

National Grid Electricity Transmission PLC (NGET), Scottish Hydro Electric Transmission Ltd (SHET), Scottish Power Transmission Ltd (SPT), Offshore Transmission Operators, Distribution Network Operators, Generators, SQSS users and other interested parties

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Date: 1 July 2016

Dear Colleagues

## **Modification to the SQSS<sup>1</sup> – Regional variations and wider issues (GSR008-1)**

This letter sets out the Authority's<sup>2</sup> decision regarding proposal GSR008-1 to modify the National Electricity Transmission System Security and Quality of Supply Standard (NETS SQSS or SQSS) version 2.2. GSR008-1 proposes a number of modifications to the SQSS impacting mainly on the design for generation and demand connections (Chapters 2 and 3), the Main Interconnected Transmission System (MITS) design (Chapter 4) and voltage standards (Chapter 6). The Authority's decision is to accept the proposed changes in GSR008-1.

### **Background to the modification proposal**

In 2008, the SQSS Review Group (now called the SQSS Panel<sup>3</sup>) commissioned a number of workgroups to work on a review of the NETS SQSS. On 23 April 2010, draft proposals to modify the SQSS were reported to the broader industry in the Update and Consultation Report.<sup>4</sup> This consultation was referred to as GSR008. The consultation responses were broadly supportive, although a number of concerns and changes were raised. The SQSS Review Group addressed these concerns before submitting a modification report<sup>5</sup> to the Authority on 19 October 2011.

Since then the SQSS Panel has gone through a number of rounds of review which resulted in some revisions to the proposal. These are partly in response to questions from the Authority regarding the clarity of, and rationale and evidence supporting, some of the original proposed changes. They also include revisions to ensure that the proposals remain robust given the changes to the energy landscape.

Following discussion of this proposal at the SQSS Panel in April 2016, final changes have been made to these modification proposals. An updated text modification has been submitted to the Authority. This can be found as GSR008-1 in Annex 1 to this letter and online.<sup>6</sup> We summarise in this letter the key parts of the modification and our decision.

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<sup>1</sup> Version 2.2 dated 5 March 2012 can be found online at: <http://www2.nationalgrid.com/uk/industry-information/electricity-codes/sqss/the-sqss/>

<sup>2</sup> The terms 'the Authority', 'Ofgem' and 'we' are used interchangeably in this document. Ofgem is the Office of the Gas and Electricity Markets.

<sup>3</sup> Information on SQSS panel membership can be found here: <http://www2.nationalgrid.com/uk/industry-information/electricity-codes/sqss/panel-information/>

<sup>4</sup> <http://www2.nationalgrid.com/UK/Industry-information/Electricity-codes/SQSS/Modifications/GSR008/>

<sup>6</sup> <http://www2.nationalgrid.com/UK/Industry-information/Electricity-codes/SQSS/Modifications/GSR008/>

## **Objectives of the SQSS**

The objectives of the SQSS<sup>7</sup> are to:

- (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;
- (ii) ensure an appropriate level of security and quality of supply and safe operation of the National Electricity Transmission System;
- (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
- (iv) facilitate electricity Transmission Licensees to comply with their obligations under EU law.

## **Proposed modification and the Authority's assessment**

### ***Clarification to overlap of criteria***

Section 1.23 in the current SQSS (version 2.2, dated 5 March 2012) states that, in sections of the NETS where more than one set of criteria applies, the requirements of all relevant criteria should be met.

Under normal circumstances Grid Supply Points (GSPs) and their surrounding networks have been designed under Chapter 3 requirements which are more stringent than other parts of the SQSS. With the growth in embedded generation, under certain conditions, more and more GSPs are exporting power to the NETS. The proposed modification would clarify that, for composite GSPs with both embedded generation and demand, where power can be imported from, as well as exported to, the NETS, the more stringent of the Generation connection criteria in Chapter 2 and the Demand connection criteria in Chapter 3 will apply.

The Review Group believes that impacts of this change would be to improve the clarity of what is already required by the current criteria.

We consider that the greater clarity in the rules for the design of composite sites resulting from this modification will facilitate coordination in the planning of the transmission system and facilitate effective competition in the generation and supply of electricity. Therefore it is in line with objectives (i) and (iii) of the SQSS.

### ***Assumed reactive power output from generators***

Chapter 2.8 of the current SQSS requires that, in England and Wales, when assessing system stability, the assumed reactive power output from generators, is set to full leading or lagging, corresponding to an active power output equal to registered capacity. In Scotland, reactive power output from generators is set to replicate conditions which may reasonably be expected.

This modification proposes to remove this regional difference, and to enable system planners to exercise reasonable discretion when setting the reactive power output levels of generators throughout Great Britain and not only in Scotland. During the consultation process, the Renewable Energy Association (REA) proposed to extend this provision to voltage analysis. This has been now been included.

We note the Panel's analysis that the impact to system security and investment will be minimal in practice. We consider that removing this regional difference and allowing system

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<sup>7</sup> SQSS governance framework, pg.6: <http://www2.nationalgrid.com/uk/industry-information/electricity-codes/sqss/panel-information/>

planners to use reasonable discretion when modelling the network will facilitate the planning, development and maintenance of an efficient, coordinated and economical GB-wide electricity transmission system. Aligning the approach for voltage and stability studies based on prevalent system conditions ensures an appropriate level of security and quality of supply and safe operation of the NETS in line with objectives (i) and (ii) of the SQSS.

### ***Inclusion of generator trip as secured event***

Currently the sudden loss ('trip') of a single generator unit needs to be taken into account for frequency change and to meet the maximum or normal infeed loss risk criteria as well as for stability assessments. Additionally, the loss of a single reactive compensator/power provider is one of the current secured events which would imply that generator units, with the appropriately modelled reactive power output, need to be considered.

It is proposed that the sudden loss of a single generator will be included explicitly as a secured event. During the consultation process, the REA suggested a text modification to clarify the treatment of faulted units which can be separately isolated. This text modification has been included.

We consider that the introduction of this modification clarifies the requirements within the SQSS and ensures an appropriate level of security and quality of supply and safe operation of the NETS in line with objective (ii) of the SQSS.

### ***Adjusted N-1-1 requirements***

The current MITS design criteria in chapter 4 of the SQSS requires consideration of a fault on a transmission circuit with the prior outage of another transmission circuit or a generating unit, reactive compensator or other reactive power provider, ie an N-1-1 criterion at peak system demand. Instantaneous faults on parallel double circuits are also considered (ie N-D).

The workgroup carried out a comprehensive review of the probability of an N-1-1 event at peak demand and the possible impacts of such an event. The proposed modification will relax this requirement to only consider the prior outage of another transmission circuit where it contains a transformer or cable section that is wholly or mainly outside a substation to take into account the longer maintenance periods and emergency return to service timescales associated with these types of outages which increases the probability and impact of such a combination of outages. This relaxation also only applies to winter peak demand, when minimum maintenance is expected, decreasing the likelihood of an N-1-1 fault.

We note the analysis undertaken by the workgroup which suggests that applying the current N-1-1 criteria may give rise to a capacity requirement that exceeds economically justifiable levels. Retaining the requirement for N-1-1 where cable and transformer circuits are concerned and the more credible N-D criteria appear to be well evidenced and supported by a strong analysis. Additionally, as part of our yearly transmission price control monitoring process, we will monitor the impact of this change on transmission network companies' investment programme. We therefore consider that these modifications better facilitate the achievement of objectives (i) and (ii) of the SQSS.

### ***Revised voltage standards***

Chapter 6 of the current SQSS highlights the pre-fault, post-fault and step change voltage limits that must be adhered to on the onshore electricity transmission network for both operational and planning purposes.

A number of modifications are being proposed to this section:

- Regional inconsistencies to be removed; differentiation to be by voltage level instead.
- A minimum post-fault voltage limit at -10% has been introduced for 132 kV aligning with the existing operational limits.
- A minimum pre-fault voltage limit has been introduced for 132 kV at -5% so that the operational and minimum post-fault planning limits can be met.
- Infrequent and frequent switching actions have been defined for the step change limit criteria.
- Timescales for post-fault relaxations for 400 kV network to 420 kV have been changed from "15 minutes" to "operational timescales" allowing network planners flexibility to plan efficiently.
- Relaxation to operational limits for Scottish networks following major system faults have been removed for 132 and 275 kV given planning limits are significantly more stringent.
- Operational limits and planning limits have been aligned as much as possible.

In response to our scrutiny of the impact on consumers, the companies confirmed that the investment impact will be minimal. Consultation responses were also supportive of these changes. We consider that the changes allow better alignment between planning and operational criteria, remove regional inconsistencies, clarify some definitions by reflecting existing operational practices, and therefore better facilitate the achievement of objective (i) of the SQSS without compromising objective (ii).

### ***Application of Dynamic ratings***

Currently, the SQSS does not specifically address the use of on-line, real-time circuit ratings technologies. Definitions of unacceptable overloading and pre-fault ratings take into account the use of seasonal ratings which are based on probabilistic assessment of circuit ratings under different loading conditions.

The initial proposals were to explicitly allow the use of dynamic ratings during system planning. During the consultation, a number of responses raised concerns around whether use of dynamic ratings could lead to users exporting or importing power capability being limited at certain times. The Panel has since revised the modification to the definitions of unacceptable overloading and pre-fault ratings to include the consideration of dynamic ratings in operational timescales only. The workgroup's view was that the use of dynamic ratings in planning the system is not practical due to the significant dependencies on prevalent conditions such as previous loading etc, but that constraint savings could be generated by the use of dynamic ratings in operational timescales where possible.

Noting the above, we consider that this approach aligns with objective (ii) of the SQSS.

### ***Housekeeping changes***

There are also a number of presentational and housekeeping changes that are proposed:

- The existing table 3.1 will include demand group classes to align with Engineering Recommendation (ER) P2/6.
- Paragraph 1.10 will be changed to clarify the definition of Grid Entry Point.
- A typo in the definition of small power station on SPT network on page 67 of SQSS version 2.2 (5<sup>th</sup> March 2012) will be rectified changing the registered capacity from 50 MW to 30 MW consistent with the Grid Code and intended SQSS definition.

We consider that these changes have a positive impact on facilitating the achievement of objective (i) of the SQSS.

## **Previously proposed modifications which have been removed following consultation**

Through the work carried out by the Panel and Ofgem, a number of proposed amendments which were consulted on as GSR008 have been removed. The materiality of these changes is considered as low and the result is that current sections of the SQSS will be retained. This section presents the rationale for these changes.

### ***Requirements to consider circuit breaker faults***

Currently, the SQSS requires consideration of the fault outage of any single busbar coupler or busbar section or mesh circuit breaker under Chapters 2.6, 7.8.3 and 7.13.3.

Although rare, circuit breaker faults could potentially cause significant voltage rise leading to insulation damage across multiple circuits and long outages of circuits and busbars. The initial proposals included the following text modification to Chapters 2.11, 3.11 and 4.11: "Under intact system or planned outage conditions with background conditions as described in paragraph 2.8, a fault on any circuit breaker shall not cause unacceptably high voltage".

Section 0.3 of workgroup 4's<sup>8</sup> report suggested that further economic assessment should be carried out to understand the implications of including major system faults such as bus section, bus coupler and mesh circuit breaker faults, and that circuit breaker faults could be considered as part of this assessment.

Following a further review, the Panel recognised the requirement for a more comprehensive assessment of the impact of the proposed changes. This should include quantification of the potentially significant impact on investment and the practicality for system planners to consider every single circuit breaker fault. The Panel therefore have recommended that this requirement should be removed from this modification and picked up within a wider review of the technical and economic assessment of major system faults as part of GSR017.

### ***Contribution of embedded generation to demand security***

The assumed contribution of embedded generation impacts on the power importing requirements of GSPs and hence the design of demand connection points. Currently, tables 3.2 and 3.3 of the SQSS specify the effective contribution of embedded large power stations to demand group importing capacity that should be taken into account on NGET's, and SHETL's and SPT's networks respectively. The contribution factors for NGET's network are not technology specific whereas SHETL's and SPT's requirements are, but do not consider renewable generation.

Initial proposals included revising tables 3.2 and 3.3 in the SQSS to provide greater granularity to the maximum effective contribution of different types of embedded generation to demand group importing capacity, aligning with ER) P2/6. This would also take into account renewable generation technologies. Sections 6.4, 6.6 and 7.4 of workgroup 2's report<sup>9</sup> suggested that, once additional experience with intermittent embedded generation has been gained, a joint review of the SQSS and ER P2/6 should be carried out.

During the consultation, one respondent agreed that more work is required to update these assumptions. They also expressed concern that the implications for grid users are not entirely clear. Another respondent indicated that they would be reluctant to change ER P2/6 until further operating experience with the availability and reliability of wind generation is obtained.

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<sup>8,9</sup> <http://www2.nationalgrid.com/UK/Industry-information/Electricity-codes/SQSS/Modifications/GSR008/>

Since 2011, the assumptions around the uptake of embedded renewable generation and the actual contribution from different technologies have significantly changed. This could undermine the assumptions that have resulted in the recommended changes. A review of ER P2/6 is underway which could change the ER P2/6 recommendations for contribution of embedded generation. Additionally, a proposed SQSS modification (GSR016) is currently considering the treatment of embedded generation for the design of the MITS under Chapter 4. These reviews will reconsider some of the same data and assumptions underlying the proposed modifications under GSR008.

Given the issues highlighted above, we are concerned that these changes could drive inefficiencies in the design of the network and hinder effective competition in the generation of electricity specifically renewable technologies, thus falling short of objectives (i) and (ii) of the SQSS. The Panel has reviewed this section and have recommended that these changes are removed. The Panel will update the underlying assumptions behind the cost benefit analysis carried out by workgroup 2 following updated information gathered through the GSR016 modification process and through the current ER P2/6 review.

### ***Double Circuit overhead line Faults in the SPT Area***

Chapter 2 sub criterion 2.10.3, in the current SQSS specifies that a double circuit overhead line is only considered as a contingency "where any part of either circuit is in the England and Wales area or the SHETL area". This regional difference was included at the time of drafting the SQSS to reflect specific regional issues on the 132 kV SPT network which were best managed using established operational actions rather than investment decisions. This regional variation is also included in Chapter 4 of the SQSS.

The initial workgroup report suggested that this particular regional difference is removed from Chapter 2 of the SQSS but retained in Chapter 4 (MITS design criteria) of the SQSS. Given the overlap of criteria described in Chapter 1 of the SQSS, we do not consider that the treatment of fault outages within Chapters 2 and 4 of the SQSS should be different. SPT have also highlighted that the removal of this regional variation will lead to non-compliance on their network. The Panel have reviewed this issue and have recommended that the current wording of the SQSS (version 2.2) with regards to Chapter 2 sub-paragraph 2.10.3 is retained.

### **Assessment of the proposed modification against objectives of the SQSS**

We have highlighted our assessment against objectives (i), (ii) and (iii) of the SQSS in the above sections. Additionally, it is our assessment that the proposals would have a neutral impact on objective (iv).

### **Assessment against the Authority's statutory objectives and duties<sup>10</sup>**

For the reasons outlined in the sections above, the Authority considers that the proposals set out in GSR008-1 would better facilitate the Authority's principal objective and statutory duties.

### **Decision notice**

This letter sets out the Authority's decision to approve the proposed changes to the NETS SQSS. We have concluded that:

- implementation of the modification proposal will better facilitate the achievement of the objectives of the SQSS and
- approving the modification is consistent with our principal objective and statutory duties.

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<sup>10</sup> The Authority's statutory are detailed mainly in the Electricity Act 1989 as amended.

## Implementation and future work

These changes will take effect three months after an Authority decision. In order for these changes to take effect, the transmission licences would need to be modified such that they refer to the new version 2.4 of the NETS SQSS which will also consist of text changes reflecting the Authority's decision on GSR015<sup>11</sup> and GSR011-1.<sup>12</sup> The Authority will start the licence modification process by issuing a statutory consultation in the coming weeks. Notice of the proposed modifications to the transmission licence will also go out to preferred bidders for offshore transmission licences, as these bidders are persons likely to be affected by the making of the modifications.

Any queries regarding the content of this letter should be made to Katherine Taaffe (Katherine.Taaffe@ofgem.gov.uk, 0207 901 7014) in the first instance.



**Min Zhu**

**Associate Partner, Electricity Transmission**

Signed on behalf of the Authority and authorised for that purpose

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<sup>11</sup> <http://www2.nationalgrid.com/UK/Industry-information/Electricity-codes/SQSS/Modifications/GSR015/>

<sup>12</sup> <http://www2.nationalgrid.com/UK/Industry-information/Electricity-codes/SQSS/Modifications/GSR011/>

## **Annex 1**

This is the link to the National Grid NETS SQSS website that contains NETS SQSS V2 2 - GSR008-1 ('Final Modification Report' tab, uploaded on 26 April 2016) and sets out the legal text proposed by the licensees to implement this modification. The proposed new text is shown in red and is based on SQSS version 2.2 (5 March 2012).

<http://www2.nationalgrid.com/UK/Industry-information/Electricity-codes/SQSS/Modifications/GSR008/>