GBSQSS recommendations for offshore transmission networks

GBSQSS Sub Group

OTEG 29 September 2006

Contents

- Background
- Methodology
- Scope of offshore transmission
- Cost benefit analysis
- Offshore transmission voltage requirements
- Recommendations
- Further work

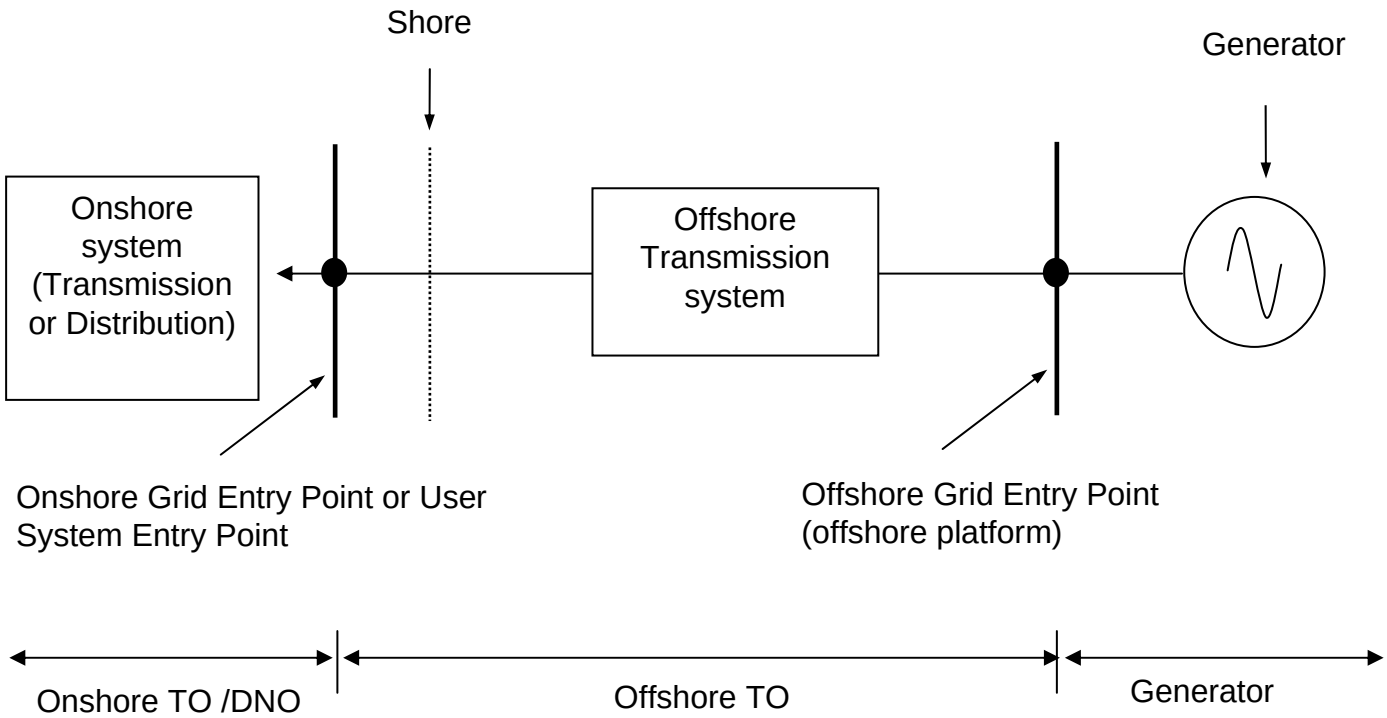
Background

- Ofgem scoping document published in April 2006
- OTEG established
- GBSQSS sub-group of OTEG set up to review existing GBSQSS and test relevance to offshore transmission networks
- This presentation sets our GBSQSS sub-group assessment of the GBSQSS and its recommendations
- X meetings (man hours)
- X thousand studies

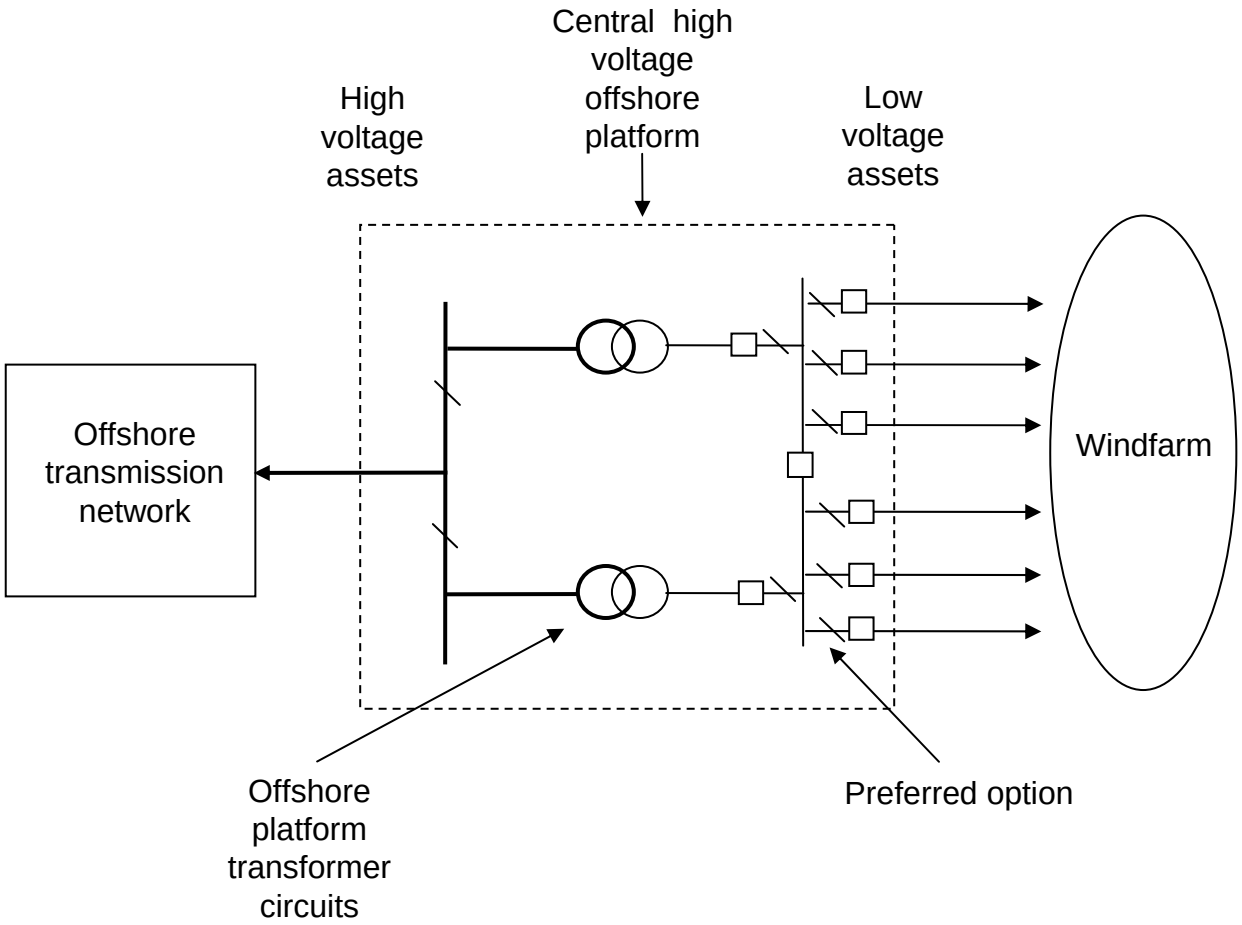
Methodology

- Consider GBSQSS and identify areas that require review
- Cost benefit analysis - in line with existing GBSQSS and ER P2/6
- Formulation of working assumptions
- Consideration of assets likely to have an impact on outcome of cost benefit analysis
- Creation of network models for assessment
- Population of network models with real data
- Carry out analysis and present back to sub-group at each meeting
- Test key input variables for the value at which the conclusion changes

Scope of offshore transmission



Scope of offshore transmission



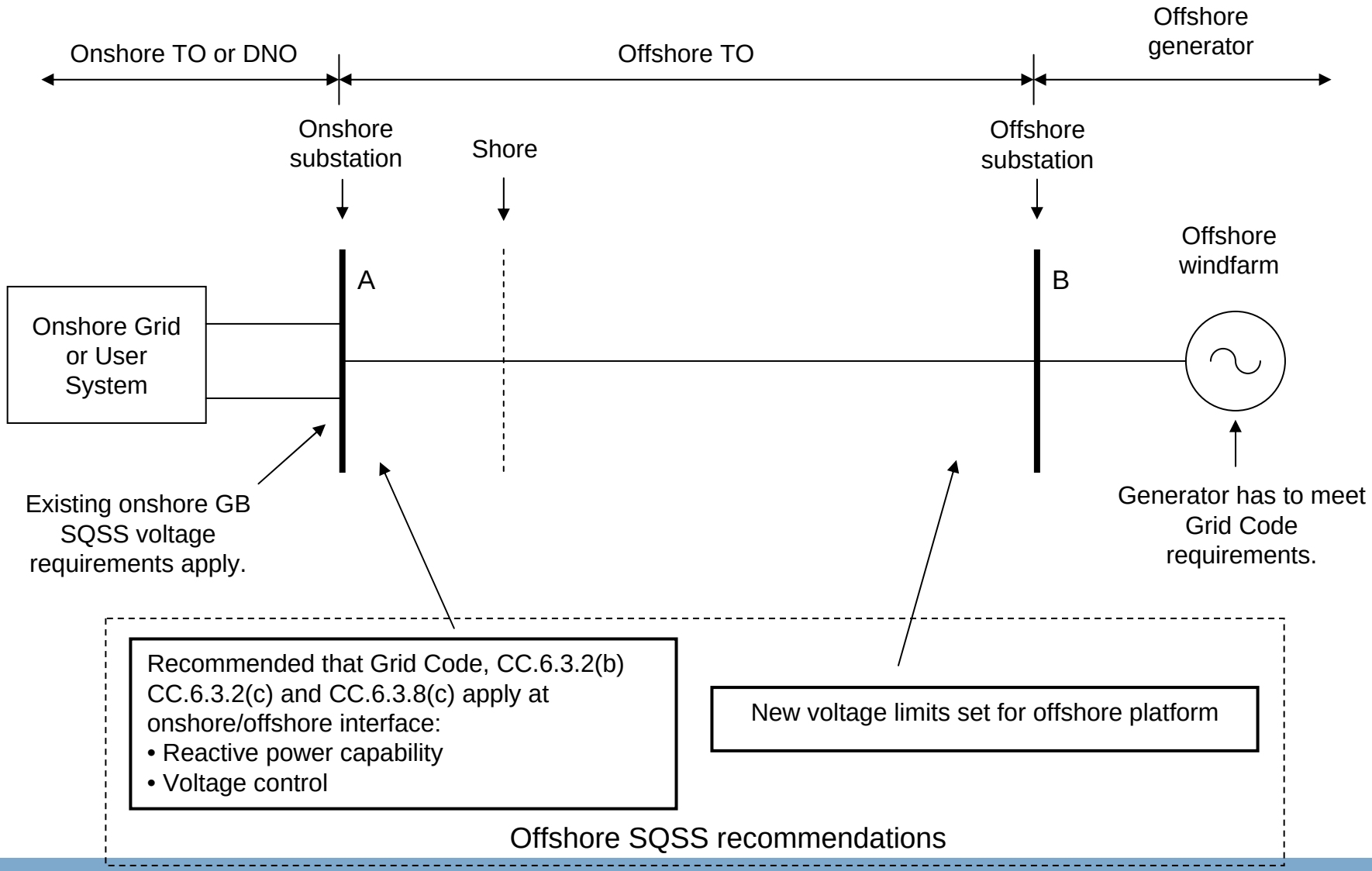
Cost benefit analysis

- Network models
  - Single / shared AC connections
  - Single / shared DC connections
- Windfarms considered
  - Up to 1500MW
  - Up to 100km from shoreline
- Sensitivity assessment of input parameters to test robustness of recommendation

Offshore transmission voltage requirements

- Assessment of existing arrangements
  - At onshore connection point of offshore transmission network to onshore electricity network
  - At offshore connection point of generator to offshore transmission network
- Outline possible options
  - Consideration of voltage limits at connection of offshore network to onshore network
  - Consideration of voltage limits at offshore platform
- Comparison of options and provide recommendations

Offshore transmission voltage requirements



Recommendation – Offshore platform

- For a single wind farm connection
  - Platform capacity should be planned to accept the full output of the windfarm with no equipment loadings exceeding their pre-fault rating.
  - For AC connections; for wind farms with an export capacity of 120MW or greater, following the outage (planned or unplanned) of a single offshore transmission transformer circuit, the reduction in transformer circuit capacity should not exceed 50% of the export capacity of the windfarm connected.
  - For DC connections; for outages (planned or unplanned) of a single offshore platform DC converter module, the loss of power infeed shall not exceed 1000MW.

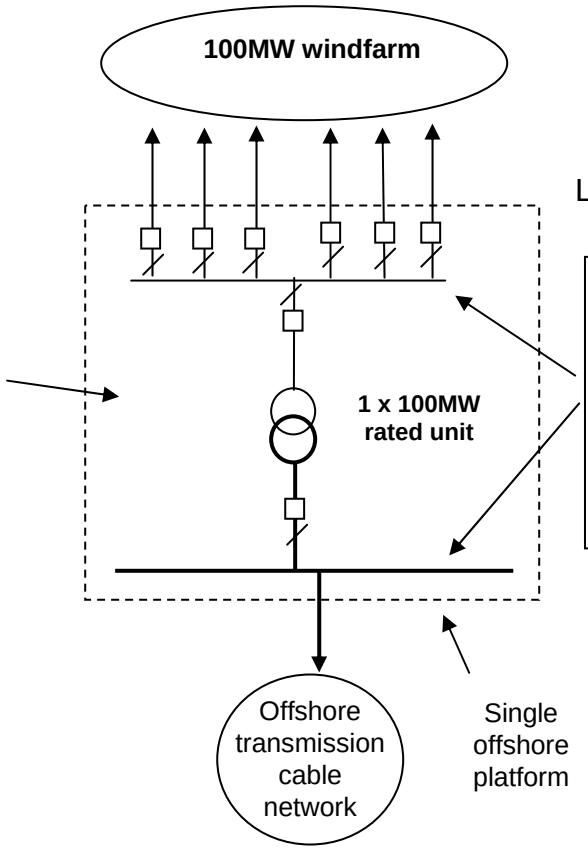
Recommendation – Offshore platform

- For a multiple windfarm connections
  - Transformer capacity should be planned to accept 90% of the cumulative installed capacity of the windfarms connected, with no equipment loadings exceeding their pre-fault rating.
  - For AC connections; for wind farms with an export capacity of 120MW or greater, following the outage (planned or unplanned) of a single offshore transmission transformer circuit, the reduction in transformer circuit capacity should not exceed 50% of installed transformer capacity .
  - For DC connections; for outages (planned or unplanned) of a single offshore platform DC converter module, the loss of power infeed shall not exceed 1000MW.

Recommendation – AC platform

Single windfarm connection

For wind farms with an export capacity of 120MW or greater, following the outage (planned or unplanned) of a single offshore transmission transformer circuit, the reduction in transformer circuit capacity should not exceed 50% of the export capacity of the windfarm connected.



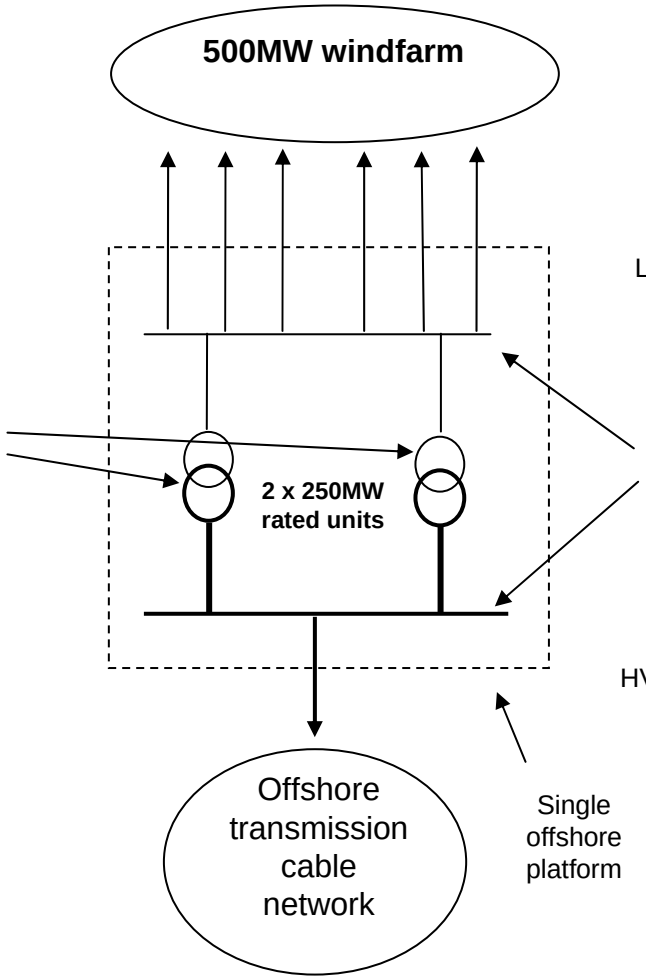
Platform should be designed such that the High Voltage and Low Voltage terminals of the platform transformer circuits are interconnected to allow for full flexibility of use of all assets housed upon it.

Substation configurations for illustration only

Recommendation – AC platform

Single windfarm connection

For wind farms with an export capacity of 120MW or greater, following the outage (planned or unplanned) of a single offshore transmission transformer circuit, the reduction in transformer circuit capacity should not exceed 50% of the export capacity of the windfarm connected.



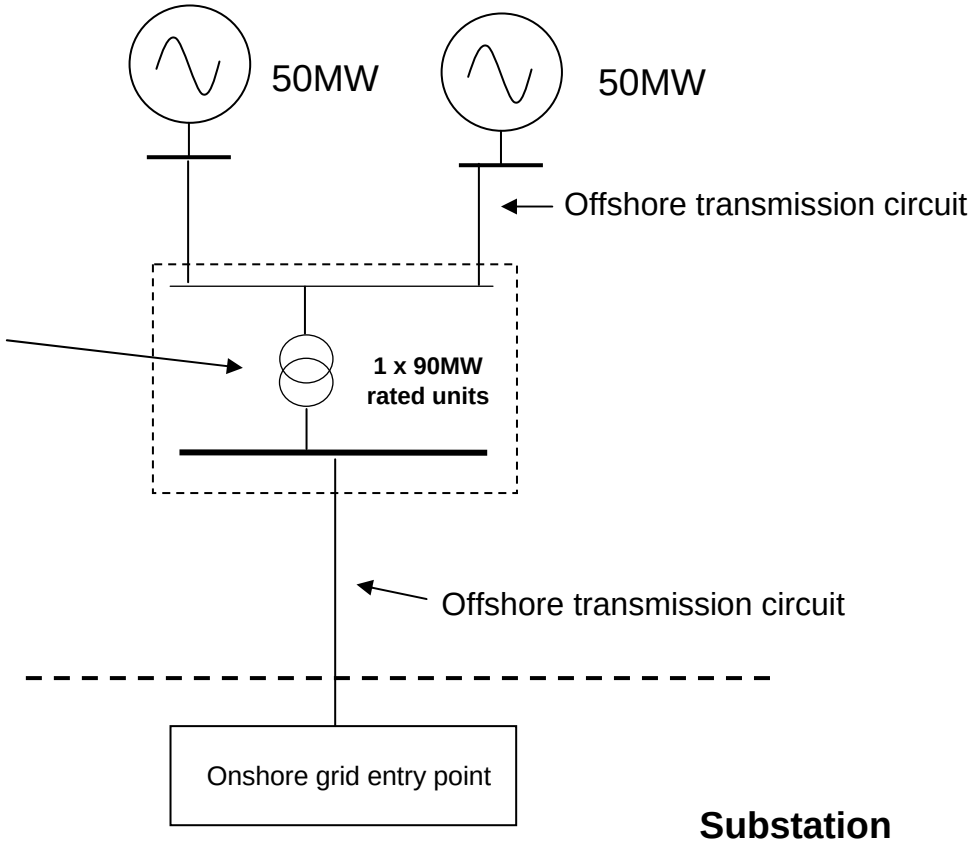
Platform should be designed such that the High Voltage and Low Voltage terminals of the platform transformer circuits are interconnected to allow for full flexibility of use of all assets housed upon it.

Substation configurations for illustration only

Recommendation – AC platform

Multiple windfarm connection

Transmission transformer capacity should be planned to accept 90% of the cumulative installed capacity of the windfarms connected, with no equipment loadings exceeding their pre-fault rating. For windfarms with a cumulative installed capacity of above 120MW, following the outage (planned or unplanned) of a single offshore transmission transformer circuit, the reduction in transformer circuit capacity should not exceed 0.5 * X% of cumulative installed capacity of the windfarm/s connected.



Substation configurations for illustration only

Recommendation – AC platform

Multiple windfarm connection

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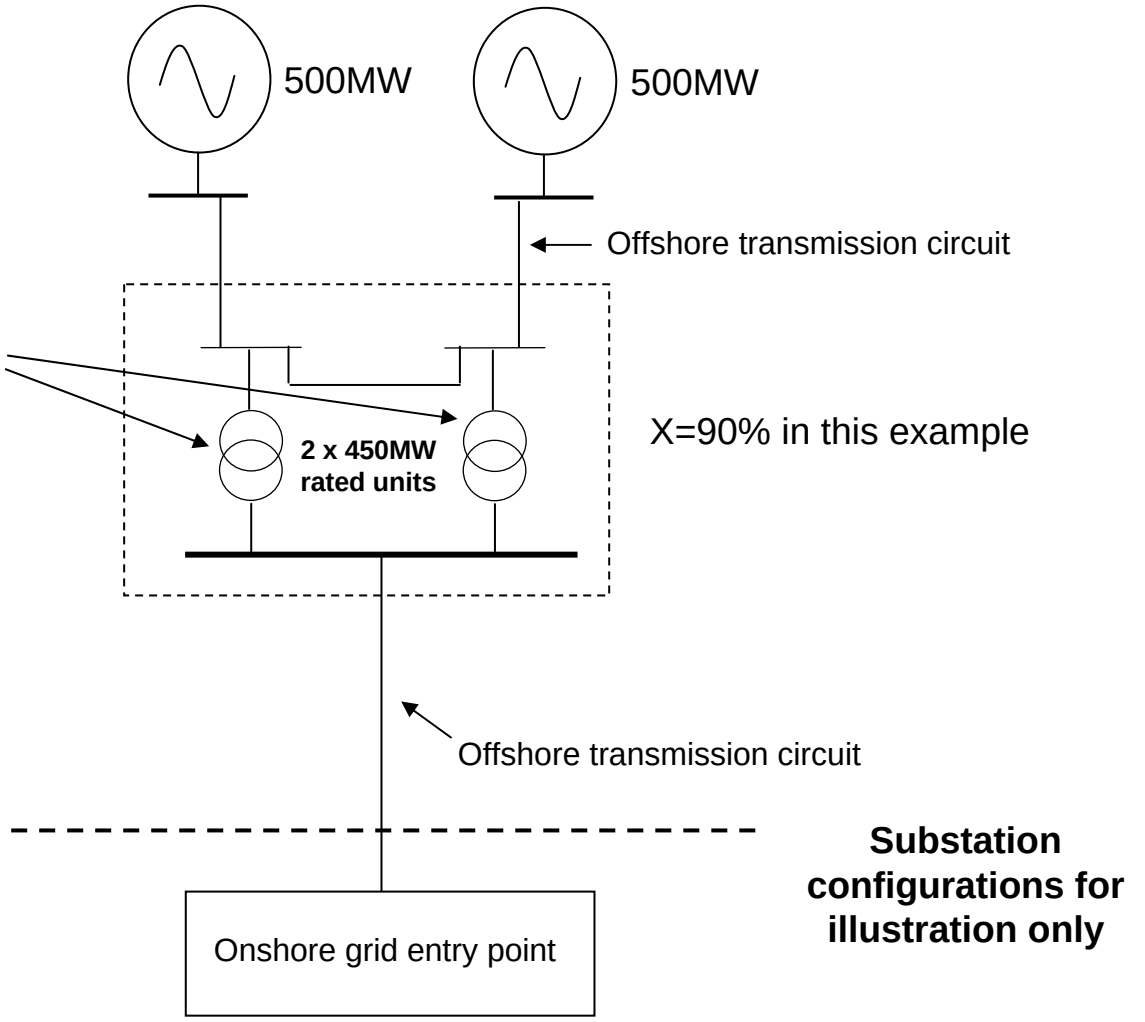


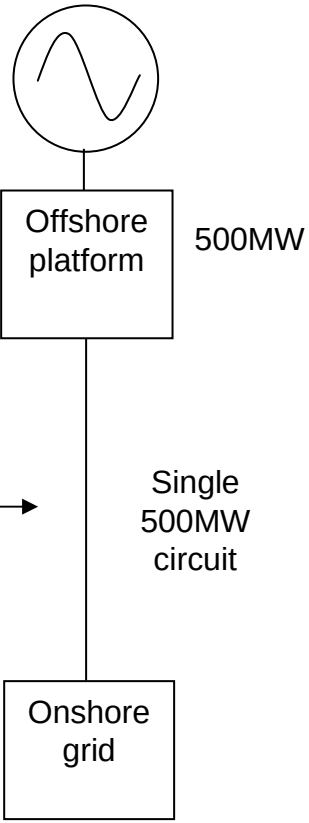
Substation configurations for illustration only

Recommendation – Network capacity

- For a single windfarm connection
  - Transmission cable circuit capacity should be planned to accept the full output of the windfarm with no equipment loadings exceeding the pre-fault rating.
- For multiple windfarm connections
  - Transmission cable circuit capacity should be planned to accept X% of the cumulative installed capacity of the windfarms connected to it, with no equipment loadings exceeding their pre-fault rating
- Following the outage of a single offshore transmission cable circuit, the reduction in cable circuit capacity should not exceed 1500MW i.e. can allow up to 1500MW to be connected to a single transmission cable circuit.

Recommendation – Network capacity

Single windfarm connection

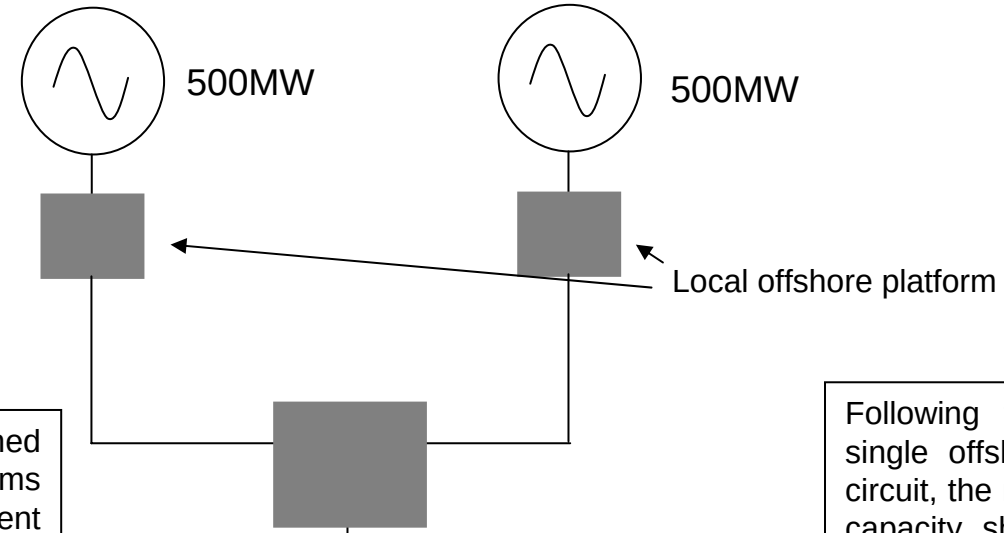


The transmission circuit capacity should be planned to accept the full output of the windfarm with no equipment loadings exceeding the pre-fault rating

Following the outage of a single offshore transmission circuit, the reduction in circuit capacity should not exceed 1500MW i.e. can allow up to 1500MW to be connected to a single transmission circuit.

Recommendation – Network capacity

Multiple windfarm connection



The circuit capacity should be planned to accept 90% output of the windfarms connected to it, with no equipment loadings exceeding their pre-fault rating.

Following the outage of a single offshore transmission circuit, the reduction in circuit capacity should not exceed 1500MW i.e. can allow up to 1500MW to be connected to a single transmission circuit.

Issues for OTEG consideration

- DNO ‘sandwich’
- Assessment of demand connected to offshore transmission networks
- The consideration of generating plant with a higher annual capacity factor(e.g. offshore CCGT, tidal etc) should be considered
- Access rights, compensation arrangements and transmission charging require review