

GSR019: Review of Chapter 7 Double Busbar Requirements



NETS SQSS Review Panel, Wednesday 6 August 2014
John West: Work-Group Chair

Background

- GSR019 was raised by DONG Energy on 02/04/2014.
- GSR019 was referred to a Work-Group by the NETS SQSS Review Panel on 02/04/2014.

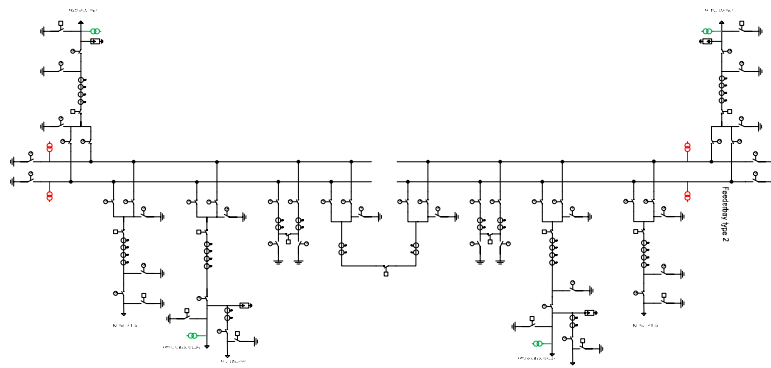
Summary

- NETS SQSS Chapter 7 specifies the minimum requirements for the design of offshore transmission systems and contains the following text with reference to busbars and switchgear in onshore substations (which form part of the offshore transmission system):

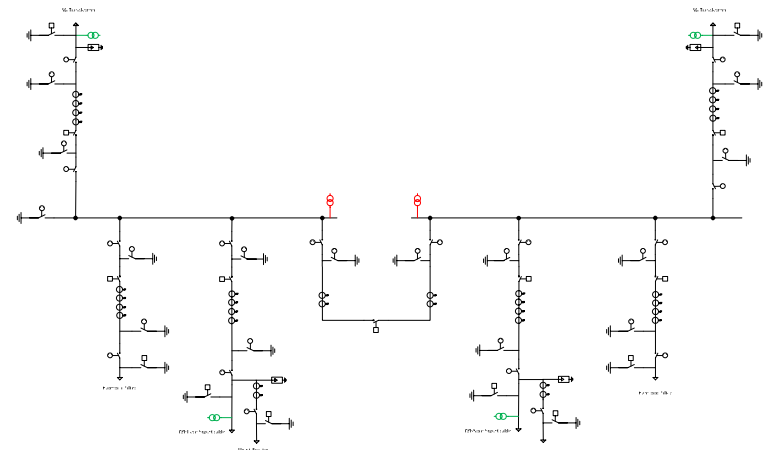
7.13.3.1 In the case of *offshore power park module* connections or multiple gas turbine connections, following a *planned outage* of any single section of *busbar* or mesh corner, no loss of *power infeed* shall occur;

Summary

- A cost benefit analysis has been conducted that demonstrates that in the majority of cases, a double busbar substation does not represent the most economic design.
- The analysis is presented in a working-group report produced by DONG Energy.

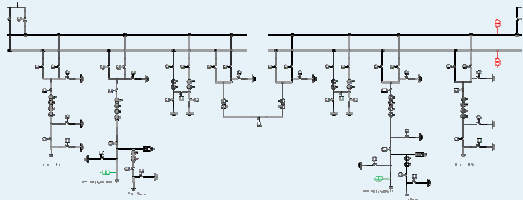
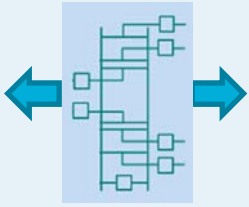


Vs.



Assumptions & Sensitivities

- Sensitivities to the baseline design were considered to test the limits of the conclusions over a range of wind farm sizes 400MW – 800MW using GIS switchgear.

Assumption	Baseline	Sensitivity
System Voltage	220kV	150kV
WACC	8.9%	6.5%
MTTR (220/150kV)	81/56hrs	197/179hrs
DBB Configuration	"Standard", 1 Section, 2 Coupler Design 	"Minimal", 1 Coupler Design 

Results & Conclusions

- In most cases, a single bus design represents the most economic switchgear configuration.
- For some sensitivities, a "minimal" double bus design was more economic, but this is subject to operability restrictions.

		Baseline	Lower WACC	Increased MTTR	"Minimal" DBB Design	Increased MTTR & "Minimal" DBB Design	Increased MTTR, "Minimal" DBB & Lower WACC
150kV	800MW	● -£570,260.39	● -£389,569.04	● £570,823.50	● £203,741.45	● £1,344,825.34	● £1,397,351.01
	600MW	● -£700,497.32	● -£519,805.97	● £155,315.59	● £73,504.52	● £929,317.44	● £981,843.10
	400MW	● -£842,675.78	● -£662,405.54	● -£303,861.08	● -£68,673.94	● £470,140.77	● £522,245.31
220kV	800MW	● -£1,501,832.70	● -£1,096,755.39	● -£151,404.20	● £5,360.83	● £1,355,789.32	● £1,511,292.93
	600MW	● -£1,737,947.28	● -£1,332,869.98	● -£725,125.91	● -£230,753.76	● £782,067.62	● £937,571.23
	400MW	● -£1,974,061.87	● -£1,568,984.56	● -£1,298,847.62	● -£466,868.34	● £208,345.91	● £363,849.52

Proposed Solution

- It is recommended to remove the deterministic requirement for double bus switchgear in Chapter 7 and leave some measure of flexibility to the developer.
- This will mirror the requirements for offshore substations.
- Thus the text in 7.13.3.1 should be replaced with:

"Following a *planned outage* of any single section of *busbar* or mesh corner, the *loss of power infeed* shall not exceed the *normal infeed loss risk*;"
- This proposed wording is still being debated by the working-group.

Work-Group Discussions

- The working-group discussed at length the assumptions used for model inputs, modelling methodology and necessary sensitivities to be examined.
 - Maintenance outage times were agreed to be excluded, as typically intrusive switchgear maintenance is minimal and aligned with other primary components (particularly transformers) in offshore systems.
 - It was felt that the return to service times extracted from CIGRE surveys may be optimistic and hence a sensitivity was included. This assumes that 27% of the faults have a significantly longer return to service time.
 - An alternative double bus arrangement ("Minimal Double Bus") was developed by the working-group and analysed.
- Generally it was felt that creating flexibility was right, although there were some concerns regarding the potential need to justify investment decisions in detail and on a case-by-case basis given that the margins are relatively small.
- The operability of SBB vs. DBB designs were discussed and the use of SBB designs were not considered to be a threat to system security. This is still subject to working-group discussions.

Work-Group Conclusions

- The Work-Group is broadly supportive of this proposal but some members have raised concerns including:
 - If this proposal is approved would building a DBB substation be above and beyond the requirements of the NETS SQSS and therefore harder to justify and recover the costs of (i.e. by ruling in SBB substations are we inadvertently ruling out DBB substations)?
 - The validity and operational flexibility of the “minimal double busbar” substation sensitivity analysed.
- The Work-Group is progressing towards meeting its Terms of Reference.
- The Work-Group has good momentum and anticipates bringing this proposal to the NETS SQSS Review Panel for their consideration and approval ahead of the October 2014 Meeting.
- To achieve this, further work-group meetings shall be held and the following issues will need to be addressed.

Work-Group Key Outstanding Actions

- Substation Unit Costs: Work-Group to check these are accurate and reflective of their previous experience.
- Double Busbar Configuration: Work-Group to check this is a typical configuration and the quoted costs are representative.
- Minimal Double Busbar Sensitivity: Work-Group to review the operational flexibility of the different substation configurations analysed to date.
- MTTR: Work-Group to ensure consistency throughout the CBA and the report and to confirm the 27% value used to set the level of more significant failures within one of the sensitivities.
- Lower Load Factor Sensitivity: Work-Group to determine if a lower load factor sensitivity (e.g. 40%) is required.
- NETS SQSS Drafting: Work-Group to determine interpretation / implications of their proposed wording and also whether Appendix A shall require rewriting also.

Timetable – Provisional / Indicative

w/c 25/08/2014	Work-Group Report presented to NETS SQSS Review Panel
	NETS SQSS Review Panel given x3 weeks to provide comments
01/10/2014 Panel Meeting	Updated Work-Group Report and Industry Consultation Document presented to NETS SQSS Review Panel
w/c 06/10/2014	Industry Consultation issued
w/c 03/11/2014	Deadline for Industry Consultation responses

Questions?

