SQSS Modification Proposal Form	At what stage is this document in the process?
# GSR027 ## Mod Title: Review of the NETS SQSS Criteria for Frequency Control that drive reserve, response and inertia holding on the GB electricity system	01 Proposal Form 02 Industry Consultation 03 Modification Report

Purpose of Modification: This modification is required to address the specific actions from the Energy Emergency Executive Committee (E3C) and Ofgem final reports into the power outage of 9th August 2019 for the ESO to review, in consultation with industry, the NETS SQSS requirements that drive reserve, response and inertia holding on the GB electricity system.

	**The Proposer recommends that this modification should be:** • assessed by a Workgroup This modification will be presented by the Proposer to the Panel on 27th April 2020. The Panel will consider the Proposer's recommendation and determine the appropriate route.
	**High Impact:** National Grid ESO, Consumers (and consumer organisations)
	**Medium Impact:** Generators, interconnectors, Network Operators
	**Low Impact:** Transmission Owner companies

Contents

Any questions?

Contact:
Paul Mullen

paul.mullen@nationalgrideso.com

07794537028

Proposer:
Rob Wilson

robert.wilson2@nationalgrideso.com

Timetable

The Code Administrator recommends the following timetable:	
Workgroup process	May 2020- October 2020
Code Administration Consultation Report issued to Industry	October 2020
Final Modification Report presented to Panel	November 2020
Final Modification Report issued the Authority	November 2020
Decision implemented in SQSS	Following Authority approval & consultation

Proposer Details

Details of Proposer: (Organisation Name)	National Grid ESO
Capacity in which the SQSS Modification Proposal is being proposed:	Licensee
Details of Proposer's Representative: Name: Organisation: Telephone Number: Email Address:	Robert Wilson NGESO 07799 656402 robert.wilson2@nationalgrideso.com
Details of Representative's Alternate: Name: Organisation: Telephone Number: Email Address:	Rob Westmancoat NGESO 07971 006414 robert.westmancoat@nationalgrideso.com
Attachments (No): **If Yes, Title and No. of pages of each Attachment:**	

Impact on Core Industry Documentation.

Please mark the relevant boxes with an "x" and provide any supporting information

BSC	
CUSC	
STC	
Grid Code	
Other	

At present no further code changes are thought to be necessary to progress this specific action from the Ofgem and E3C reports. However, this will be kept under review.

1 Summary

Defect

Actions from the Energy Emergency Executive Committee (E3C) and Ofgem final reports into the power outage of 9th August 2019 require the ESO to review, in consultation with industry, the NETS SQSS requirements for reserve, response and inertia holding on the GB electricity system.

What

The SQSS defines the conditions under which unacceptable frequency conditions should not occur. This drives the volume, the type of, and ultimately the cost of response, reserve and inertia services procured by the ESO to avoid such conditions. This modification will review the frequency control criteria of the NETS SQSS to ensure that an appropriate balance can be reached between the costs of managing frequency, which is eventually borne by the consumer, and the risks mitigated in doing so.

Why

Assessments of the power outage of 9th August 2019 have been clear that the level of security of supply, and the costs associated with this, are societal questions. However, the GB electricity system is changing with the move to smaller, embedded generation and more renewable energy sources and the time is right to carry out such a review.

How

This modification proposal recommends amendments to the NETS SQSS itself to reference a methodology that will be created to sit alongside the NETS SQSS.

It is intended that the methodology will provide a framework through which the risks that could be covered by the ESO can be assessed, consulted upon and agreed. The intention is that the precise framework will be defined as part of the development of the modification and scenarios analysed to determine the cost and risk mitigation that using the methodology will entail. Thereafter, scenarios under the methodology will be reviewed, consulted on and approved under the agreed process periodically as required.

2 Governance

Requested Next Steps

This modification should:

- be assessed by a Workgroup

The E3C and Ofgem reports into 9th August 2019 require this modification to be raised to the SQSS Panel in April 2020. A timeline will be agreed by the workgroup but the expectation is that this work will be expedited to deliver improvements to transparency and system operation as soon as possible.

3 Why Change?

The requirement to carry out this modification to the SQSS has been triggered by the events of 9th August 2019 in which the combined near-simultaneous loss of two large generators, as well as consequential losses of smaller generators at a local level, together caused a significant frequency disturbance and triggered the subsequent disconnection, loss of power and disruption to more than one million consumers. An action from the E3C and Ofgem reports into the incident required the ESO, in consultation with industry, to review reserve, response and inertia holding policies.

While these policies are in themselves not part of the SQSS, the volume of reserve and response held is a direct result of the requirements set out in the SQSS to avoid unacceptable frequency conditions for a range of system conditions including and taking into account an assessment of the loss of power infeed risk.

The need for this review is reflective of the changes that are taking place on the system and in the generation portfolio. A once centrally despatched, transmission based system is changing fundamentally to one in which a greater proportion of generation is connected at a lower voltage within the distribution system, is of smaller sizes, and is predominantly made up of renewable generators (wind and solar).

Distributed generation

The frequency resilience and fault ride through requirements for Distributed generation are set out in the Distribution Code and the associated Engineering Recommendations. These have developed over time and have recently started to converge with the requirements that Transmission connected generation must meet with the implementation of European Network Codes, such as the Requirements for Generator code, but significant differences remain.

In particular, there are known issues with vector shift and rate of change of frequency (RoCoF) protection mechanisms which can cause cascade tripping during a frequency event, thus increasing the total losses of generation and worsening such an event. This protection is a pre-requisite for connection and is referred to as ‘loss of mains’ protection. Loss of mains protection is used by distributed generators to detect when they have been disconnected from the system and should therefore trip off to prevent problems with synchronisation and power islanding. However, the protection has been found to be sensitive to tripping where a disturbance on the system in which they are not disconnected causes a RoCoF or vector shift and is therefore seen as a triggering event by the protection.

This has been an increasingly prevalent issue both with the increasing volumes of such embedded generation and also with declining system inertia which means that without further intervention the system is less stable than it was, disturbances tend to be larger, and therefore the occurrence of nuisance tripping is more widespread. Vector Shift protection is now not permitted for new generators as is the historic low (sensitive) setting for RoCoF. A retrospective change programme is underway under the Accelerated Loss of Mains Change Programme (ALoMCP).

There is also anecdotal evidence that distributed generation has other vulnerabilities to system disturbances. The ALoMCP will gather evidence and identify where further steps might need to be taken.

The uncertainties that distributed generation operation can present to the whole system are not dealt with clearly in the SQSS and there would be benefit in making the management of associated risks or benefits more transparent.

Simultaneous loss events

During the August 9th event, the loss of two large transmission connected generators contributed to deliver a large cumulative loss and led to further losses of distributed generation. A range of circumstances are required to be covered by the SQSS broadly comprising any single credible event and including 'the most onerous loss of power infeed' (SQSS 5.1.3). A simultaneous event, being the loss of more than one generator either at the same time or close enough that the system has not recovered to a normal condition, is not currently covered by the SQSS.

Cost versus risk

The probability of an infeed loss event and the impact it has on the network vary significantly depending on the event and prevailing system conditions. In operating the system securely and economically these factors need to be considered. Whilst in some circumstances it may be possible to define a loss which should always be secured, in other circumstances it may be more appropriate to consider the risk and cost to determine what action is required. Part of this review will look at the range of faults, including simultaneous faults and consequential generation losses, that could occur and will provide the mechanism in the methodology through which an assessment of the risk and costs can be made.

4 Code Specific Matters

This modification is required by the specific actions shown below which are taken from the Ofgem and E3C final reports on the power outage of 9th August 2019:

E3C final report:

Action 5: The ESO, in consultation with industry, should undertake a review of the SQSS requirements for holding reserve, response and system inertia. This review should consider:

- the explicit impacts of distributed generation on the required level of security;
- whether it is appropriate to provide flexibility in the requirements for securing against risk events with a very low likelihood, for example on a cost/risk basis; and
- the costs and benefits of requiring the availability of additional reserves to secure against the risk of simultaneous loss events.

Timing: The ESO should put forward modification proposals to the SQSS by April 2020.

Ofgem final report:

5.7. *Action (1):* The ESO, in consultation with the industry, should undertake a review of the SQSS requirements for holding reserve, response and system inertia.

5.7.1. This review should consider:

-the explicit impacts of distributed generation on the required level of security

- whether it is appropriate to provide flexibility in the requirements for securing against risk events with a very low likelihood, for example on a cost/risk basis
- the costs and benefits of requiring the availability of additional reserves to secure against the risk of simultaneous loss events

5.7.2. The ESO, as the party required to operate to the standard, should carry out this review and raise modification proposals to the SQSS Panel by April 2020. This would provide the appropriate channels for industry scrutiny and transparency, and for an ultimate Ofgem decision on any required changes to the standard

Technical Skillsets

To help in developing this proposal, familiarity with the application of the existing NETS SQSS provisions for secure operation of the system; experience of and familiarity with the existing reserve and response holding requirements applied by NGESO is required.

Reference Documents

Ofgem final report on 9th August 2019 power outage, January 2020.

E3C final report on 9th August 2019 power outage, January 2020.

5 Solution

The SQSS criteria for frequency control are intended to provide a defined level of security with an expected level of cost. Changing the SQSS to reflect the additional risks will impact that balance which must therefore be considered with a wider audience to ensure the right outcomes for industry and the consumer.

The principle challenges faced in progressing this modification are:

- The modification must be explicit in its treatment of Distributed energy resources (DER) and simultaneous losses;
- The current SQSS framework is specific in some but not all areas and optimisation is carried out by the ESO in a broader context: any modification must also improve transparency;
- The conventional way of changing the SQSS has been a single Cost Benefit Analysis for future implementation. Known changes that we need to take account of are;
    - Decreasing system inertia countered by ESO stability pathfinder delivery;
    - Faster acting response products changing the operating envelope;
    - Reduction in the potential size of DER losses as the Accelerated Loss of Mains Change Programme delivers; and
- In a changing environment it would be preferable to be able to adjust the parameters or process needed to achieve the desired balance of cost and risk with greater agility than the code modification process allows.

NETS SQSS requirements and ESO System Operation

The SQSS as currently drafted requires the ESO to secure the system for a maximum infeed loss caused by a set of defined events that could take place either on the

transmission system or directly to one of the Users connected to it. This modification needs to consider:

- infeed/outfeed losses directly resulting from the events currently defined.in the SQSS
- credible, although less likely, combinations of these events (e.g. two simultaneous losses of generation), and
- consequential, although unintended, generation losses following any of the above events (e.g. embedded generation loss due to unintended operation of loss of mains protection)

It will also need to consider the level of flexibility required to accommodate any new issues (e.g. a new common mode of failure affecting multiple sites) and/or the resolution of a current risk (e.g. the completion of the programme to update loss of mains protection at all embedded generation sites)

Options Under Consideration

In forming this proposal, the ESO considered several options and presented these at industry forums including meetings of the Grid Code (inviting the SQSS Panel attendees) and BSC panels and the Grid Code Development Forum. The objective of this document is to set out a proposal to change the SQSS which Panel members can use to decide on the need for and approach to an SQSS change and hence the options have been distilled down to a single proposal albeit with a number of plausible variations.

One option would have been to simply modify the SQSS to ensure that all necessary criteria and limits are captured clearly. The Proposer's view is that it might not be desirable to use this approach as there are known and significant changes that will occur over the next 5 years which mean that a single set of criteria will either lead to inappropriate cost and risk, a need to make repeated derogations, or the need for further code modifications. The known changes are:

1) Implementation of faster frequency control products for 'post-fault' containment;
2) The implementing of loss of mains protection changes;
3) The continued decrease in system inertia and short circuit levels; and
4) The introduction of stability products.

A single set of criteria also does not acknowledge the wide range of costs and risk likelihoods, and so does not facilitate economic and efficient operation of the National Electricity Transmission System (NETS).

The proposer's recommended option is to implement a framework which is sufficiently flexible to adapt to these and any as yet unknown changes, which has appropriate controls in place, and has a well understood and transparent decision making process. The key components of the proposal are:

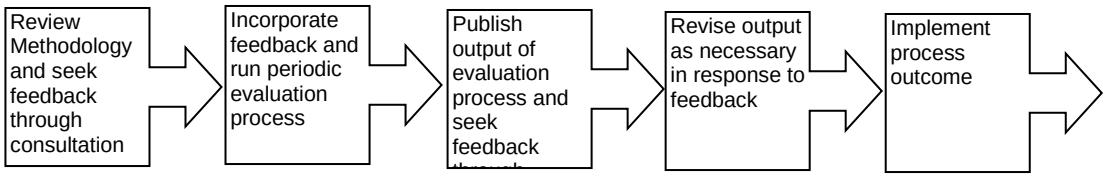
1) The development of a methodology framework, in accordance with an agreed process and which is regularly reviewed and updated by consultation, that:
    a. describes the method and parameters used to determine the circumstances for which unacceptable frequency conditions should not occur; and

b. clearly states what these conditions are;

2) The implementation of a regular process, led by the ESO, which is described in the methodology, and has an output which is appropriately transparent and agreed through a defined process (eg by a specifically convened committee or by a body such as the Authority); and

3) Change to the SQSS provisions to define or supplement the process and address any inconsistencies.

The high level sequence is illustrated below. The means by which consultation feedback is acted upon will need to be defined.



Key features of the framework will need to be defined in some detail and should include:

- A definition of roles and obligations regarding process and information provision
- The requirement to set how the approach will be consulted upon and agreed
- The minimum interval at which the overall process must be completed and the period to be assessed
- The requirement to produce a report detailing the outcome of the evaluation process, referred to as the 'Frequency Risk and Control Report' in this proposal
- A requirement to define the evaluation process including
    - How the evaluation process will be developed including content, timing and how responses are dealt with
    - The output approval process
    - The aspects that must be in scope of the process (eg distributed generation)
    - The method and approach used in evaluation of options
    - How interested parties will be engaged with
    - How approval will be achieved and what body will undertake this (assumed to be the Authority unless otherwise dictated)
    - How the output will be implemented and communicated
    - Other processes or requirements with which the process must maintain consistency (eg the design criteria of the SQSS)
    - The need to recommend any enduring changes to the SQSS that become apparent through ongoing analysis

The Proposer's recommended method and approach is to use a probabilistic treatment. This will allow a balance to be struck between the consideration of risks, the benefit of avoiding these risks materialising, and potential additional costs of doing so. There are

number of ways in which the output can be captured and hence used to define policy which are summarised in the table below.

	Approach	Method	Output
A	A single set of limits and conditions	• Set background and sensitivities • Evaluate cost and value (the avoided impact and likelihood) of securing contingencies in the following steps ○ Assess how often the system is likely to experience imbalances of different sizes ○ Calculate the cost of preventing different size imbalances causing "unacceptable frequency conditions" including the size and duration of the frequency deviation ○ Combine the first two steps together to assess the balance of the two key objectives	Broad categories of contingencies and secure everything that could fall in that category, with no consideration of cost or probability for individual contingencies within each category
B	A specific list of contingencies and conditions		Specify contingencies to be secured and recommended method
C	A single contingency (a reference incident) and conditions.		Specify a reference loss size and minimum inertia to be secured at all times

Option A is most closely linked to the current approach hence should be well understood but leaves some scope for interpretation of how the limits should be applied in practice. Option B has the potential to be very transparent and clear but is potentially complex and burdensome. Option C could be very clear, transparent and simple but needs to be carefully designed to ensure that the reference incident is not excessively onerous.

Further work is required to determine the most appropriate approach which could be taken forward in the development of an initial methodology and process. This will be done in parallel with and as part of the development of the SQSS modification.

6 Impacts & Other Considerations

It is not currently expected that any cross-code requirements will be identified as part of this modification, however this will be kept under review.

The review should take account of the frequency related provisions of the Grid Code and Distribution Code. There is also a requirement to ensure consistency with the frequency management requirements set out in the European System Operation Guideline (Regulation (EU) 2017/1485 (SOGL)). The provisions of SOGL establish a framework for the maintenance of the secure operation of the interconnected transmission system in real time.

As European Law SOGL takes precedent over GB Frameworks, however, in application to GB it was drafted to be consistent with the GB NETS SQSS provisions. Clearly the intention of the modification is to enable the development of the ESO's policy on

reserve, response and inertia holding, to consider what level of risk should be mitigated and therefore what costs should be incurred.

Additional costs would ultimately be passed through to consumers but would be directly paid by the ESO to reserve, response and stability service providers which would come from the payers of BSUoS charges.

As the need for the modification is in part due to the changing generation portfolio and the shift to smaller, embedded and renewable power sources, by maintaining an acceptable level of security of supply the modification will enable the environmental improvements associated with more sustainable generation.

Does this modification impact a Significant Code Review (SCR) or other significant industry change projects, if so, how?

No.

Consumer Impacts

The impact of any power outage is widespread societal disruption. However, consumers will also ultimately pay for any enhancements to reserve and response holding requirements that could lessen the risk of such disruption. This modification needs to find a way to balance cost and risk in an acceptable way.

7 Relevant Objectives

Impact of the modification on the SQSS objectives:

Relevant Objective	Identified impact
(i) facilitate the planning, development and maintenance of an efficient, coordinated and economical system of electricity transmission, and the operation of that system in an efficient, economic and coordinated manner;	Positive
(ii) ensure an appropriate level of security and quality of supply and safe operation of the National Electricity Transmission System;	Positive
(iii) facilitate effective competition in the generation and supply of electricity, and (so far as consistent therewith) facilitating such competition in the distribution of electricity; and	Neutral
(iv) facilitate electricity Transmission Licensees to comply with their obligations under EU law.	Neutral

This modification will drive changes to the response and reserve holding policies of the ESO by making amendments to the SQSS and its application. The requirement is to be

reflective of the changing system and to balance the risks of power outages and the costs to consumers of mitigating these.

In making these changes objective (ii) to enhance security of supply is clearly addressed; as the need to do this is borne out of system and generation portfolio changes and objective (i) to develop the system in an economic and efficient manner is also positively impacted.

8 Implementation

It is proposed that the changes to the SQSS should apply as soon as possible after their approval, subject to any necessary licence changes which may be needed. In the solution proposed, the methodology that will sit alongside the SQSS will be consulted on and approved as part of the modification and will then go through a periodic review process as required, including consultation and approval assumed to be by the Authority.

9 Legal Text

SQSS change

The extent to which the SQSS text will change will be informed by the Workgroup discussions and any assessment/analyses required to support these discussions. In the very first instance, the review will cover

- in section 5 and section 9, the list of secured events under which “unacceptable frequency conditions” are referenced and the extent of that reference
- the definition of “loss of infeed risk”;
- the definition of “unacceptable frequency conditions”
- reference to a new report to set out any requirements related to additional secured events or exemptions

Proposed changes are denoted in redline text. There are a number of ways of implementing the principles contained within this proposal so the drafting below provides an illustration of how this might be done and will be informed by further development.

The drafting includes new paragraphs in section 5, ‘Operation of the Onshore Transmission System. Similar provisions will need to be included in Section 9 ‘Operation of the Offshore Transmission System’. These are not presented here for brevity and as they will on completion be similar.

The intent of the changes is to introduce a controlled process by which variations can be made to the current baseline. Specifically, the new paragraph 5.8 allows for circumstances where additional security can be justified. Paragraph 5.11.2 allows for flexibility in circumstances where the costs of meeting the baseline cannot be justified. These refer to the “Frequency Risk and Control Report” which is where the output of the proposed evaluation process would be captured, including requirements related to additional secured events or exemptions.

A change is also illustrated to the definition of Unacceptable frequency conditions which is intended to simplify current provisions and remove an inconsistency between the normal and infrequent loss risk criteria. It is recognised that consideration will have to be given to any unintended consequences of this change.

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 group*s.

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) T~~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 NGESO 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.

Frequency Risk and Control Report

The methodology framework that will enable this will be developed in parallel with the modification and will follow the principles set out in the paper above. It is envisaged that this will form part of the final submission to Ofgem of the modification as it will allow the impact of the changes to be assessed. It will also follow a parallel path in terms of the engagement and consultation that will be required during its development. In terms of the governance for this, it is assumed that this will be defined within the SQSS. Alternatively, it would also be possible to do this as part of a licence change. This could potentially be achieved at the same time as the licence conditions were changed to reference an updated version of the SQSS.

10 Recommendations

Proposer's Recommendation to Panel

Panel is asked to:

- Refer this proposal to a Workgroup for assessment.
- Note that the Frequency Risk and Control Report and the methodology framework that enables this will be developed in parallel with the modification and engagement in this will also be sought from the workgroup.

Acronym	Meaning
BSUoS	Balancing Services Use of System (referring to charges)
NETS SQSS or SQSS	National Electricity Transmission System Security and Quality of Supply Standard
SOGL	European System Operation Guideline
RoCoF	Rate of Change of Frequency (often referring to a specific type of loss of mains protection)
E3C	Energy Emergencies Executive committee
NETS	National Electricity Transmission System
DER	Distributed Energy Resources
ESO	Electricity System Operator

