 sec to 5

min it is classed as TOR1 and from 5 to 20 min TOR2. The interconnector flow should be ramping back to schedule within 30 minutes.

7. At present cross border FCR sharing must be armed to enable EirGrid and SONI to participate in a cross border FRR sharing process with synchronous area GB. There are no other affected TSOs. The process has 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 inform SONI and 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 inform EirGrid and 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 emergency power 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. EirGrid and SONI will inform each other of the intention to return to schedule on EWIC and Moyle respectively. 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.

Article 20 Requirements concerning the availability, reliability and redundancy of technical infrastructure in accordance with SOGL Article 151(2)

1. Energy management system and SCADA
   a. Availability
      i. overall EMS availability is 99.95%
      ii. SCADA availability 98% (as well as the very high availability dual ported Remote Telemetry Units with fibre optic communication links, this availability figure includes single ported Remote Telemetry Units in isolated locations with only satellite communication links).
   b. Redundancy
      i. The EMS was designed for high availability in the IE and NI primary control centres with backup sites and data concentrators in IE and NI emergency control centres. Dual enabled/hot-standby application servers are used for core EMS application and remote communication servers with dual comms media, dual power feeds, dual UPS, dual storage area networks.
   b. Accuracy
      i. accuracy classes for the CT/VT/transducer used for SCADA measurements of between .2 and .5 accuracy class
   c. Resolution
      i. The A/D convertor of analogue input cards have minimum of 12 bit resolution
2. Communications
   a. Availability
      i. Telephony – corporate network 99.95%
      ii. Telephony – OPTEL network 99.99%
   b. Redundancy
      i. Inter-site:

a) The inter-site communication network is a ring network spanning the four control centre sites, a black-start capable point-to-point communication network between IE primary control centre and NI primary control centre is available if the ring network is unavailable.

ii. RTU:

a) In Ireland independent routes from substation RTUs to both IE primary control centre and IE emergency control centre where feasible. Where not feasible, the IE primary control centre circuit is switchable to the IE emergency control centre, e.g. a satellite circuit to a remote windfarm.

b) In Northern Ireland, each RTU circuit is switchable from the NI primary control centre to NI emergency control centre.

iii. Inter-control centre:

a) Redundant circuit for inter-site communication between EirGrid and Distribution System Operator SCADA systems.

3. Tie-line measurements

a. Redundancy

i. East-West interconnector: redundant tie-line measurements available.

ii. Moyle: non-redundant tie-line measurement available.

iii. Transmission line measurements: SCADA flows available at both line ends in Ireland, SCADA flows available at one line end in Northern Ireland; all critical measurements are telemetered to allow state-estimate of network.

b. Accuracy

i. Current Transformers: 0.2sFs5
ii. Voltage Transformers: 0.2/3P
iii. P/Q Transducer: 0.2

c. Resolution

i. The A/D convertor of analogue input cards have minimum of 12 bit resolution

4. Communication protocols:

a. RTU: IEC101, IEC104

b. Inter-control centre: ICCP/TASE.2

c. Inter-site: Inter-Site Data Protocol (GE proprietary)

Article 21 Common rules for the operation in normal state and alert state in accordance with SOGL Article 152(6) and the actions referred to in Article SOGL Article 152(15)

1. The objective of common rules for operation in the normal and alert state is to reduce frequency deviations. In order to restore system frequency to the normal state EirGrid and SONI will make use of but may not be limited to the following:

    a. Redispatch centrally dispatched generators, pump storage plant, energy storage power stations, aggregated generating units and demand side units;

    b. Synchronise or desynchronise centrally dispatched generators, pump storage plant, energy storage power stations, aggregated generating units and demand side units;

    c. Curtail wind generation or reduce the level of curtailment if wind generation is already curtailed;

    d. HVDC interconnector emergency assistance or emergency instruction;

    e. Special protection schemes to run back or trip generation;

    f. High frequency tripping of wind generation;

    g. Planned emergency load shedding; and

    h. Issue Alerts both local and using the ENTSO-E Awareness System (Market Operations, CRU and UR are to be informed).

Article 22 Roles and responsibilities of the reserve connecting TSO, the reserve receiving TSO and the affected TSO as regards the exchange of FRR and RR defined in accordance with SOGL Article 165(1)

'Exchange of reserves' means the possibility of a TSO to access reserve capacity connected to 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;

1. EirGrid and SONI do not exchange FRR and RR. For the purpose of scheduling, dispatch and provision of reserves, EirGrid and SONI act in conjunction with each other to operate the synchronous area as one load frequency control block and one load frequency control area, dimensioning reserves on an all-island basis, making sure there are appropriate reserves to ensure that the FRCE target parameters, that the synchronous area frequency quality defining parameters and the frequency quality target parameter are achieved. FRR and RR are dimensioned and sourced on an all-island basis as part of the integrated scheduling and dispatch process with a geographical limitation imposed by the tie line operational constraints.

Article 23 Roles and responsibilities of the control capability providing TSO, the control capability receiving TSO and the affected TSO for the sharing of FRR and RR defined in accordance with SOGL Article 166(1)

'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;

1. EirGrid and SONI do not explicitly share FRR and RR. For the purpose of scheduling, dispatch and provision of reserves, EirGrid and SONI act in conjunction with each other to operate the synchronous area as one load frequency control block and one load frequency control area, dimensioning reserves on an all-island basis, making sure there are appropriate reserves to ensure that the FRCE target parameters, that the synchronous area frequency quality defining parameters and the frequency quality target parameter are achieved. FRR and RR are dimensioned and sourced on an all-island basis as part of the integrated scheduling and dispatch process with a geographical limitation imposed by the tie line operational constraints.

Article 24 Roles and responsibilities of the reserve connecting TSO, the reserve receiving TSO and the reserve affected TSO for the exchange of reserves between synchronous areas and of the control capability providing TSO, the control capability receiving TSO and the affected TSO for the sharing of reserves between synchronous areas defined in accordance with SOGL Article 171(2)

1. While EirGrid and SONI do not at present exchange reserves between synchronous areas with the implementation of the Electricity Balancing Guideline the process for sharing in point 2 below will have to be expanded to include exchange.

2. EirGrid and SONI jointly participate with the GB synchronous area in a cross border FCR and FRR sharing process between synchronous areas. There are no other affected TSOs. The process has 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 inform SONI and 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 inform EirGrid and 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.

   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 emergency power 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. EirGrid and SONI will inform each other of the intention to return to schedule on EWIC and Moyle respectively. 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.

Article 25 Specify the conditions for sharing FCR between the involved synchronous areas in accordance with Article 174(3)[10]

1. Before commencing sharing of FCR between synchronous areas the TSOs of the synchronous areas involved shall:
    a. Develop an operational procedure agreement which will at a minimum specify the roles and responsibilities of the involved TSO;
    b. Carry out system frequency stability studies. The scenarios for the studies will cover a range of system demand, renewable generation output and interconnector transfers;
    c. Based on an analysis of the outputs of the stability studies decide if a trial period is required;
2. In real-time or close to real-time before commencing sharing of FCR between synchronous areas the TSOs of the synchronous areas involved shall:
    a. Agree to enable the sharing service and on the amount of reserves to be shared;
    b. Ensure there is available capacity on the interconnector;
    c. Ensure that the sharing of reserves does not lead to violations of operational security;
    d. Respect the limit on the minimum provision of reserve capacity on FCR within the synchronous areas; and
    e. Respect the limits on the amount of exchange and sharing of FCR between synchronous areas.

Article 26 Methodology to determine the limits on the amount of sharing of FCR between synchronous areas defined in accordance with Article 174(2)

See Article 8 in Title 2 of this SAOA[11].

[10] This is not listed in SOGL Article 118 however it is included it as per SOGL Article 174(3).

[11] SOGL Article 118 (x) refers to the requirement for the SAOA to contain a methodology in accordance with SOGL Article 174 (2). However only SOGL Article 174 (2)(b) is relevant to the IE/NI Synchronous Area as 174(2)(a) is the requirement for the CE and Nordic Synchronous Area. The methodology to determine the minimum provision of reserve capacity on FCR in the synchronous area accordance with SOGL Article 174(2)(b) is already covered in SAOA Title 2 Article 8 as mandated by SOGL Articles 118 (y) and 6(3)(d)(viii).

TITLE 4
Final Provisions

Article 27 Timescale for implementation and publication

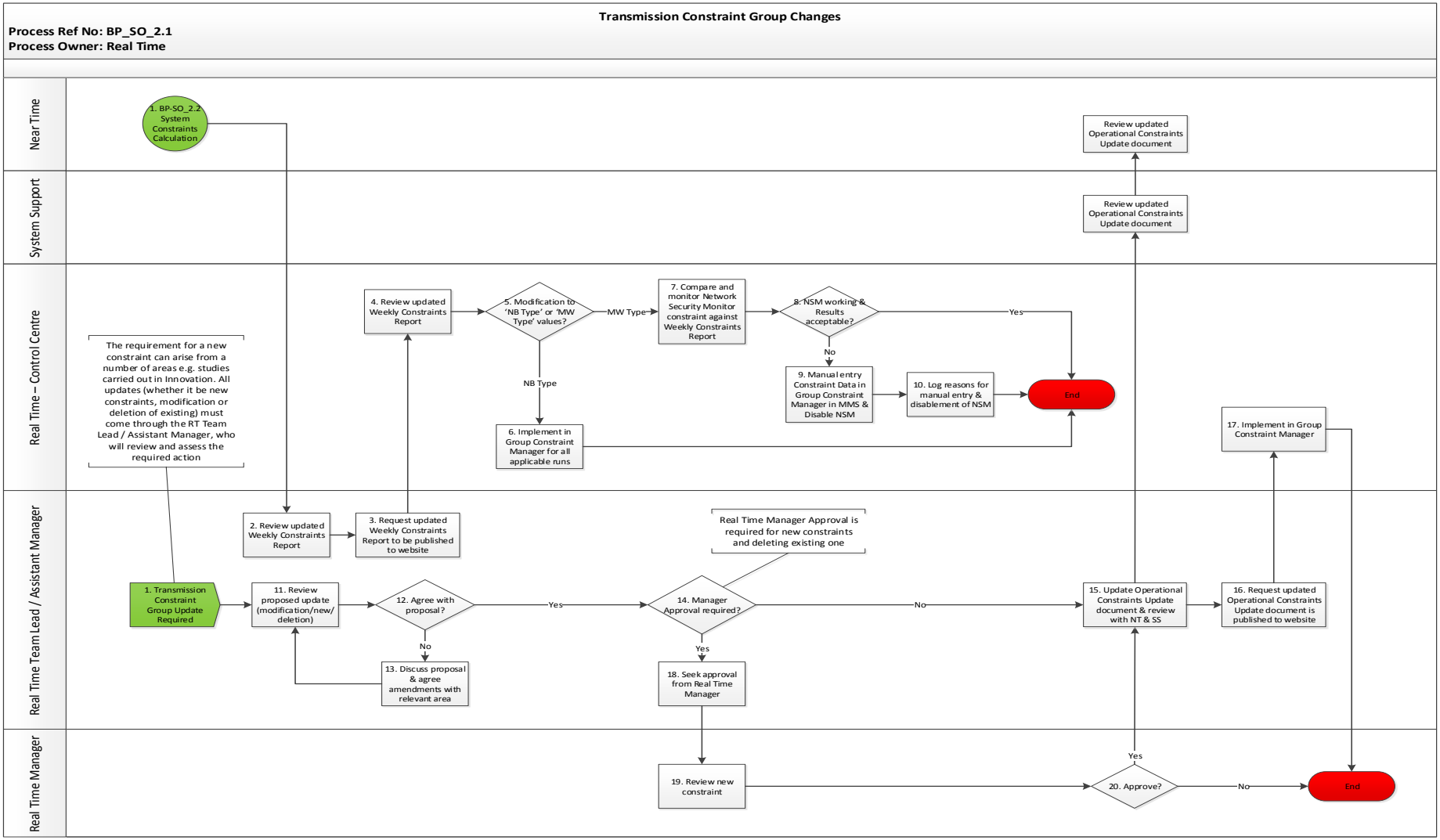
1. The SAOA will enter into force three months after the approval of the methodologies & conditions contained in Title 2 by the National Regulatory Authorities of Ireland and Northern Ireland in accordance with SOGL article 118 (2).
2. EirGrid and SONI shall share the contents of the SAOA with the National Regulatory Authorities of Ireland and Northern Ireland no later than one month before its entry into force in accordance with SOGL article 184 (1).
3. EirGrid and SONI shall notify the contents of the SAOA to ENTSO-E for publication on the ENTSO-E Transparency Platform no later than one week after its entry into force, in accordance with SOGL article 184(2).

Article 28 Language

The reference language for this SAOA shall be English.

Appendix 1 – Operational Constraints process

EIRGRID SONI


Transmission Constraint Group Changes
Process Ref No: BP_SO_2.1
Process Owner: Real Time
Near Time
System Support
Real Time – Control Centre
Real Time Team Lead / Assistant Manager
Real Time Manager
1. BP-SO_2.2 System Constraints Calculation
Review updated Operational Constraints Update document
Review updated Operational Constraints Update document
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
4. Review updated Weekly Constraints Report
5. Modification to 'NB Type' or 'MW Type' values?
MW Type
7. Compare and monitor Network Security Monitor constraint against Weekly Constraints Report
8. NSM working & Results acceptable?
Yes
No
NB Type
9. Manual entry Constraint Data in Group Constraint Manager in MMS & Disable NSM
10. Log reasons for manual entry & disablement of NSM
End
6. Implement in Group Constraint Manager for all applicable runs
17. Implement in Group Constraint Manager
2. Review updated Weekly Constraints Report
3. Request updated Weekly Constraints Report to be published to website
Real Time Manager Approval is required for new constraints and deleting existing one
1. Transmission Constraint Group Update Required
11. Review proposed update (modification/new/ deletion)
12. Agree with proposal?
Yes
14. Manager Approval required?
No
15. Update Operational Constraints Update document & review with NT & SS
16. Request updated Operational Constraints Update document is published to website
No
13. Discuss proposal & agree amendments with relevant area
Yes
18. Seek approval from Real Time Manager
19. Review new constraint
Yes
20. Approve?
No
End

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 updates that need to be applied to the scheduling runs.	Real Time – Control Centre	N/A	As required	N/A
5	Modification to 'NB Type' or 'MW Type' values?	Is the update a modification to a 'NB Type' or a 'MW Type'? - • '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. If it is to a 'NB Type' go to step 6. If it is to a 'MW Type' go to step 7.	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	Real Time – Control Centre	GCM updated	As required	Group Constraints Manager

#	Step	Step Description	Responsible Role	Outputs	Indicative Timing/ Frequency	System
		been completed the process ends and no further action is required.				(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)
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. If they do not agree with it or have follow-up questions go to step 13.	Real Time Team Lead/Assistant Manager	N/A	As required	N/A
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	Real Time Team Lead/Assistant Manager	N/A	As required	N/A

#	Step	Step Description	Responsible Role	Outputs	Indicative Timing/ Frequency	System
		required go to step 15.				
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
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