

## Stage 03: Modification Report

National Electricity Transmission System Security  
and Quality of Supply Standards (NETS SQSS)

# GSR011: Review of Offshore Networks

What stage is this  
document at?

01 Work-Group  
Report

02 Industry  
Consultation

03 Modification  
Report

This Modification Report seeks to make modifications to the NETS SQSS following a review of the criteria pertaining to offshore generation connections and the larger generation developments envisaged during Round 3. The review concluded on issues including the appropriate capacity of connections, the treatment of wind generation in wider infrastructure analysis, the circuit loss criteria that should be secured, and the use of HVDC cables of greater capacity than infeed loss limits.

The purpose of this document is to assist the Authority in its decision of whether to implement the proposed modification to the NETS SQSS.

**Published on:** 31st July 2014



***The SQSS Review Panel recommends:***

That GSR011 should be implemented as it better facilitates applicable NETS SQSS objectives.



***High Impact:***

None.



***Medium Impact:***

Large Generators (Offshore Windfarms), Offshore Transmission Owners, System Operator.



***Low Impact:***

Onshore Transmission Owners.

GSR011 Modification  
Report

31<sup>st</sup> July 2014

Version 2.0

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## About this Document

This Modification Report contains the information that the NETS SQSS Review Panel believes is required for the Authority to progress a change to the National Electricity Transmission System Security and Quality of Supply Standards (NETS SQSS).

## Document Control

Version	Date	Author	Change Reference
1.0	18 July 2014	National Grid	First Draft for comment
2.0	31 July 2014	National Grid	Second Draft for NETS SQSS Review Panel



### Any Questions?

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# 1 Summary & Proposed Change

## Background

- 1.1 The NETS SQSS was initially developed for application to the onshore system. In response to the first proposals to develop offshore generation, additional criteria relating to the connection of offshore generation and demand to the Main Interconnected Transmission System (MITS) were introduced to the standard in June 2009. At the time that the standard was reviewed, offshore generation development was limited to relatively small wind farms in close proximity to the shore. Consequently the scope of the review, and the resulting criteria, were based on generation capacities of less than 1500MW, with radial connections to shore of less than 100km. Although the review focused on radial connections to the MITS, amendments were introduced relating to the design and operation of an offshore network in parallel with the onshore system. The standard states that the criteria that were introduced should apply until further review.
- 1.2 Subsequent reviews of the maximum infeed loss criteria relating to the whole GB system (GSR007/7a) resulted in changes to offshore criteria such that generation with a capacity up to 1800MW can be radially connected via a single cable.
- 1.3 In June 2008, The Crown Estate made available further significant tranches of seabed around GB for the development of renewable generation. These tranches are referred to as Round 3 sites. The Round 3 sites are much further from shore (some sites go out to 300km) than those previously considered and have far greater potential generation capacities (up to several GW). The economic connection of generation in these zones is likely to involve the use of HVDC circuits and may require the use of higher capacity cables than those currently used. The use of interconnection within a Round 3 site and between sites is also feasible.
- 1.4 The existing NETS SQSS criteria pertaining to offshore generation connections were not developed for the generation connections envisaged for the Round 3 developments. Whilst they specify some requirements for offshore networks in providing transmission capability, those were intended to be subject to future review and they do not address all of the issues that arise, such as the use of HVDC cables with a rating above 1800MW. Consequently, the NETS SQSS Review Group (now the NETS SQSS Review Panel) instigated a review of the offshore criteria, to ensure that they continue to facilitate the development of an overall economic, efficient, and secure system.
- 1.5 The Working-Group that reviewed the NETS SQSS offshore criteria completed its report in July 2012. An industry consultation was started on 6<sup>th</sup> August 2012 with a closing date of 1<sup>st</sup> October 2012. No responses were received through the consultation. Subsequent discussion with the Authority did lead to further consideration of some areas of the Working-Group report.

## Way Forward

- 1.6 In line with the recommendations of the Working-Group, the NETS SQSS Review Panel believes that:
  - In designing the transmission system, the following should be considered as secured events: an N-1 outage of an offshore circuit; an N-1-1 outage involving an offshore circuit on prior outage followed by either an offshore circuit or an onshore circuit fault outage, and an N-1-1 condition with an onshore circuit containing a cable section on prior outage, followed by an offshore circuit fault outage.

- In designing local connections, it is appropriate to provide a connection capacity of 100% Transmission Entry Capacity (TEC).
  - For infrastructure capacity (MITS) analysis, it is appropriate to consider offshore wind at 70% output, as per the criteria of the current standard.
  - Short duration losses of a DC link carrying more than the Infrequent Infeed Loss can be tolerated where parallel routes can increase their flows.
- 1.7 The rationale for these conclusions is given in the attached Working-Group report. A summary of the conclusions is given in Section 5 of the Working-Group report.
- 1.8 The NETS SQSS Review Panel therefore recommends that the NETS SQSS is modified. As the conclusions are broadly in line with the existing NETS SQSS, the proposed NETS SQSS text changes in Annex 1 are not extensive.

## 2 Consultation

2.1 The GSR011 consultation was published on 6<sup>th</sup> August 2012. Responses were invited upon the proposals outlined in the consultation with a closing date of 1<sup>st</sup> October 2012.

2.2 Responses were invited to the following questions:

- (i) Do you agree that the proposed modification meets the principles and/or objectives of the NETS SQSS?
- (ii) Local Generation Capacity: Do you agree with the conclusion that the current requirement to plan the connection according to the offshore windfarm's full capacity (TEC), as a minimum, is appropriate for the connection of the larger, more distant, Round 3 wind farms?
- (iii) Infrastructure Planning: Do you agree with the proposal that offshore wind generation should be treated in the same equitable way as onshore wind generation in infrastructure capacity planning (i.e. currently scaled to 70% as per GSR009, which is now implemented)?
- (iv) Circuit Outages: Do you agree with the Working-Group proposals that, in planning the system, the following events should be secured:
  - The single loss of an offshore cable;
  - The loss of an offshore cable with a prior outage of either an onshore or offshore cable circuit;
  - The loss of an onshore circuit with a prior outage of an offshore circuit;

In addition, do you agree that the simultaneous loss of two offshore cables should not be secured?

- (v) Cable Capacity: Do you agree that offshore cables with a rating in excess of the infeed loss limit can be used offshore, provided that alternate connections are available that ensure there is no requirement to hold additional response and that there are no violations of any other NETS SQSS criteria?
- (vi) Other Codes: Are there any impacts on other industry documents that arise from the proposals of the Working-Group?

2.3 No responses were received during the consultation.

2.4 Subsequent discussion with the Authority led to further consideration of some areas of the Working-Group report including single circuit fault rates and the relative levels of these through the year. It is not believed that this further assessment impacts the conclusions.

## 3 Impact & Assessment

### NETS SQSS Review Panel Assessment

- 3.1 The NETS SQSS Review Panel's assessment is that the proposed changes are implemented because they improve the NETS SQSS for the design and operation of larger Round 3 offshore generation developments.
- 3.2 NETS SQSS Review Panel members agreed that the proposed changes should be submitted to the Authority in the form of this Modification Report to the Authority on **[6th August 2014]**.

### Impact on the NETS SQSS

- 3.3 GSR011 requires amendments to the following parts of the NETS SQSS:
- Section 7: Generation Connection Criteria Applicable to an Offshore Transmission System
  - Section 11: Terms and Definitions

The text required to give effect to the proposal is contained in Annex 1 of this Modification Report.

- 3.4 Regarding the treatment of wind generation in MITS analysis, the recommendation is to maintain the current requirements (wind generation scaled to 70% in MITS analysis), and so no amendments are required.
- 3.5 Regarding the consideration of offshore contingencies, the recommendations are that the following should be considered as secured events:
- Loss of a single offshore transmission circuit;
  - Loss of a single offshore circuit with a different circuit on prior outage;
  - Loss of a single onshore circuit with an offshore circuit on prior outage.
- 3.6 These are consistent with the current version of the standard. GSR008 proposes to limit consideration of circuits on prior outage to those containing cable sections. As all offshore connections will use cables, there will be no impact from the GSR008 proposals, and so no changes are required to the NETS SQSS, irrespective of whether GSR008 is approved or not.

### Impact on National Electricity Transmission System (NETS)

- 3.7 The proposed changes will provide more efficient connection designs for larger windfarms.

### Impact on NETS SQSS Users

- 3.8 The proposed modification will assist the developers of offshore generation projects.

### Impact on Greenhouse Gas Emissions

- 3.9 The proposed modification will have no significant impact on Greenhouse Gas emissions.

## Assessment Against NETS SQSS Objectives

3.10 The NETS SQSS Review Panel considers that the proposed changes would better facilitate the NETS SQSS objectives:

- (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;

*By extending the scope of the criteria in Chapter 7 to account for larger, more distant offshore connections, the changes will ensure that there is clarity on the standards that are applicable to the design of these connections. The proposals facilitate the use of circuits used in offshore connections as wider system reinforcement, giving additional options for the economic development of the transmission system. In modifying the definition of "Loss of Power Infeed" to explicitly refer to the possible re-distribution of power following the loss of connection circuits, the proposals will facilitate the use of larger, more economic cables.*

- (ii) ensure an appropriate level of security and quality of supply and safe operation of the National Electricity Transmission System;

*The proposals have considered historic fault statistics and are based on ensuring that current levels of security and reliability are maintained. Whilst the modifications raise the option of using controlled re-distribution of power following a fault to manage the loss of infeed, they also specify that wider impacts, such as the rate of change of frequency, are taken account of.*

- (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

*The proposal has a neutral impact on this objective.*

- (iv) facilitate electricity Transmission Licensees to comply with their obligations under EU law.

*The proposal has a neutral impact on this objective.*

## Impact on Core Industry Documents

3.11 The proposed modification does not impact on any core industry documents.

## Impact on Other Industry Documents

3.12 The proposed modification does not impact on any other industry documents.

## Implementation

3.13 The NETS SQSS Review Panel proposes that GSR011 should be implemented 10 business days after an Authority decision.

This section contains the proposed legal text to give effect to the proposals. The proposed new text is in red and is based on NETS SQSS v2.2.

### **Section 7 - Generation Connection Criteria Applicable to an Offshore Transmission System**

7.1 This section presents the planning criteria applicable to the connection of one or more offshore power stations to an offshore transmission system. The criteria in this section apply from the offshore grid entry point/s (GEP) at which each offshore power station connects to an offshore transmission system, through the remainder of the offshore transmission system to the point of connection at the first onshore substation, which is the interface point (IP) in the case of a direct connection to the onshore transmission system or the user system interface point (USIP) in the case of a connection to an onshore user system.

~~7.2 The generation connection criteria, applicable to an offshore transmission system, presented in this section, are based on a series of cost benefit analyses. The scope of those analyses was bounded by certain pragmatic assumptions, which recognised the technology available at the time the analyses were carried out. Accordingly, the generation connection criteria presented in this section should only be applied up to those limits. The criteria have been updated since the initial analysis to account for developments in cable and HVDC technology. The limits are:~~

~~7.2.1 the capacity for offshore power park modules was limited to a maximum of 1500MW. Following review of the values of normal infeed loss risk and infrequent infeed loss risk, this capacity limit will equal the infrequent infeed loss risk from April 1<sup>st</sup> 2014.~~

~~7.2.2 the type of intermittent power source powering the offshore power park module was limited to wind.~~

~~7.2.3 the capacity of offshore gas turbines was limited to a maximum of 200MW per platform;~~

~~7.2.4 the distance from an offshore grid entry point on an offshore platform to the interface point or user system interface point (as the case may be) at the first onshore substation was limited to a maximum of 100km;~~

~~7.2.5 the length of any overhead line section of an offshore transmission system was limited to a maximum of 50km; and~~

~~7.2.6 Radial offshore network configurations only have been considered. Until reviewed, section 4 shall apply in respect of interconnected offshore networks.~~

~~The above limits will be subject to periodic review in the light of technological developments and experience. The limits should not be exceeded without justification provided by further review.~~

~~7.37.2~~ Planning criteria are defined for all elements of an *offshore transmission system* including: the *offshore transmission circuits* and equipment on the *offshore platform* (whether AC or DC); the *offshore transmission circuits* from the *offshore platform* to the *interface point* or *user system interface point* (as the case may be) including undersea cables and any overhead lines (whether AC or DC); and any onshore AC voltage transformation facilities or *DC converter* facilities.



The remaining clauses of Chapter 7 will need renumbering.

## **Section 11 - Terms and Definitions**

### **Loss of cables carrying more than the infrequent infeed loss limit**

The current NETS SQSS requirements for the loss of infeed from offshore generation specify that the loss is calculated at the point of connection to the onshore system (definition of Loss of Power Infeed). There is no specification of the timing of this disconnection in the definition or in any of the criteria relating to the loss of infeed. The proposal of this review allows for the automatic re-distribution of power infeeds through HVDC links to the onshore system following the loss of an offshore connection cable. In principle this may be covered by the current definition. However, the Working-Group proposes to clarify the definition such that it refers to this redistribution, as follows:

Loss of Power Infeed	The output of a <i>generating unit</i> or a group of <i>generating units</i> or the import from <i>external systems</i> disconnected from the system by a <i>secured event</i> , less the demand disconnected from the system by the same <i>secured event</i> . For the avoidance of doubt if, following such a <i>secured event</i> , demand associated with the normal operation of the affected <i>generating unit</i> or <i>generating units</i> 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 <i>loss of power infeed</i> to the system. For the purpose of the operational criteria, the <i>loss of power infeed</i> , includes the output of a single <i>generating unit</i> , CCGT Module, boiler, nuclear reactor or DC Link bi-pole lost as a result of an event. In the case of an <i>offshore generating unit</i> or group of <i>offshore generating units</i> , the <i>loss of power infeed</i> is measured at the <i>interface point</i> , or <i>user system interface point</i> , as appropriate.
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***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 HVDC links, 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 should be taken into account.***