

# BP\_SO\_9.2

# Declaration of System Alerts

## Business Process

Version 2 - 01/07/2024



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# 1. Assumptions

Assumptions made during the design of this process include:

- This is an all-island business process, meaning the same process will be used across both jurisdictions on the island, Ireland and Northern Ireland; however, any deviation from the “Normal” system state should only be issued by the Control Centre in the affected jurisdiction;
- The following business process addresses all requirements, including roles, tools, and activities that will enable the TSOs to achieve scheduling objectives; and
- All required systems, including MMS are in place. They offer all required functionalities to support business needs.

## 2. Process references

### 2.1. Related rules references

The following table provides references to the documents that govern the design of this business process.

Document Title	Relevant Section	Description
EirGrid Grid Code	OC9 Emergency Control and Power System Restoration	OC9.4 outlines the criteria for issuing of System Alerts by the TSO in the event of a System Emergency Condition or imminent shortfall in capacity. These alerts may include an Amber Alert, Red Alert or Blue Alert.
SONI Grid Code	OC3 Operating Margin	Operating Code No. 3 ("OC3") sets out the different types of reserve which make up the Operating Margin that the TSO may use in the Control Phase.
Trading and Settlement Code	Chapter G	Chapter G includes provision for Administered Imbalance Settlement in the event of electrical system collapse.
COMMISSION REGULATION (EU) 2017/1485 establishing a guideline on electricity transmission system operation	Part II Operational Security	TITLE 1 OPERATIONAL SECURITY REQUIREMENTS The SO GL provides harmonised rules on system operation for transmission system operators (TSOs). CHAPTER 1 details the system states that all TSOs are required to assess their systems against.
COMMISSION REGULATION (EU) 2017/2196 establishing a network code on electricity emergency and restoration	Chapter II and Chapter III	SYSTEM DEFENCE PLAN - Is activated when the power system is in an Emergency state. RESTORATION PLAN - Is activated when the power system is in a Restoration state. Both Plans aim to return the power system to the normal state
Operating Security Standards Ireland  Operating Security Standards and Northern Ireland	ALL	EirGrid plc and SONI ltd (the Transmission System Operators for Ireland and Northern Ireland), cooperate to ensure the all-island transmission system is operated in a secure and reliable manner.

## 2.2. Related documents

The following table provides a list of documents that are related to this business process.

Document Title	Relationship	Description
Demand Control Process	This business process may be a trigger for it.	Demand control details the steps taken by the Control Centre, relevant Distribution System Operator and Market Operator in the event of a demand reduction event. If this process is triggered an emergency state is typically declared.

## 3. Process context

### 3.1 Business model relationship

The Declaration of System States sits within 'Real Time Control' process group within the Systems Operator processes. Aside from scheduling and dispatching the system, there are a number of planned and unplanned activities that occur in System Operations that can be implemented.

### 3.2 Background and Scope

#### Background

The Ireland and Northern Ireland system states are designed to describe various states that may arise on the power systems. The system states range from the normal state to increasing levels of system stress, from Alert (Amber), to Emergency (Red), to Blackout (Blue), and finally to a Restoration state which aims to return the power system to the Normal state.

The European Network Code - System Operator Guideline (SO GL) came into force in November 2017 and introduced a common set of system states and criteria for all European Transmission System Operators (TSO). Each TSO must monitor their transmission system, assessed against the defined criteria, and communicate their system state at all times to all other ENTSOE TSOs via a European Awareness System (EAS). Prior to the Network Codes coming into force, EirGrid and SONI had an established Alert system in place.

To enable compliance with the SO GL requirements, the Ireland and Northern Ireland system states were updated and integrated into TSO business processes and Plans in Ireland and Northern Ireland. The diagram below shows the alignment between the old system states and the new system states.



The EAS is employed by the TSOs to communicate the state of the All-island transmission system with other European TSOs, with the most severe system state in Ireland or Northern Ireland being communicated at all times. An alert system is also employed by the TSOs to notify relevant parties, including, generators, and distribution system operators, internal staff, regulators and the market operator that the system is in an abnormal state. Upon receipt of an alert the different parties implement their own procedures.

Power system alerts are issued on a jurisdictional basis. As there are limited transmission connections between the Northern Ireland and Ireland power systems, it is plausible for one system to be in an alert state whilst the other one isn't. The criteria for each system state are detailed in Section 4.

# 4. System states

## 4.1 Normal

### Ireland and Northern Ireland

The transmission system shall be in the normal state when all of the following conditions are fulfilled:

- a. voltage and power flows are within the operational security limits;
- b. the steady state frequency meets the following criteria:
  - i. remains between 49.8 Hz and 50.2 Hz; or
  - ii. the absolute value of the steady state system frequency deviation from nominal is not larger than 0.5Hz and the system frequency limits established for the alert state are not fulfilled;
- c. active and reactive power reserves are sufficient to withstand contingencies from the contingency list without violating operational security limits;
- d. operation of the All-island transmission system is and will remain within operational security limits after the activation of remedial actions following the occurrence of a contingency from the contingency list.

## 4.2 Alert - Amber alert

### Ireland

The Alert state (Amber alert) should be initiated by NCC when the System enters an "Alert state" i.e. when voltage and power flows are within operational security limits but any of the following criteria are satisfied:

- a. the All-Island 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;
- b. frequency meets the following criteria:
  - i. the absolute value of the steady state system frequency deviation from nominal has not continuously exceeded 500 mHz for a time period longer than one minute; and
  - ii. the absolute value of the steady state system frequency deviation from nominal has continuously exceeded  $\pm 200$  mHz for a time period longer than 15 minutes; or
  - iii. the absolute value of the steady state system frequency deviation from nominal has continuously exceeded  $\pm 250$  mHz for a time period longer than 10 minutes
- c. at least one contingency from the contingency list leads to a violation of operational security limits, even after the activation of remedial actions;
- d. multiple contingencies are probable because of thunderstorm or high wind activity; or
- e. the jurisdictional margin is such as the tripping of the largest set, would give rise to a reasonable possibility of failure to meet the System Demand - Use the following formula as a guideline:

$$LSI_{IE} > MAR_{IE}$$

Where:

$$MAR_{IE} = [GEN_{IE} + WIND_{IE}/PV_{IE}/BESS_{IE} +/- ICF_{EWIC}/- ICF_{GL}] - DEMAND_{IE} + TLS$$

$GEN_{IE}$  = Available generation in IE

$WIND_{IE}/PV_{IE}/BESS_{IE}$  = Expected generation from wind and PV and energy provided by BESS in IE



$DEMAND_{IE}$  = Expected system demand in IE  
 $ICF_{EWIC}$  = Flow on the EWIC Interconnector  
 $ICF_{GL}$  = Flow on the Greenlink Interconnector  
 TLS = Tie Line Support (capped by total transfer capability)  
 $LSI_{IE}$  = largest MW infeed to jurisdiction

In the previous formula, the summands corresponding to the interconnectors are positive if they import energy, and negative otherwise.

### Northern Ireland

The Alert state (Amber alert) should be initiated by CHCC when the System enters an “Alert state” i.e. when voltage and power flows are within operational security limits but any of the following criteria are satisfied:

- a. the All-Island 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;
- b. frequency meets the following criteria:
  - i. the absolute value of the steady state system frequency deviation from nominal has not continuously exceeded 500 mHz for a time period longer than one minute; and
  - ii. the absolute value of the steady state system frequency deviation from nominal has continuously exceeded  $\pm 200$  mHz for a time period longer than 15 minutes; or
  - iii. the absolute value of the steady state system frequency deviation from nominal has continuously exceeded  $\pm 250$  mHz for a time period longer than 10 minutes
- c. at least one contingency from the contingency list leads to a violation of operational security limits, even after the activation of remedial actions;
- d. the jurisdictional margin (i.e. all the available plant, including wind, plus any guaranteed emergency assistance from interconnection less the predicted demand) pre fault in that period is less than the largest jurisdictional infeed but more than the primary spinning reserve requirement associated with this infeed i.e.

$$LSI_{NI} > MAR_{NI}$$

Where:

$$MAR_{NI} = [GEN_{NI} + WIND_{NI}/PV_{NI}/BESS_{NI} +/- ICF_{NI}] - Demand_{NI} + TLS$$

$GEN_{NI}$  = Available generation in NI

$WIND_{NI}/PV_{NI}/BESS_{NI}$  = Expected generation from wind and PV and energy provided by BESS in NI

$DEMAND_{NI}$  = Expected system load in NI

$ICF_{NI}$  = Flow on the Moyle Interconnector

TLS= Tie Line Support (capped by total transfer capability)

$LSI_{NI}$  = largest MW infeed to jurisdiction

In the previous formula, the summands corresponding to the interconnectors are positive if they import energy, and negative otherwise.

## 4.3 Emergency - Red alert

### Ireland

The Emergency state (Red alert) should be initiated by the NCC when the System enters an "Emergency state" i.e. when any of the following criteria are satisfied:

- a. there is at least one violation of voltage limits, short-circuit current limits, or current limits in terms of thermal rating;
- b. frequency does not meet the criteria for the normal alert state;
- c. any of the following System Defence Plan measures are activated:
  1. activation of UF load shedding,
  2. widespread (multiple station) UV load shedding,
  3. activation of system separation protection.
  4. Activation of Emergency Assistance / Emergency Instruction
- d. there is a failure in the functioning of
  1. EMS/ SCADA
  2. Phones (Corporate and Optel)resulting in the unavailability of those tools, means and facilities for longer than 30 minutes.
- e. Dynamic reserves (excl. batteries) have been reduced to 50MW
- f. LSAT (real time) continually forecasts a freq. Nadir of below 49 Hz for a period of 30 min and no means are available to address this.

### Northern Ireland

The Emergency state (Red alert) should be initiated by the CHCC when the System enters an "Emergency state" i.e. when any of the following criteria are satisfied:

- a. there is at least one violation of voltage limits, short-circuit current limits, or current limits in terms of thermal rating;
- b. frequency does not meet the criteria for the normal alert state;
- c. any of the following System Defence Plan measures are activated;
  1. activation of UF load shedding,
  2. widespread (multiple station) UV load shedding,
  3. activation of system separation protection.
  4. Activation of Emergency Assistance / Emergency Instruction
- d. there is a failure in the functioning of
  5. EMS/ SCADA
  6. Phones (Corporate and Optel)resulting in the unavailability of those tools, means and facilities for longer than 30 minutes.
- e. Dynamic reserves (excl. batteries) have been reduced to 20MW
- f. LSAT (real time) continually forecasts a freq. Nadir of below 49 Hz for a period of 30 min and no means are available to address this.

## 4.4 Blackout - Blue alert

### Ireland

The Blackout state (Blue alert) should be initiated by the NCC to inform relevant parties that all or part of the transmission system must be started from black i.e. when the System enters a "Black Start" state, that is:

- a. there has been a loss of more than 50 % of demand in Ireland;
- b. total absence of voltage for at least three minutes in Ireland, leading to the triggering of restoration plans.

### Northern Ireland

The Blackout state (Blue alert) should be initiated by the CHCC to inform relevant parties that all or part of the transmission system must be started from black i.e. when the System enters a "Black Start" state, that is:

- a. there has been a loss of more than 50 % of demand in Northern Ireland;
- b. total absence of voltage for at least three minutes in Northern Ireland, leading to the triggering of restoration plans.

## 4.5 Restoration

### Ireland and Northern Ireland

The transmission system shall be in the restoration state when any measure of the restoration plan has been activated, following an emergency or blackout state.

## 4.6 Cancellation of alerts

In general alerts should be cancelled only once system conditions have stabilised for at least one hour and there is only a very low probability of another alert being issued on the same day.

## 5. Scope

This business process outlines the criteria for issuing each type of alert for both jurisdictions, and the steps taken by the relevant control centre to issue that alert including notification of relevant parties and updating of the European Awareness System. It also covers the steps taken to cancel an alert.

### 5.1 Process objective

The objective of this Business Process is to meet the following obligations:

- SONI OC3 and EirGrid Grid Code OC9.4 System Alerts
- Trading & Settlement Code, Chapter G Financial and Settlement
- ENTSO-E Obligations in relation to European Awareness System
- System Operators Guidelines (SOGL)

## 6. Roles and responsibilities

### 6.1 System operations

The following table provides a summary of the obligations of the System Operations team relating to Declaration of System Alerts:

Team Name	Responsibility in relation to process	Timeline Associated
System Operations	<ul style="list-style-type: none"><li>• Issue power system alert and notify the relevant people including the Market Operator (MO Trading office 07.00 to 19.00, 7 days a week) (MO on-call 19.00 to 07.00, 7 days a week)</li><li>• Cancel power system alert once system has stabilised.</li></ul>	As required

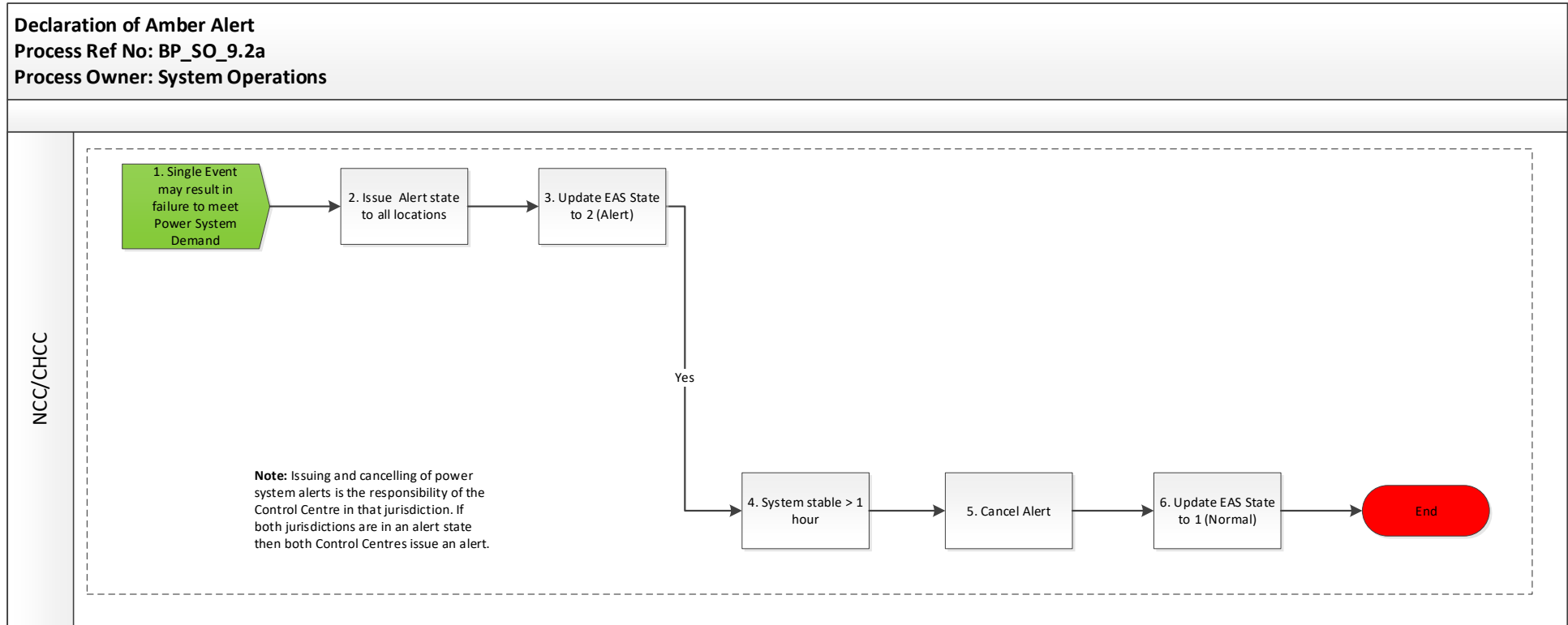
### 6.2 Trading

The following table provides a summary of the obligations of the Trading team relating to Declaration of System Alerts:

Team Name	Responsibility in relation to process	Timeline Associated
MO Trading	<ul style="list-style-type: none"><li>• Receive notification of power system blue alerts and cancellations and trigger Administered Settlement process.</li></ul>	As required.

# 7. Process description

## 7.1 Process map - declaration of alert state - (Amber)

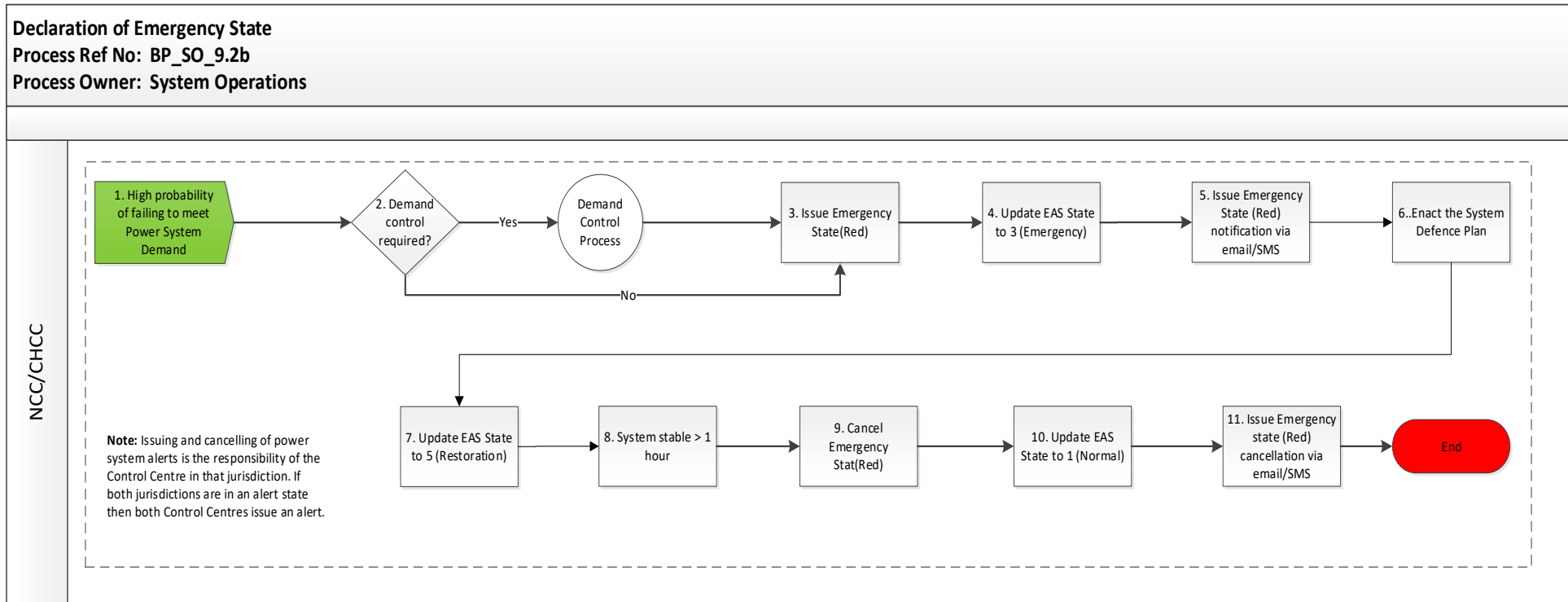


## 7.2 Process steps - declaration of alert state

#	Step	Step Description	Responsible Role	Outputs	Indicative Timing/Frequency	System
1	Single Event may result in failure to meet Power System Demand	<p>The following may act as a trigger to this process:</p> <ol style="list-style-type: none"> <li>1. A Single Event would give rise to a reasonable possibility of failure to meet Power System Demand</li> <li>2. If frequency or voltage departing significantly from normal, or</li> <li>3. If multiple Events are probable due to prevailing weather conditions</li> </ol> <p><i>Power system alerts are issued jurisdictionally, so if both jurisdictions are in an alert state the following steps are completed by both jurisdictions.</i></p>	N/A	N/A	As required	N/A
2	Issue Alert state to all locations	An Alert state (amber) is issued to all applicable stations, large customers, MO and stakeholders.	SO	Alert	As required	EMS Alerts, E-mail, SMS
3	Update EAS State to 2 (Alert)	<p>Once an Alert state has been issued, the SO Control Centre should update the System State to 2, which corresponds to the Alert or YELLOW state in the ENTSO-E Awareness System.</p> <p><i>Note: Ireland and Northern Ireland are treated as a common system so updating the EAS alert state impacts both jurisdictions.</i></p>	SO	EAS Update	As required	EAS system

#	Step	Step Description	Responsible Role	Outputs	Indicative Timing/Frequency	System
4	System stable > 1 hour	Once the system has been stable for more than one hour and there is low risk of further alerts being issued then the alert can be cancelled. Note: This may take a number of hours after it is first issued.	SO	N/A	As required	N/A
5	Cancel Alert state	The Alert state (Amber) is cancelled via EMS	SO	Alert	As required	EMS Alerts
6	Update EAS State to 1 (Normal)	Once the Alert state has been cancelled the SO control centre should update the System State to 1, which corresponds to the Normal or GREEN state in the ENTSO-E Awareness System.	SO	EAS Update	As required	EAS System

## 7.3 Process map - declaration of an emergency state - Red alert





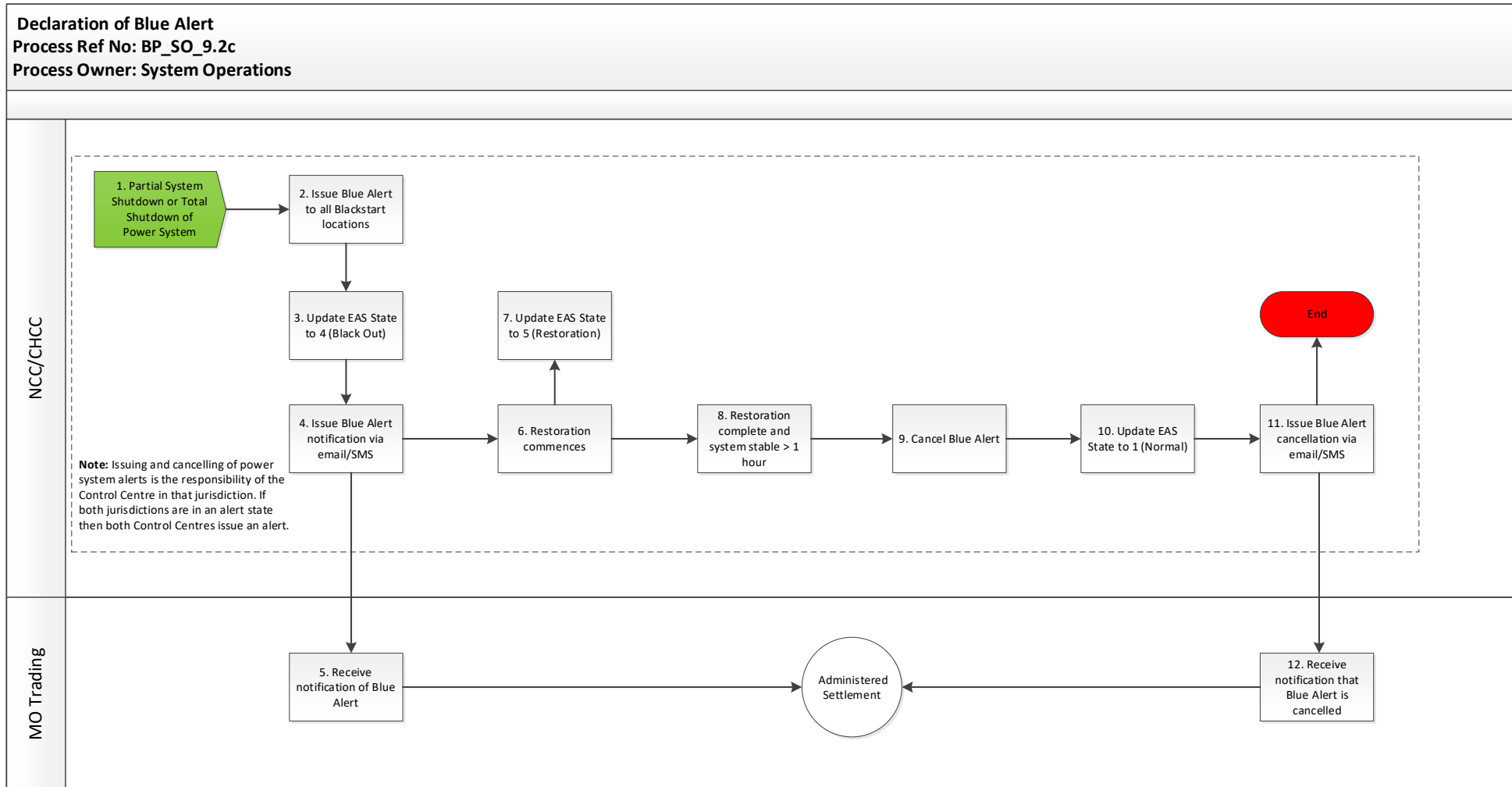
## 7.4 Process steps - declaration of an emergency state - Red alert

#	Step	Step Description	Responsible Role	Outputs	Indicative Timing/Frequency	System
1	High probability of failing to meet Power System Demand	<p>The following may act as a trigger to this process:</p> <ol style="list-style-type: none"> <li>1. The frequency or voltage has deviated significantly from normal</li> <li>2. User's demand has been disconnected</li> <li>3. Or in the period immediately ahead there is a high probability of failing to meet Power System Demand or to maintain normal Voltage</li> </ol> <p><i>Power system alerts are issued jurisdictionally, so if both jurisdictions are in an emergency state the following steps are completed by both jurisdictions.</i></p>	N/A	N/A	As required	N/A
2	Demand Control required?	<p>Is demand control required?</p> <p>If yes, implement Demand Control Process and then proceed to Step 3</p> <p>If no, proceed directly to Step 3</p>	SO	Decision	As required	N/A
3	Issue Emergency State	An Emergency State (Red) is issued to all locations	SO	Alert	As required	EMS Alerts

#	Step	Step Description	Responsible Role	Outputs	Indicative Timing/ Frequency	System
4	Update EAS State to 3 (Emergency)	Once an Emergency State has been issued, the SO Control Centre should update the System State to 3, which corresponds to the Emergency or Red state in the ENTSO-E Awareness System. <i>Note: Ireland and Northern Ireland are treated as a common system so updating the EAS alert state impacts both jurisdictions.</i>	SO	EAS Update	As required	EAS system
5	Issue Emergency State (Red)notification via email/SMS	The Emergency State email template is issued to a pre-defined list, including the Market Operator, and also issues an SMS to a pre-defined list.	SO	Notification	As required	Email / Text
6	Activate System Defence Plan	Following declaration of a Red Alert, NCC/CHCC prepares a defence plan in accordance with the Power System Defence Plan. This signifies the start of restoration.	SO	N/A	As required	N/A
7	Update EAS State to 5 (Restoration)	Once a measure of the System Defence plan has been activated, the SO Control Centres should update the System State to 5, which corresponds to the Restoration state in the ENTSO-E Awareness System.	SO	EAS Update	As required	EAS System
8	System stable > 1 hour	Once the system has been stable for more than one hour and there is low risk of further alerts being issued then the alert can be cancelled.	SO	N/A	As required	N/A
9	Cancel Emergency State.	The emergency state is cancelled.	SO	Alert	As required	EMS Alerts

#	Step	Step Description	Responsible Role	Outputs	Indicative Timing/ Frequency	System
10	Update EAS State to 1 (Normal)	Once the Emergency State has been cancelled the NCC/CHCC User should update the System State to 1, which corresponds to the Normal or GREEN state in the ENTSO-E Awareness System.	SO	EAS Update	As required	EAS System
11	Issue Emergency State cancellation via email / SMS	The Emergency State cancellation email template is issued to a pre-defined list, including the Market Operator, and also issues an SMS to a pre-defined list.	SO	Notification	As required	N/A

## 7.5 Process map - declaration of a blackout state - Blue alert



## 7.6 Process steps - declaration of a blackout state - Blue alert



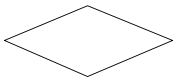




#	Step	Step Description	Responsible Role	Outputs	Indicative Timing/Frequency	System
1	Partial System Shutdown or Total Shutdown of Power System	<p>Partial system shutdown or total shutdown of power system acts as the trigger for declaring a Blue Alert</p> <p><i>Power system alerts are issued jurisdictionally, so if both jurisdictions are in an alert state the following steps are completed by both jurisdictions.</i></p>	N/A	N/A	As required	N/A
2	Issue Blue Alert to all 'Black start' locations	A blue alert is issued to all 'black start' locations by issuing a Global Blue Alert	SO	Alert	As required	EMS Alerts
3	Update EAS State to 4 (Black Out)	<p>Once a Blue Alert has been issued, the SO Control Centre should update the System State to 4, which corresponds to the Black Out state in the ENTSO-E Awareness System.</p> <p><i>Note: Ireland and Northern Ireland are treated as a common system so updating the EAS alert state impacts both jurisdictions.</i></p>	SO	EAS Update	As required	EAS System
4	Issue Blue Alert notification via email/SMS	The Blue Alert email template is issued to a pre-defined list, including the Market Operator, and also issues an SMS to a pre-defined list.	SO	Notification	As required	Email / Text

#	Step	Step Description	Responsible Role	Outputs	Indicative Timing/Frequency	System
5	Receive notification of Blue Alert	Receives notification from SO that a blue alert has been issued. This is the trigger for the Administered Settlement process.	MO Trading	N/A	As required	N/A
6	Restoration commences	Following declaration of a Blue Alert, SO prepares a restoration plan in accordance with the Power System Restoration Plan. This signifies the start of restoration.	SO	N/A	As required	N/A
7	Update EAS State to 5 (Restoration)	Once restoration has commenced, the SO Control centre should update the System State to 5, which corresponds to the Restoration or BLUE state in the ENTSO-E Awareness System.  <i>Note: Ireland and Northern Ireland are treated as a common system so updating the EAS alert state impacts both jurisdictions.</i>	SO	EAS Update	As required	EAS system
8	Restoration complete and system stable > 1 hour	Once all system demand has been restored and the system has been stable for more than one hour and there is low risk of further alerts being issued then restoration can be considered complete.	SO	N/A	Up to 24 Hours after restoration commences	N/A
9	Cancel Blue Alert	Once restoration is complete then the Blue Alert is cancelled via EMS	SO	Alert	As required	EMS Alerts
10	Update EAS State to 1 (Normal)	Once the Blue Alert has been cancelled the NCC/CHCC User should update the System State to 1, which corresponds to the Normal or GREEN state in the ENTSO-E Awareness System.	SO	EAS Update	As required	EAS System

#	Step	Step Description	Responsible Role	Outputs	Indicative Timing/ Frequency	System
11	Issue Blue Alert cancellation via email / SMS	The Blue Alert cancellation email template is issued to a pre-defined list, including the Market Operator, and also issues an SMS to a pre-defined list.	SO	Notification	As required	N/A
12	Receive notification that Blue Alert is cancelled	Receives notification from NCC/CHCC that the Blue Alert has been cancelled. This signifies the end of the Administered Settlement period.	MO Trading	N/A	As required	N/A

# 8. Appendices

## 8.1 Process flowchart key

FLOWCHART KEY	
	Trigger
	Process step
	Process decision / question
	Reference to another process
	Another business process to be implemented following current step (current step is a trigger for another process)
	Process end
	System (automatic step)