

Legal Text for GSR027 Modification

5. Operation of the Onshore Transmission System

Normal Operational Criteria

- 5.1 The *onshore transmission system* shall be operated under *prevailing system conditions* so that for the *secured event* of a *fault outage* on the *onshore transmission system* of any of the following:
- 5.1.1 a single *transmission circuit*, a reactive compensator or other reactive power provider; or
 - 5.1.2 a single *generation circuit*, a single *generating unit* (or several *generating units* sharing a common circuit breaker), a single *power park module*, or a single *DC converter*; or
 - 5.1.3 the most onerous *loss of power infeed*; or
 - 5.1.4 where the system is designed to be secure against a *fault outage* of a section of *busbar* or mesh corner under *planned outage* conditions, a section of *busbar* or mesh corner,
- there shall not be any of the following:
- 5.1.5 a *loss of supply capacity* except as specified in Table 5.1
 - 5.1.6 unacceptable frequency conditions;
 - 5.1.7 unacceptable overloading of any primary transmission equipment;
 - 5.1.8 unacceptable voltage conditions;
 - 5.1.9 *system instability*; or
 - 5.1.10 *Unacceptable Sub-Synchronous Oscillations*.
- 5.2 For a *secured event* on the *onshore 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 5.1 for each of these *demand groups*.
- 5.3 The *onshore transmission system* shall be operated under *prevailing system conditions* so that for the *secured event* on the *onshore transmission system* of a *fault outage* of:
- 5.3.1 a *double circuit overhead line*; or
 - 5.3.2 a section of *busbar* or mesh corner,
- there shall not be any of the following:
- 5.3.3 a *loss of supply capacity* greater than 1500 MW;
 - 5.3.4 *unacceptable frequency conditions*;
 - 5.3.5 *unacceptable voltage conditions* affecting one or more *Grid Supply Points* for which the total *group demand* is greater than 1500 MW;
 - 5.3.6 *system instability* of one or more *generating units* connected to the *supergrid*; or
 - 5.3.7 *Unacceptable Sub-Synchronous Oscillations*.
- ...

Conditional Further Operational Criteria

5.5 If:

5.5.1 there are *adverse conditions* such that the likelihood of a *double circuit overhead line* fault is significantly higher than normal; or

5.5.2 there is no significant economic justification for failing to secure *the onshore transmission system* to this criterion and the probability of loss of supply capacity is not increased by following this criterion,

the onshore transmission system shall be operated under *prevailing system conditions* so that for the *secured event* of

5.5.3 a *fault outage* on the *supergrid* of a *double circuit overhead line*

there shall not be:

5.5.4 where possible and there is no significant economic penalty, any *loss of supply capacity* greater than 300 MW;

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

5.5.6 *unacceptable voltage conditions*;

5.5.7 *system instability*; or

5.5.8 *Unacceptable Sub-Synchronous Oscillations*.

- 5.6 During periods of *major system risk*, NGESO may implement measures to mitigate the consequences of this risk. Such measures may include: providing additional reserve; reducing system-to-*generator* intertrip risks, securing as far as possible appropriate two-circuit combinations, or reducing system transfers, for example *through balancing services*.
- 5.7 In the case that neither of the conditions in paragraphs 5.5.1 and 5.5.2 is met, it is acceptable to utilise short term post fault actions to avoid *unacceptable overloading* of *primary transmission equipment* which may include a requirement for demand reduction; however, this will not be used as a method of increasing reserve to cover abnormal post fault generation reduction. Where possible these post fault actions shall be notified to the appropriate *Network Operator* or *Generator*. Normally the provisions of the Grid Code, in respect of Emergency Manual Demand Disconnection and/or, for example through *balancing services*, will be applied. Additional post fault actions beyond the Grid Code provisions may be applied, but only where they have been agreed in advance with the appropriate *Network Operator* or *Generator*.
- 5.8 NGESO shall apply the guidelines set out in the *Frequency Risk and Control Report* to determine the additional events for which no *unacceptable frequency conditions* shall take place.

Post-fault Restoration of System Security

- 5.9 Following the occurrence of a *secured event* on the *onshore 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

- 5.10 Provided it is in accordance with the appropriate requirements of the demand connection criteria in Section 3, 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.
- 5.11 Exceptions to the criteria in paragraphs 5.1 to 5.8 may be required ~~where variations to the connection designs as per paragraphs 3.12 to 3.15 have been agreed.~~
- 5.10.1 where variations to the connection designs as per paragraphs 3.12 to 3.15 have been agreed; or
- 5.10.2 in relation to 5.1.6 and 5.3.4 only, based on the outcome of an economic assessment conducted in accordance with the guidelines set out in the *Frequency Risk and Control Report*
- 5.12 The principles of these operational criteria shall be applied at all times except in special circumstances where *NGESO*, following consultation with the appropriate *Network Operator*, *Generator* or *Non-Embedded Customer*, may need to give instructions to the contrary to preserve overall system integrity.

Definitions section:

Frequency Risk and Control Report

The report setting out the results of an economic assessment produced by *NGESO* in accordance with [reference to be determined]

Unacceptable Frequency Conditions

These are conditions where:

- i) the *steady state* frequency falls outside the statutory limits of 49.5Hz to 50.5Hz; or
- ii) a transient frequency deviation on the *MITS* persists outside the above statutory limits and does not recover to within 49.5Hz to 50.5Hz within 60 seconds.

Transient frequency deviations outside the limits of 49.5Hz and 50.5Hz shall only occur at intervals which ought to reasonably be considered as infrequent.

In order to avoid the occurrence of *Unacceptable Frequency Conditions*:

- ~~a) The minimum level of loss of power infeed risk which is covered over long periods operationally by frequency response to avoid frequency deviations below 49.5Hz or above 50.5Hz will be the actual loss of power infeed risk present at connections planned in accordance with the normal infeed loss risk criteria;~~
- b) The minimum level of loss of power infeed which is covered over long periods operationally by frequency response to avoid frequency deviations below 49.5Hz or above 50.5Hz for more than 60 seconds will be the actual *loss of power infeed risk present at connections planned in accordance with the infrequent infeed loss risk criteria.*

It is not possible to be prescriptive with regard to the type of *secured event* which could lead to transient deviations since this will depend on the extant frequency response characteristics of the system which NGENSO adjust from time to time to meet the security and quality requirements of this Standard.

Loss of Power Infeed

The output of a generating unit or a group of generating units or the import from external systems disconnected from the system by a secured event, less the demand disconnected from the system by the same secured event.

For the avoidance of doubt if, following such a secured event, demand associated with the normal operation of the affected generating unit or generating units is automatically transferred to a supply point which is not disconnected from the system, e.g. the station board, then this shall not be deducted from the total loss of power infeed to the system.

For the purpose of the operational criteria:

- i) the loss of power infeed includes the output of a single generating unit, CCGT Module, boiler, nuclear reactor or DC Link lost as a result of an event.
- ii) In the case of an offshore generating unit or group of offshore generating units, the loss of power infeed is measured at the interface point, or user system interface point, as appropriate.
- iii) In the case of an offshore generating unit or group of offshore generating units for which infeed will be automatically re-distributed to one or more interface points or user system interface points through one or more interlinks, the re-distribution should be taken into account in determining the total generation capacity that is disconnected. However, in assessing this re-distribution, consequential losses of infeed that might occur in the re-distribution timescales due to wider generation instability or tripping, including losses at distribution voltage levels, should be taken into account.

Some minor numbering changes will also be required to subsequent sections and references. Also, once finalised the changes made to section 5 (Operation of the Onshore Transmission System) will need to be reflected in section 9 (Operation of an Offshore Transmission System).

Note that the changes set out here are designed to only impact the way in which the system is operated with sufficient allowances for response, reserve and inertia holding to maintain security of supply through stabilising system frequency and limiting disturbances. Other operational criteria (voltage, overloading of equipment etc) are unchanged as they have more to do with the design of the system and potential reinforcement.

This modification does not intend to alter any of the following criteria:

- operational criteria beyond the criteria related to frequency control;*
- design criteria in general;*
- design criteria related to loss of infeed risk in particular unless these are found out to be inconsistent with the workgroup proposals.*