

This paper provides further information to GB stakeholders on the origins and comparison of values in the LFCR code with those in existing GB regulation and operational practice. I have chosen three main references to help stakeholders understand that these values correspond to current operational values (other source materials may exist).

Please note that the GB operating environment is currently changing, because of changes in demand behaviour, changes in the generation plant type mix and other factors such as numbers of interconnectors and smaller asynchronous generators.

It is National Grid's intention to consult with industry and regulators on any need to change values in the future subject to best and fair practice, and in accordance with rules and limitations set out in legislation.

The values for GB in Table 1 are derived from current GB regulation and current GB operational practice.

	GB
Nominal Frequency	50 Hz
Standard Frequency Range	±200 mHz
Maximum Instantaneous Frequency Deviation	800 mHz
Maximum Steady-state Frequency Deviation	500 mHz
Time to Recover Frequency	1 minute
Frequency Range Within Time To Recover Frequency	±500 mHz
Time To Restore Frequency	10 minutes
Frequency Range Within Time To Restore Frequency	±200 mHz

Table 1 : Frequency Quality Defining Parameters - taken from LFCR code (Public Consultation version)

The values align with current GB operational standards as found in the public domain at the following reference points.

[REFERENCE 1]

REPORT OF THE INVESTIGATION INTO THE AUTOMATIC DEMAND DISCONNECTION FOLLOWING MULTIPLE GENERATION LOSSES AND THE DEMAND CONTROL RESPONSE THAT OCCURRED ON THE 27TH MAY 2008

<http://www.nationalgrid.com/NR/ronlyres/D680C70A-F73D-4484-BA54-95656534B52D/26917/PublicReportIssue1.pdf>

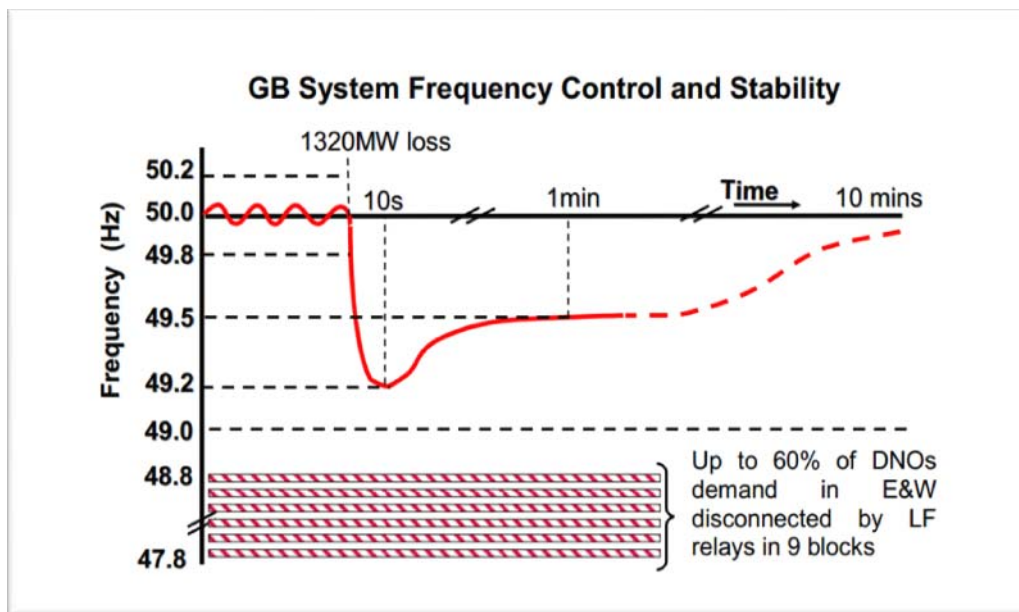


Figure 1: illustrates the frequency control philosophy and frequency stability of the GB power system. In addition, where the initial frequency is close to the lower operational limit of 49.8Hz at the time of a 1320MW loss, the lowest planned frequency would be 49Hz. This would still restrict the maximum frequency deviation to 0.8Hz and provide a 0.2Hz margin above the level where the LFDD scheme is designed to operate and disconnect demand.

Please download and read the document for further information.

[REFERENCE 2]

**NETS SECURITY AND QUALITY OF SUPPLY STANDARD
ISSUE 2.2 - 05 MARCH 2012**

<http://www.nationalgrid.com/NR/ronlyres/5C1E8E34-B655-4D46-B9AF-EF6EE91B12B2/52026/NETSSQSSversion22FINALchangesremoved.pdf>

Please download and read the document for further information.

[REFERENCE 3]

NETS SQSS OFFSHORE INFEED LOSS WORKING GROUP (GSR013) WORKING GROUP REPORT

JULY 2012

<http://www.nationalgrid.com/NR/rdonlyres/5553F036-FAB5-4AC0-9547-BCBB7C46B83B/57968/NETSSQSSGSR013final.pdf>

3.2 NGET's Frequency Containment Policy

The statutory requirements relating to system frequency are included in NGET's frequency containment policy.

The frequency containment policy is such that:

- a) For a 'significant loss' of generation or demand up to 1000MW (from 14th April 2014 this will be 1320MW), the maximum change of frequency shall not be greater than +/- 0.5Hz;
- b) For an 'abnormal loss' of generation up to 1320MW (from 14th April 2014 this will be 1800MW), the maximum change of frequency shall not be greater than -0.8Hz; - 5 -
- c) If the system frequency is 49.8Hz (i.e. the lower operational limit) prior to an 'abnormal loss' of 1320MW (from 14th April 2014 this will be 1800 MW), then the frequency shall not fall below 49Hz. This is to maintain a margin of 0.2Hz above the first stage of emergency low frequency demand disconnection at 48.8Hz;
- d) Any frequency deviation outside the 50.5Hz to 49.5Hz shall not exceed one minute.

The frequency containment policy equates a 'significant loss' (under normal circumstances) with the normal infeed loss risk and an 'abnormal loss' (under exceptional circumstances) with the infrequent infeed loss risk. The reason for the different terminology is that the Normal and Infrequent criteria apply to the System Planner (SQSS section 2. to 4.). From time-to-time, the System Operator may for a few hours operate the system to different levels of infeed risk, and so the criteria of operational policy (reflecting SQSS section 5.) are termed 'significant loss' and 'normal loss'.

The current GB SQSS definitions of normal and infrequent infeed loss risk are referenced below:

Infrequent Infeed Loss Risk:

That level of loss of power infeed risk which is covered over long periods operationally by frequency response to avoid a deviation of system frequency outside the range 49.5Hz to 50.5Hz for more than 60 seconds.

Normal Infeed Loss Risk:

That level of loss of power infeed risk which is covered over long periods operationally by frequency response to avoid a deviation of system frequency by more than 0.5Hz.

The current values of 1320MW and 1800MW are also a function of NGET's obligations to contain costs. An increase in either of these values or their frequency of occurrence would lead to the need for more frequency response and reserve holding and incur higher operational cost although, it may be argued, reduced investment in some circumstances. *It could be argued that, given sufficient response to keep the system frequency above 49.2Hz for a 1800MW loss, the system could accept a loss somewhat greater than 1320MW and still keep the frequency within 49.5Hz. Hence the normal infeed loss risk could be modified to reflect this.*

For instantaneous losses greater than 1800MW, or for situations where there are a series of smaller losses in short timescales, National Grid may have to rely on emergency defence measures such as the initiation of low frequency relays leading to demand shedding. Fortunately this is a rare occurrence (the last event happening in May 2008). Great Britain has never implemented automated reserve restoration services (such Automatic Generation Control), and manual actions are required to restore primary and secondary response following an initial loss. At present it can take up to 20 minutes to fully restore response levels. The current definitions of the two terms (i.e. normal and infrequent infeed loss risk) leave scope for reviewing the thresholds, should the need arise in an event such as an increased frequency of occurrence of a loss of power infeed more than 1320MW such that it could no longer be reasonably considered 'infrequent' or 'exceptional' (e.g. due to the introduction of external HVDC importing more than 1320MW subject to interruption materially more than in the region of up to four times per year).

Please download and read the document for further information.