

Regulation of Offshore Electricity Transmission Grid Code Connection Conditions Assumptions Document

Summary

This paper provides an outline of the assumptions to be considered in the development of the Grid Code Connection Conditions for Generators connected to an Offshore Electricity Transmission network. It is critical that these assumptions are accepted by OTEG and the Offshore Grid Code Working Group before further work is completed in developing the Grid Code requirements.

This document builds on the previous work completed by the Offshore GBSQSS subgroup which is described in references [1] to [3]. As the work and recommendations of the offshore GBSQSS are important to considering the changes required to the Grid Code, a brief summary of the subgroup's recommendations and assumptions have been included in [4]. In addition, it is also suggested that the reader consults [3] which details those sections of the Grid Code Connection Conditions that it is likely will require modification in order to accommodate the provisions for Offshore Electricity Transmission.

As a Transmission Owner (irrespective of whether they are located onshore or offshore) is not defined as a User under the terms of the Grid Code (GC.13), the Connection Requirements which apply at the offshore / onshore Grid Entry Point will need to be placed within the STC or a new similar document. Whilst this paper is mainly concerned with the Grid Code Connection Conditions, it will advise on those onshore / offshore requirements which need to be considered for implementation within the STC or equivalent.

Background

Figure 1 below indicates the general connection arrangements for an offshore Generator. This will be connected to the offshore TO which in turn will be connected to the onshore TO or DNO. Issues associated with the connection of an offshore TO to an onshore DNO are outside the terms of reference of the Grid Code Working Group.

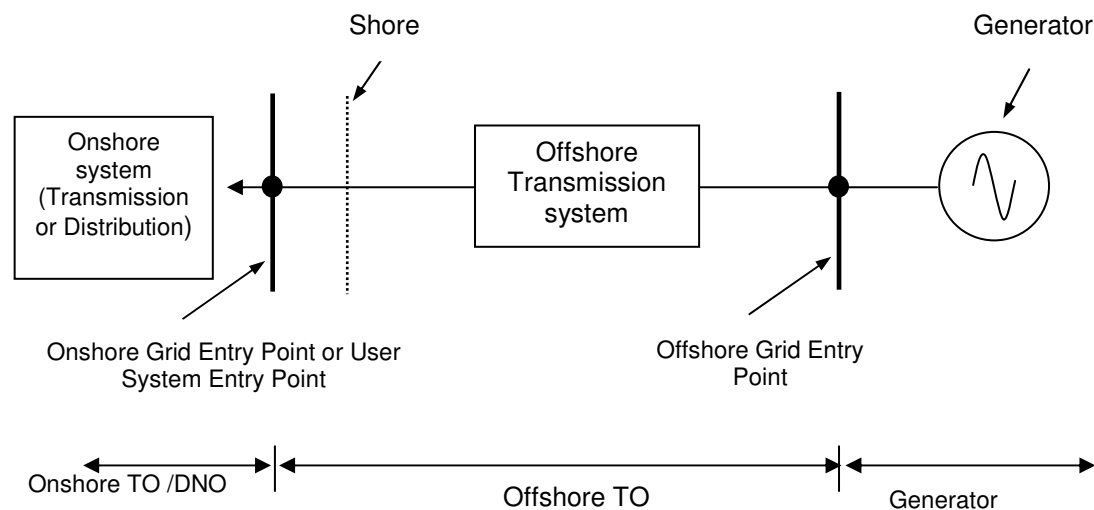


Figure 1: Designation of offshore transmission system

The offshore Transmission Owners Network may be either an HVAC or HVDC Network at voltages of 132kV or above. The offshore TO may connect to either an onshore TO or onshore Distribution Network. Connection requirements which apply to the offshore

Generator will be specified in the Grid Code and the requirements which apply at the onshore/offshore Grid Entry Point will be specified in the appropriate document (to be determined).

Assumptions

In developing the requirements of the Connection Conditions the following assumptions have therefore been made.

- i) The Offshore Transmission Network Owner will be Licensed and be a signatory to the STC. Offshore Generators will be required to sign the Connection and Use of System Code (CUSC) and comply with the requirements of the Grid Code.
- ii) The Offshore Transmission Network will be operated by NGET in its role as the GBSO.
- iii) The Offshore Transmission Network could either be HVDC or HVAC.
- iv) In accordance with the objectives defined in the Terms of Reference, the Grid Code requirements that apply onshore will be extended offshore unless there is a good reason not to do so. For the avoidance of doubt, the Grid Code technical and operational requirements which apply onshore will not be changed as part of this review, although account will be taken of interim changes which have been initiated separately via the Grid Code Review Panel (such as G/06 consultation [5]).
- v) Requirements on offshore Generators will be specified in the Grid Code at the Offshore Grid Entry Point, and any requirements on the offshore TO at either the onshore Grid Entry Point or Offshore Grid Entry Point will be identified for inclusion within the STC or equivalent.
- vi) The offshore TO could connect to either an onshore TO or onshore DNO. This latter arrangement will be considered under a separate work stream on Embedded Transmission.

Some Technology Issues

As a starting point it is assumed that the same Grid Code requirements that currently apply at the Grid Entry Point still apply, although this may change as the Grid Code work progresses. However the individual requirements placed on the offshore TO and offshore Generator, when combined, should largely equate to the existing Grid Code requirements.

For AC Offshore Networks, this process is expected to be achievable. The requirements will depend on the location of the offshore Grid Entry Point, which is currently being considered through the offshore GBSQSS consultation.

Whilst it is believed that the Grid Code issues for AC offshore transmission networks can be managed within the current framework, this becomes far more problematic for an HVDC solution. At the present time, there are Grid Code requirements related to HVDC converters at the onshore / offshore Grid Entry Point. There are no provisions for Generators connected to the remote end of an HVDC system. The HVDC scheme will act as a form of isolation between the off shore generators and the onshore transmission system and so some of the requirements of these generators may be very different to those of generators connecting to an AC system.

To take this to its conclusion, it is therefore suggested that in the case of an HVDC converter there are two options:-

- 1) All connection requirements are applied at the onshore Grid Entry Point and the offshore TO will put in place whatever provisions are necessary with the offshore wind farm to meet the specified requirements.

- 2) Whilst most of the requirements are applied at the onshore Grid Entry Point, some may be applied at the offshore Grid Entry Point (ie on the Generator eg frequency response). The Generator and offshore TO will put in place provisions to facilitate the delivery of this requirement.

Commercial Issues

In addition to the technical issues, there is also a requirement to consider the commercial framework. As outlined above, the technical requirements placed on the offshore Generator will be placed in the Grid Code and it is to be determined if those applicable to the offshore TO will be placed in the STC or some form of equivalent document.

Conclusions

It is suggested that the working group discusses and considers the issues raised above with a view to developing and updating the Connection Conditions in the Grid Code.

- 1) For offshore AC networks, the connection requirements applying to offshore Generators will be specified in the Grid Code.
- 2) For offshore AC networks, the requirements placed on the offshore TO will be specified for inclusion in the STC or equivalent and be consistent with the current Grid Code requirements, unless there is good reason not to do so.
- 3) For offshore HVDC TO's, the existing requirements which generally apply at the onshore Grid Entry point may be applied. Alternatively some requirements may be placed on the offshore generators.
- 4) For offshore Generators connected behind an HVDC TO, any technical requirements will be included in the Grid Code. There would however need to be some mechanism to allow an offshore Generator connected behind an HVDC link to deliver its requirement through the TO network.

It is important that these assumptions are recognised by OTEG and approved by the Offshore Grid Code Working Group before further work is completed in developing the requirements.

References

- [1] Offshore Transmission Expert Group – Great Britain Security and Quality of Supply sub-group – Recommendations for the coverage of offshore transmission networks in the Great Britain Security and Quality of Supply Standard.
- [2] Terms of reference for the GB Grid Code sub group of OTEG
- [3] Initial Thoughts to the Grid Code Connection Conditions in respect of Offshore Electricity Transmission. – Dated 17 January 2007
- [4] Summary of Recommendations and Assumptions made by the GBSQSS Subgroup.
- [5] G/06 Consultation Document - Power Park Modules and Synchronous Generating Units (Closed 18/1/07, report to Authority being prepared by National Grid)