Operating Security Standards

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Contents

1. Introduction 3
2. Security Criteria 3
3. Voltage Limits in Operating the Transmission System 5
4. Demand Control 6
5. Power System Restoration 7
6. Reserve 7
7. Fuel Dependency 8
8. Terms and Definitions 9

1. Introduction

Objective & Scope

1.1 Pursuant to Condition 21 of the Transmission Licence in Northern Ireland, this document sets out the main standard that the *transmission licensee* (SONI ltd) shall use in the operation of the Northern Ireland transmission system.

1.2 The Transmission System Security and Planning Standards[1] (TSSPS) outlines the main standard that *transmission licensee* shall use in the planning of the Northern Ireland Transmission System. The TSSPS is referenced in this document and should be read to understand generation and demand connection criteria applied in Northern Ireland.

1.3 Additional criteria, for example covering more detailed and other aspects of quality of supply, are contained in the SONI Grid Code which should be read in conjunction with this document.

1.4 SONI ltd along with EirGrid plc (the Transmission System Operator for Ireland), cooperate to ensure the all-island *transmission system* is operated in a secure and reliable manner. SONI shall as far as possible ensure that the operation of the EirGrid *transmission system* is not adversely affected by any matter within its control.

2. Security Criteria

Normal Operational Criteria

2.1 The *transmission system* shall be operated under *prevailing system conditions* so that for the secured event of a *fault outage* on the *transmission system* of any of the following:

2.1.1 a single *transmission circuit*, a reactive compensator or other *reactive power* provider; or

2.1.2 the most onerous *loss of power infeed*;

2.1.3 a double circuit overhead line on the 275 kV network,

2.1.4 a section of *busbar* or mesh corner or;

2.1.5 any single transmission circuit with the prior planned outage of another *transmission circuit*, or a *generating unit*, reactive compensator or other *reactive power* provider together with any economic re-dispatch of generation during the planned outage,

there shall not be any of the following:

2.1.6 a *loss of supply capacity* except as specified in Table 2.1;

2.1.7 *unacceptable frequency conditions*;

2.1.8 *unacceptable overloading* of any *primary transmission equipment*;

[1] Northern Ireland Transmission System Security and Planning Standards

2.1.9 *unacceptable voltage conditions*, *insufficient voltage performance margins*; or

2.1.10 *system instability*.

2.2 For a *secured event* on the *transmission system* on connections to more than one *demand group* the permitted *loss of supply capacity* for that *secured event* is the maximum of the permitted loss of supply capacities set out in Table 2.1 for each of these *demand group*s.

Table 2.1 Maximum permitted loss of supply capacity following *secured events*

Group Demand	**Initial system conditions**	
	Prevailing system conditions with no *local system outage* ***Note 1,2,3***	*Prevailing system conditions* with a *local system outage* ***Note 1,2***
over 300 MW	None	None
over 60 MW to 300 MW	None except that where such facilities and suitable measures for restoration are available, up to 20 MW by automatic disconnection	Whole group up to *Group Demand* for up to the operational specified time to restore supply capacity
over 24 MW to 60 MW	None, except that where such facilities and suitable measures for restoration are available, up to 1/3 of *Group Demand* by automatic disconnection for up to 15 minutes.	Whole group up to *Group Demand*
over 8 MW 24 MW	None, except that where such facilities and suitable measures for restoration are available, up to 8 MW by automatic disconnection for up to 15 minutes.	Whole group up to *Group Demand*
over 1 MW to 8 MW	Whole group up to *Group Demand* for up to the operational specified time to restore supply capacity	Whole group up to *Group Demand*
up to 1 MW	Whole group up to *Group Demand* for up to the operational specified time to restore supply capacity	Whole group up to *Group Demand*

Notes

1. SONI will plan with the *distribution system network Operator* to ensure that no supply capacity is lost; when this is not possible, lost supply capacity will be minimised and a plan will be implemented to ensure the time to restore any lost supply capacity shall be as short as practicable.

2. If any part of any lost supply capacity can be restored in less than the specified maximum time to restore all of it, it shall be restored.

3. Where the supply capacity was designed in such a way, there should be no *loss of supply capacity*.

Conditional Further Operational Criteria

2.3 During periods of *major system risk*, SONI may implement measures to mitigate the consequences of this risk. Such measures may include: providing additional reserve or running machines out of merit.

Post-fault Restoration of System Security

2.5 Following the occurrence of a *secured event* on the *transmission system*, measures shall be taken to re-secure the system to the above operational criteria as soon as reasonably practicable. To this end, it is permissible to put operational measures in place pre-fault to facilitate the speedy restoration of system security.

Authorised Variations from the Operational Criteria

2.6 Provided it is in accordance with the appropriate requirements of the demand connection criteria in Section 3 of the TSSPS, there may be associated *loss of supply capacity* due to a *secured event*, for example by virtue of the design of the generation connections and/or the designed switching arrangements at the substations concerned.

2.9 Exceptions to the criteria in paragraphs 2.1 to 2.7 may be required where variations to the connection designs as per paragraphs 3.12 to 3.15 of the TSSPS have been agreed.

2.10 The principles of these operational criteria shall be applied at all times except in special circumstances where SONI, following consultation with the appropriate *Network Operator* or *Generator*, may need to give instructions to the contrary to preserve overall system integrity.

3. Voltage Limits in Operating the Transmission System

3.1 A voltage condition is unacceptable in operational timescales if, after either

3.1.1 a *secured event*, or

3.1.2 operational switching,

and the affected site remains directly connected to the *transmission system* in the *steady state* after the relevant event above, either of the following conditions applies:

3.1.3 the *voltage step change* at an interface between the *transmission system* and a customer exceeds that specified in Table 3.1, or

3.1.4 there is any inability following such an event to achieve a *steady state* voltage as specified in Table 3.2 at *transmission system* substations using manual and/or automatic facilities available, including the switching in or out of relevant equipment.

3.1.5 Where possible, the *steady state* pre-fault voltage on the *transmission system* will be no lower than 95% of nominal. The target operational voltages at GSPs should be as agreed with relevant *Network Operators*.

Table 3.1 The voltage step change limits in operational timescales

***Transmission System secured events* or switching event**	**Voltage fall**	**Voltage rise**
Following loss of single circuit	-6%	+6%
Following loss of *double circuit overhead line*	-10%	+6%
following operational switching less frequent than specified in ER P28	-3%	+3%
Following operational switching of frequencies covered by ER P28	In accordance with ER P28	

Table 3.2 The steady state voltage limits in operational timescales

Nominal Voltage	**Minimum Limit**	**Maximum Limit**
275 kV	247.5 kV (90%)	302.5 kV (110%)
110 kV	99 kV (90%) ***Note 1***	121 kV (110%)
<110 kV	96% ***Note 1***	106 %

Notes

1. It shall be possible to operate the lower voltage *busbar* of a BSP at 100% of nominal voltage after tap changing.

4. Demand Control

4.1 SONI shall implement such measures of Demand Control as it deems appropriate in accordance with the OC4 of the SONI Grid Code.

4.2 If Automatic Load Shedding is required it shall be reported on the basis of the criterion for reporting incidents as specified in regulation 33 and Schedule 4 of the Electricity Safety, Quality and Continuity Regulations (Northern Ireland) 2012[2].

An incident shall be reported if there has been:

4.2.1 Any single interruption of supply to one or more consumers of 20 MW or more for a period of one minute or longer; or

4.2.2 Any single interruption of supply to one or more consumers of 5 MW or more for a period of one hour or longer; or

4.2.3 Any single interruption of supply to 5,000 or more consumers for a period of one hour or longer.

[2] The Electricity Safety, Quality and Continuity Regulations (Northern Ireland) 2012

5. Power System Restoration

5.1 The Northern Ireland Power System Restoration Plan provides a plan of action to be implemented after a total power system blackout has occurred. This PSRP is supplementary to the OC7 of the SONI Grid Code. SONI shall update and maintain this plan as required.

6. Reserve

6.1 Reserve shall be maintained in line with the System Operators Agreement and as published on the SONI web site from time to time.

6.2 SONI must ensure that sufficient additional generation output, *demand* relief or interconnector import is scheduled in order to maintain supply to customers in the event of rapid loss of the largest generation in-feed. This can be termed as "Operating Reserve".

6.3 SONI *Operating Reserve* definitions are as follows:

6.1.1 Primary Operating Reserve (POR): The additional *MW output* (or reduction in *demand*) at the frequency nadir compared to the pre-Incident output (or *demand*), where the nadir occurs between 5 and 15 seconds after the event. If the actual frequency, nadir is before 5 seconds or after 15 seconds after the event, then for the purposes of POR monitoring the nadir is deemed to be the lowest frequency which did occur between 5 and 15 seconds after the event.

6.1.2 Secondary Operating Reserve (SOR): The additional MW output (or reduction in *demand*) compared to the pre-incident output (or *demand*), which is fully available and sustainable over the period 15 to 90 seconds following the event.

6.1.3 Tertiary Operating Reserve 1 (TOR1): The additional MW output (or reduction in *demand*) compared to the pre-incident output (or *demand*), which is fully available and sustainable over the period 90 to 300 seconds following the event.

6.1.4 Tertiary Operating Reserve 2 (TOR2): The additional MW output (or reduction in *demand*) compared to the pre-incident output (or *demand*), which is fully available and sustainable over the period 300 to 1200 seconds following the event.

6.1.5 Replacement Reserve: The additional MW output (and/or reduction in *demand*) required compared to the pre-incident output (or *demand*) which is fully available and sustainable over the period from 20 minutes to 4 hours following an event. The purpose of this category of reserve is to restore primary reserve within 20 minutes including restoring any interruptible load shed.

7. Fuel Dependency

7.1 SONI shall comply with the Northern Ireland Fuel Security Code[3] by co-operating in strategic contingency planning in respect of primary fuels and secondary fuel stock.

7.2 SONI can successfully test the ability of a *generator* to run on secondary fuel up to twice per year.

[3] Northern Ireland Fuel Security Code

8. Terms and Definitions

8.1 Defined terms in this standard unless otherwise specified are consistent with the Transmission System Security and Planning Standards (TSSPS) or the SONI Grid Code.

Active Power or MW	As per SONI Grid Code.
Authority	As per the TSSPS.
Bulk Supply Point (BSP)	As per the TSSPS.
Busbar	As per the TSSPS.
Demand	As per SONI Grid Code.
Demand group	As per TSSPS.
Distribution System	As per the TSSPS.
Double Circuit Overhead Line	As per the TSSPS.
Fault outage	As per the TSSPS.
Generating Unit	As per SONI Grid Code.
Generator	As per the TSSPS.
Grid Supply Point (GSP)	As per the TSSPS.
Group Demand	As per the TSSPS.
Insufficient Voltage	As per the TSSPS.
Loss of Power Infeed	As per the TSSPS.
Loss of Supply Capacity	As per the TSSPS.
Major System Risk	A period of *major system risk* is one in which *secured events* are judged to be significantly more likely than under the circumstances addressed by the normal criteria of this Standard, or they are judged to have a significantly greater impact than normal, or events not normally secured against are judged to be significantly more likely than normal such that measures should be taken to mitigate their impact.

Network Operator	As per the TSSPS.
Operational Intertripping.	As per the TSSPS.
Planned Outage	As per the TSSPS.
Power Station	As per SONI Grid Code.
Prevailing System Conditions	These are conditions on the Northern Ireland *transmission system* prevailing at any given time and will therefore normally include *planned outages* and unplanned outages.
Primary Transmission Equipment	As per the TSSPS.
Reactive Power or Mvar	As per SONI Grid Code.
Secured event	As per the TSSPS.
Steady State	As per the TSSPS.
System Instability	As per the TSSPS.
Transient Time Phase	As per the TSSPS.
Transmission Circuit	As per the TSSPS.
Transmission Licensee	As per the TSSPS.
Transmission System	As per the TSSPS.
Unacceptable Frequency Conditions	As per the TSSPS.
Unacceptable Overloading	As per the TSSPS.
Unacceptable Voltage Conditions	As per the TSSPS.
Voltage collapse	As per the TSSPS.
Voltage Step Change	As per the TSSPS.