GSR030

07 March 2023

Online Meeting via Teams

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Welcome

GSR030

Friday 7th March 2023

Online Meeting via Teams

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Objectives and Timeline

Teri Puddefoot – National Grid ESO Code Administrator

Objectives for GSR030

Objectives of Workgroup 2

- Review Feedback
- Discuss HND costings re landing points, FRCR costings

Timeline for GSR 030 – Proposed Timeline - *Workgroup*

Milestone	Date	Milestone	Date
Modification presented to Panel	09 November 2022	Workgroup Report Showstopper	07 July 2023
Workgroup Nominations (15 Working Days)	14 November 2022 to 09 December 2022	Workgroup Report – Submission to Panel	12 July 2023
Workgroup 1 Proposer's presentation, check Terms of Reference, initial review of legal text	20 January 2023	Panel sign off that Workgroup Report has met its Terms of Reference	19 July 2023
Workgroup 2 Bipole, anchor drag risk, N-1-1 criteria	07 March 2023	Code Administrator Consultation	24 July 2023 to 24 August 2023
Workgroup 3 Scoping for cost benefit and impact assessment	31 March 2023	DFMR Submission to Panel	05 September 2023
Workgroup 4 Refine solution(s) and materials to be provided with Workgroup Consultation	19 April 2023	DFMR Panel Vote	13 September 2023
Workgroup 5 Finalise Workgroup Consultation document	09 May 2023	FMR to Ofgem	25 September 2023
Workgroup Consultation	15 May 2023 to 05 June 2023	Ofgem decision	25 September 2023 to 27 October 2023
Workgroup 6 Discuss consultation responses, refine solution and legal text	19 June 2023	Implementation Date	TBC
Workgroup 7 Finalise Workgroup Report and Legal text	05 July 2023		

Review Workgroup Feedback and Workgroup objectives

Bieshoy Awad/Fiona Williams– National Grid ESO Code Administrator

Content

- Feedback from workgroup review
- HND costings re landing points
- FRCR costings
- Work in Progress

Recap of Modes of Failure:

Common Modes of Failure

Electrical/Control
- Mitigated by design
- Guaranteed through definition of a single converter

Mechanical (cable separation)

Risk mitigated by design

- Adequate separation and depth throughout the route
  What are these parameters?
- Other controls
  +
  A detailed risk assessment according to good industry practice showing an acceptable level of risk
  What is an acceptable level of risk?

Risk not mitigated by design but managed through restrictions

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Revised Definitions:

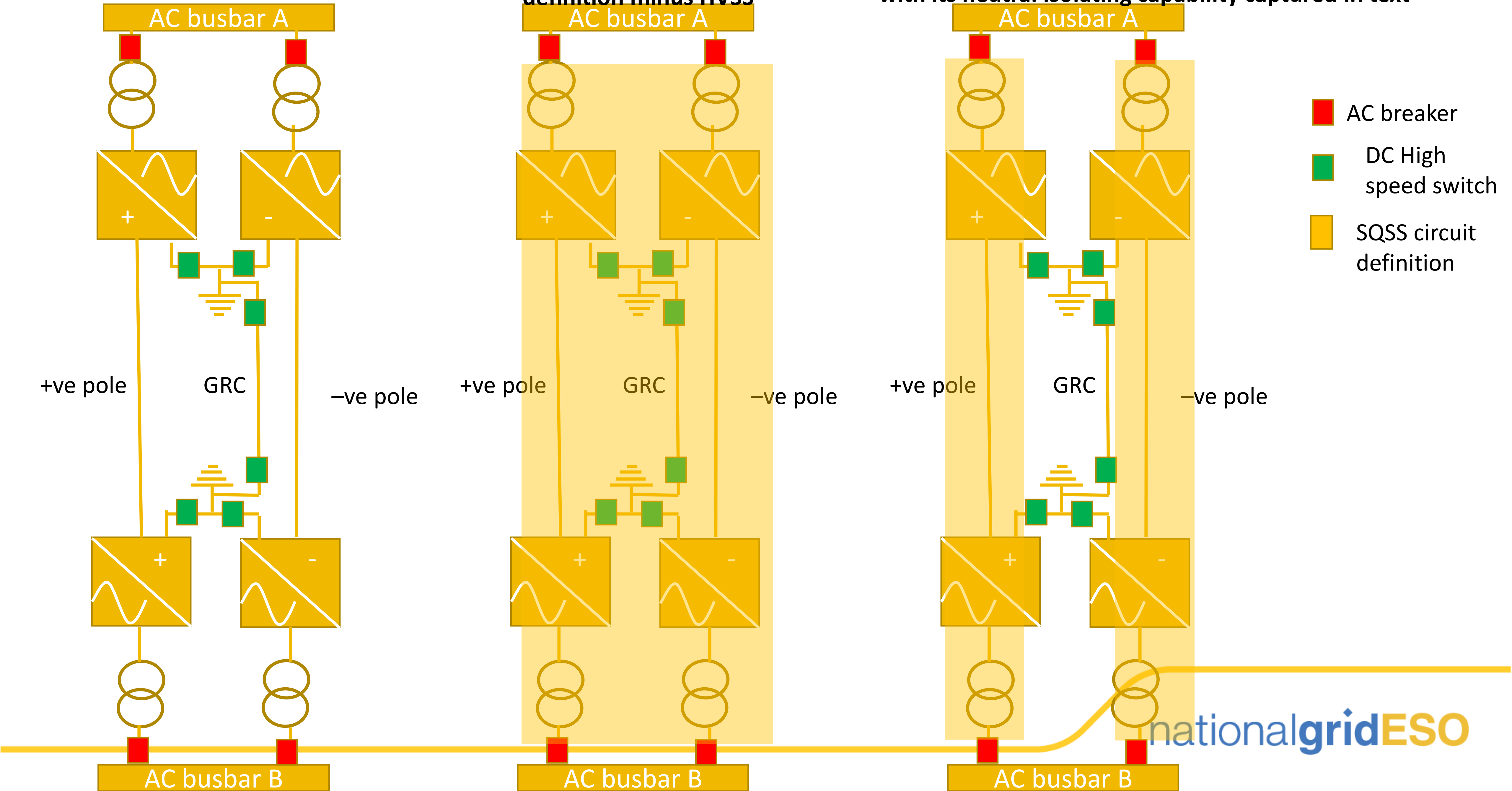
DC converter:

Any apparatus used as part of the national electricity transmission system to convert alternating current electricity to direct current electricity, or vice-versa. A DC Converter is a standalone operative configuration at a single site comprising one or more converter bridges, together with one or more converter transformers, converter control equipment, essential protective and switching devices and auxiliaries, if any, used for conversion. In a bipolar arrangement, where there is a common mode of failure that would cause a fault outage on either of the two poles to affect the other pole or where there are operational requirements that would mean that a planned outage on either of the two poles would require the other pole to be unavailable, a DC Converter represents the bipolar configuration. Otherwise, each of the two poles is a separate DC converter.

Illustrative bipole

Illustrative bipole circuit definition minus HVSS

Illustrative bipole circuit definition with HSS included with its neutral isolating capability captured in text



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Revised Definitions:

Taking into account feedback provided by National HCDC Centre

DC High Speed Switch:

A high-speed switching device capable of operating within protection timescales to isolate the earth return of a bipolar DC link from either or both DC Converters of that link

Offshore Transmission Circuit:

Part of an offshore transmission system between two or more circuit-breakers and/or DC high Speed Switches which includes, for example, transformers, reactors, cables, overhead lines and DC converters but excludes busbars and onshore transmission circuits

Potentially, propose a similar revision for an Onshore Transmission Circuit provided that it doesn't have unintended consequences

Proposal for mitigation of anchor drag risk

Offshore Cable Circuits Sharing a High Risk Route:

Two or more cable offshore transmission circuits that run within a distance of 250 meters from each other for a distance of 1000 meters where the likelihood of mechanical failure of one or more of the circuits due to an external unplanned event is more prevalent is above one event in 2500 years.

7.8.3 following the concurrent fault outage of any two cable offshore transmission circuits sharing a high risk route, the loss of power infeed shall not exceed the infrequent infeed loss risk;

Question, if the 1 event per 2500 years is the likelihood of an anchor drag risk affecting one circuit, how would that translate into the risk of the event affecting two circuits?

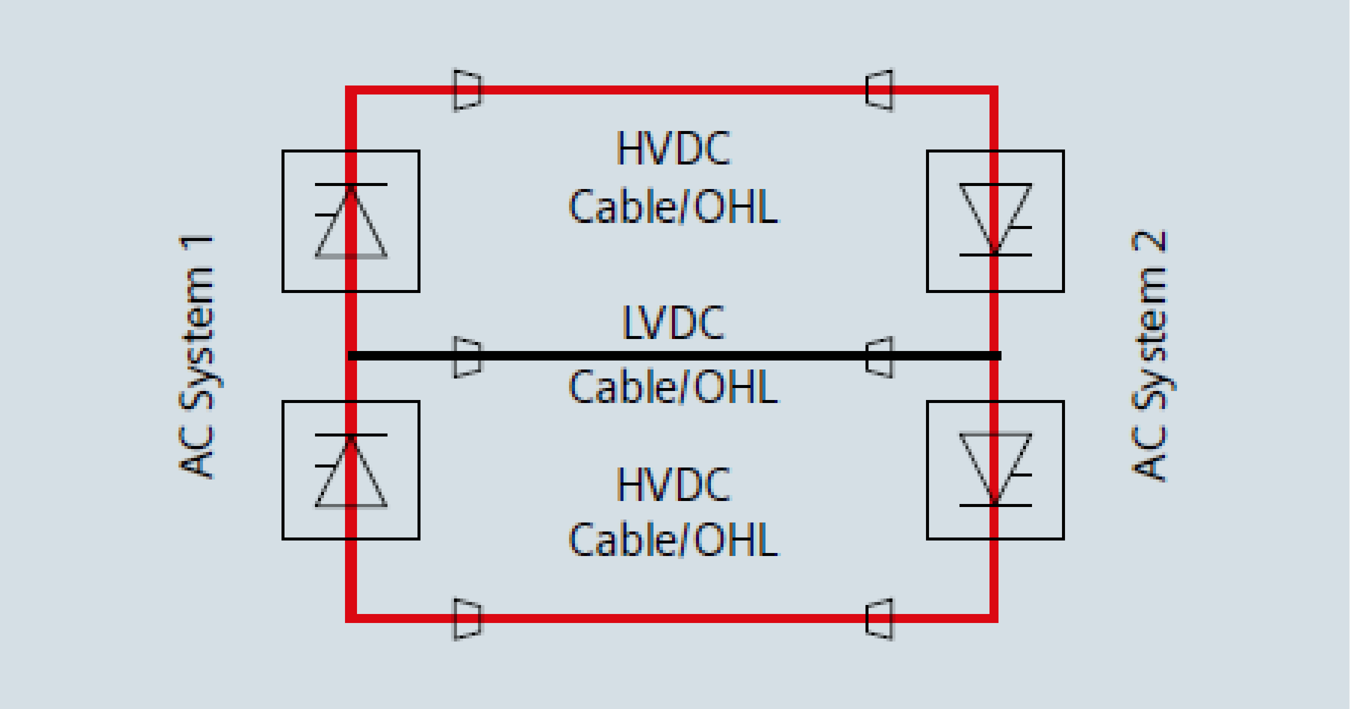
For ref: Fault statistics data (probability) for comparison with anchor drag risk:

Voltage	132kV	275kV	400kV	All	No. of years between 2 consecutive faults/km
SC trip	1.40%	0.50%	0.42%	0.63%	159.8664
DC trip	0.16%	0.04%	0.03%	0.06%	1561.205
Busbar/mesh corner trip	0.51%	0.72%	0.78%	0.69%	145.082
cable	0.00%	0.06%	0.25%	0.09%	1067.807

Voltage	132	275	400
single circuit	4216.967	6101.662	12094.64
Double circuit	2108.484	2563.373	4227.012
busbar/mesh cornor	455	609	706
cable	244.5135	479.4718	237.0412

Is the N-1-1criteria sufficiently robust to ensure faults on metallic returns are addressed – feedback required

7.8.2 following a *fault outage* of a single cable *offshore transmission circuit* during a *planned outage* of another cable *offshore transmission circuit* the further *loss of power infeed* shall not exceed the *infrequent infeed loss risk*.



Issue 2 – change to infeed loss risk

Why?

Assumption made during HND project, facilitates better use of offshore routes and landing points and better optimisation of offshore transmission assets

How?

- Change “normal” to “infrequent” in 7.7.2.1 and 7.7.12.1
- There is a need to calculate costings for reduced number of landing points versus increased frequency costs

HND Costings re landing points

£k	TWh/annum	£k/annum
Difference in asset cost	Difference in energy looses	Cost of Energy Losses
271000	-0.574	-34.4426808
265000	-0.608	-36.48466145
257500	-0.653	-39.17213727
250000	-0.695	-41.67961309
242500	-0.738	-44.3070889
235000	-0.781	-46.87456472

	Length			200		km						
	£k	£k	£k	TWh		TWh	£k	£k	£k	TWh		TWh
	1HVDC Link						2 HVDC Links					
MW rating	Assets Min	Assets Max	Assets Ave	Energy losses	Outage losses low	Outage losses high	Assets Min	Assets Max	Assets Ave	Energy losses	Outage losses low	Outage losses high
1320	930000	1287600	1108800	0.137	0.515	1.088	1170800	1588800	1379800	0.141	0.143	0.303
1400	970000	1342000	1156000	0.146	0.546	1.154	1206000	1636000	1421000	0.151	0.152	0.321
1500	1020000	1410000	1215000	0.158	0.585	1.236	1250000	1695000	1472500	0.162	0.163	0.344
1600	1070000	1478000	1274000	0.169	0.624	1.318	1294000	1754000	1524000	0.175	0.174	0.367
1700	1120000	1546000	1333000	0.181	0.663	1.401	1338000	1813000	1575500	0.187	0.185	0.390
1800	1170000	1614000	1392000	0.193	0.702	1.483	1382000	1872000	1627000	0.2	0.195	0.413

Observations

Saving on asset costs for a 200km link vs 2x200km links with 50% capacity is in the order of £250m. That is equivalent of £17m/annum over 25 years assuming a 5% discount rate.

The difference in energy costs is marginal.

FRCR frequency response costings

- To be confirmed at workgroup

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AOB & Next Steps

Teri Puddefoot– National Grid ESO Code Administrator

WG3 -
Scoping for cost benefit and impact assessment

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