

Code Administrator Meeting Summary

Meeting name: GSR030 Workgroup Meeting 7

Date: 23/02/2024

Contact Details

Chair: Teri Puddefoot, National Grid ESO Terri.Puddefoot@nationalgrideso.com

Proposer: Bieshoy Awad, National Grid ESO Bieshoy.Awad@nationalgrideso.com

Key areas of discussion

The Chair welcomed the attendees and covered the objectives of the meeting to review the timeline, review the actions and continue reviewing the Workgroup Consultation document (which for this meeting included an update from the Proposer on the sensitivity analysis underway).

Actions review

- Action 15 (review of the CBRA for cable installation) – action closed.
- Action 19 (sharing the tolerances of overhead circuit risks, calculations and rationale behind acceptable levels of risk) – action closed. The Proposer was confident this is covered in the documentation.
- Action 20 (To compile text to cover Term of Reference #3 considering the retrospective impact on existing cables). The Proposer noted that the code does not need to stipulate retrospectivity as the required assessments will result in action needing to be taken if they return a significant result. A Workgroup member asked about scenarios where projects are in advanced stages of design and whether the solution would force a change in that design. The Proposer noted that if projects are advanced they can be treated as 'already built'.
ACTION 20 update (BA) – application of the solution to projects in advanced states of design to be discussed further with the Workgroup and called out in the Workgroup Report.
- Action 21 (Consider what acceptable levels of risk are, what could be included in the SQSS & BA's suggested units involved for assessing risk) – action to remain open and to be agreed at the Workgroup.
- Action 22 (offline discussion of risks and associated costs) – action to remain open. The Proposer outlined that there had been lots of discussion about risk levels, further text added to the Workgroup Consultation document including some figures from NB.
- Action 23 (Workgroup considering the costs associated with the risks) – action to remain open.

- Action 24 (wording needed to cover intentional damage/terrorism risks) – action to be closed with wording included in the consultation document.
- Action 25 (adding more examples to the Mechanical Common Modes of Failure section of the consultation document) – action closed. The Proposer shared that there had been long discussions with GA on this point since the last meeting and more examples wouldn't be possible.
- Action 26 (re-drafting text on page 10 of the consultation document, reach out to Subject Matter Experts on this area) – action to be closed.
- Action 27 (offline discussion to see if the previous Cost Benefit Analysis would fit into this modification) – The Proposer noted that numbers from NB have been included in the document - action to be closed.
- Additional actions to be reviewed at the next meeting.

Review of the Workgroup Consultation document

The Proposer took the Workgroup through the work-in-progress document as to changes made since the last meeting.

'Mechanical Modes of Failure' section (as part of Issue 1: Treatment of DC Link Bipolar Arrangements):

The Proposer shared the latest updates made including how the explanation of mechanical modes of failure include the unavailability of one or more Onshore Transmission Circuits (as well as Offshore Transmission Circuits). This is because it assumes some Holistic Network Design assets to be onshore.

The Proposer took the Workgroup through options in the document to reduce anchor drag affecting multiple cables simultaneously (including using an alternative route to lower risk), and also the proposal to define Anchoring Distance and High Risk Cable Route in the SQSS (sharing those suggested definitions with the group). It was also proposed that a SQSS requirement be introduced to ensure a fault on a High Risk Cable Route didn't cause a loss of infeed greater than the Infrequent Loss of Infeed Risk.

The Proposer referenced where in the SQSS these changes would apply (Chapters 2, 4, 5, 7) and that Chapters 3 and 8 were not affected.

ACTION 34 (BA) – Proposer to review whether Chapter 9 is affected by the code changes.

The Proposer outlined text pointing to guidance for industry risk practices (the Cable Risk Burial Assessment) and the level of risk for two close proximity cables being struck by an anchor being impacted by the separation distance of those cables.

An observer questioned whether wording was needed to deal with situations where damage to cables is intentional. The Proposer shared newly added text on 'Events beyond the NETS SQSS' which the observer agreed with.

'Limit to the loss of infeed risk for offshore DC convertors' section (Issue 2):

The Proposer explained the text in the document outlining the purpose of clauses 7.7.2.1 and 7.12.2.1 to restrict loss of power infeed risk associated with an event on a single DC

converter, and how a 2012 review prevented an increase in loss of infeed risk for a secured event on a single dc converter.

ACTION 35 (BA) – Proposer to check for missing text in the Issue 2 section of the consultation document.

'Workgroup Considerations' section:

The Proposer explained moving the 'Performance of a bipolar DC arrangements during faults' text into the Workgroup Considerations section.

A Workgroup member noted the 50ms protection timeframe used in the example and queried whether this is a requirement or not. The Proposer noted that 50ms is not a specific requirement however the requirement is that the fault is isolated, and the equipment is available within typical protection timescales i.e., tens of milliseconds.

'Acceptable levels of Anchor Drag Risk' section:

The Proposer took the Workgroup through the three categories of transmission system events. The Proposer suggested that to work out the probability of a category 3 event, use the probability of a category 1 event and divide by an order of magnitude (10).

The Proposer shared a table to outline the frequencies of some infrequent secured events such as busbar/mesh corner faults, double circuit overhead line faults (over different length cables), underground cable faults (over different lengths) and submarine cable faults (over different lengths). The Proposer noted that risk values from the Offshore Transmission Expert Group (OTEG) respond to an event that is sufficiently frequent for it to be secured. A Workgroup member who contributed values to this table (NB) noted that calculations for event frequencies on submarine cable faults used a minimum distance of 25km or longer.

ACTION 36 (BA) – Titles and information sources needed for tables/figures included in documentation.

Comments were made in relation to the relevant fault examples:

- All values – The Proposer noted that values shared are real values for typical secured events. Where these are to be used to derive the maximum acceptable level of risk, they need to be an order of magnitude less.
- Busbar/mesh corner fault – the contributing Workgroup member noted that there should be a consistent approach to the level of magnitude used (and that scale is yet to be finalised). The Proposer noted that the 145.8yr frequency value reflects real frequency of events and is not stated as acceptable/unacceptable.
- Double circuit overhead line fault – for a 50km line a frequency of 31.2 years was deemed frequent.

It was noted that Workgroup documentation should include a reference to there being different Workgroup/industry views on the event frequency table values (at the WG7 stage).

'System resilience considerations' section:

The Proposer explained new text added under this topic, covering:

- The operation of low frequency demand disconnection relays – including that a 3.6GW link could result in 20% of demand being lost across England and Wales due to activation of Low Frequency Demand Disconnection stages (Scottish demand likely to be unaffected due to how LFDD stages are arranged).
- Rate of Change of Frequency of 1Hz/s leading to disconnection of all embedded generation fleet – the Proposer included details of this in the document and noted that if a particular solution from GC0155 is approved, there would be additional compounded loss to also consider. It was noted that this scenario would be too significant to not be secured. The Proposer noted that if not using grid-forming, the impact of an anchor drag causing all embedded generation to trip would be lower (for example, if inertia was different), but that the cost of impacts would be hard to calculate.
- Quantification of the impact of additional risk on the likelihood of certain frequency events (e.g., a drop to 49.2-49.5Hz, to 48.8-49.2Hz, below 48.8Hz or a further drop). The Proposer shared graphical analysis of risk for such events based on different numbers of links involved. The Proposer noted that the analysis treated Great Britain as a single node system, considered radial connections and not how links are used/connected together, and stressed that the wind profile should also be factored into probabilities. Also, for meshed networks where the level of infeed risk is lower, the impact would be reduced.

ACTION 37 (BA, Workgroup) – Decision needed about a reasonable number of links to include in the event frequency analysis and diagrams to be checked by BA.

An observer expressed that assumptions were used in the analysis and that 2GW links were more reflective of the current state/near future than 3.6GW links. A Workgroup member supported this by saying that they wouldn't expect to see 3.6GW links coming online until the mid-2030s, and felt that a 2.5GW link would be a sensible level for the medium term.

ACTION 38 (BA) – Event frequency/probability analysis to be updated with 2GW and 2.5GW links, cases with wind and consideration of meshed connections.

'Retrospective application considerations' section:

The Proposer shared new text in this section and noted the only element of concern is the anchor drag consideration. It was posed that parties with cables are asked what this level of risk is, for example the owner of an offshore wind farm (who designed the project) or an Offshore Transmission Owners who should know the risks from when the assets were acquired.

ACTION 39 (BA, SQSS Panel) – Offshore Transmission Owners to be contacted about the likelihood of mechanical failures (which can be handled confidentially) for the Proposer to assess.

It was noted that if there is a risk of, say 1 in 100 years, such cases are looked into in detail and owners asked about anchoring distances (comparing locations of their cables to nearby cables and assess whether there is a high risk of a fault event from anchor drag).

‘Holistic Network Design costing re: landing points’ section:

The Proposer shared new text for this section including indicative costs for securing the network against frequency events with different numbers of HVDC tripping, and noted that environmental impacts would need to be considered along with other costs.

ACTION 40 (BA, FW) – Proposer to look into why HND costs for landing points haven’t been available and to look for missing text for this section.

An observer questioned whether the first party to connect would have to pay for the required level of reliability, or if more parties connected would costs lower. The Proposer responded that costs would come to the ESO and then be socialised across all parties (even if one party operates a lower quality connection and causes the trip). The Proposer noted that if a party fails to meet its Physical Notification (PN) and doesn’t meet its BSC requirements, the ESO can claim costs back from that party. The Proposer notes that costs would be capped at roughly £12million for securing all links at the same time, assuming the wind is consistent. If that’s not the case, costs to secure the system would increase significantly (but would need quantifying).

Timeline

In order to amend the timeline to reflect the work that is ongoing and required, the conversation with Offshore Transmission Owners are needed to provide risk values to feed into the analysis.

The Workgroup expected to need two Workgroups before Workgroup Consultation, with 4 weeks (late March) before the next Workgroup to complete the actions and 4 weeks then to the further Workgroup following that.

Next Steps

- *Actions addressed and Chair updated.*
- *Offshore Transmission Owners to be contacted about their cable fault risks*
- *Workgroup arranged for late March and late April – new timeline to be shared before sending to Panel for approval.*

Actions

Action number	Workgroup Raised	Owner	Action	Comment	Due by	Status
9	WG2	MG	Provide detail on bipole / rigid bipole faults		WG5	Closed
13	WG3	BA	A sentence should be added to an appropriate existing guidance note to ensure faults on metallic returns are addressed.	A Proposer action for post-decision if GSR030 is approved	Post-GSR030 approval	Closed

			Suggested sentence and suggested guidance note where this will sit to be provided			
15	4	National Grid	Review use of CBRA for cable installation to discuss at the next meeting	NA	19.10	Closed
16	4	BA	Send amended wording for the definitions slide from today's presentation		25.09	Closed
17	4	BA	Consider other possible impacting factors, such as compass deviation	Factors noted in document and WG consultation question considered	29.09	Closed
18	4	JG	Share slides from today's WG presentation (after checking for commercially sensitive information)		25.09	Closed
19	4	BA	Share overhead circuit risk tolerances, calculations and rationale behind what's deemed an acceptable level of risk (and relevance to cable scenarios)		29.09	Closed
20	4	BA, FW	Compile text to cover ToR 3 - Consider retrospective impact on existing cables.	Application of the solution to projects in advanced states of design to be discussed further with the Workgroup and called out in the Workgroup Report.	05.10	Open
21	4	LC	Consider what acceptable levels of risk are, what could be included in the SQSS & BA's suggested units involved for assessing risk	BA to follow up with LC	05.10	Open
22	4	NN, BA, LC	To discuss offline - risk and associated costs (investment in reinforcing the network and build/maintenance). BA to send a written narrative to help Orsted understand this ahead of a discussion	Discussion held and risk level to be developed via sensitivity analysis	05.10	Open
23	4	All	Consider details of the above once shared and		05.10	Open

			provide a proposal for discussion at the next WG			
24	5	BA	Put together the wording for the intentional damage/terrorism risk	Wording for the WG consultation document rather than SQSS solution	17.11	Closed
25	5	BA	Add more examples to the Mechanical Common Modes of Failure section	No more examples to be added	17.11	Closed
26	5	BA	To redraft page 10 section, reach out to SMEs	TBC following WG 6	17.11	Closed
27	5	BA/ NN	Offline discussion to see if previous CBA will fit into this mod	Outcome TBC	17.11	Closed
28	6	FW	Consult the ESO's FCRC team to update the Chair on timings for the sensitivity analysis	Impacting other timeline adjustments	05 Jan	Open
29	6	NN, LC	Slides from WG 5 were to be reviewed and updated before sharing with the Workgroup for publication.		WG 7	Open
30	6	BA	Revise wording (and diagrams) in the Workgroup Consultation as per the Workgroup discussions and comments in the document, including copying Workgroup discussions into the Workgroup Considerations section.		WG 7	Open
31	6	BA	Review what analysis can sit separately to the Consultation document in an Annex.		WG 7	Open
32	6	All	Share any environmental and/or economic benefits of this solution to the Chair/Proposer		WG 7	Open
33	6	Chair	Review permissions access for Workgroup members to the shared workspace.		21 Dec	Open
34	7	BA	Proposer to review whether Chapter 9 is affected by the code changes.		WG8	Open

35	7	BA	Proposer to check for missing text in the Issue 2 section of the consultation document.		WG8	Open
36	7	BA	Titles and information sources needed for tables/figures included in documentation.		WG8/9	Open
37	7	BA, Workgroup	Decision needed about a reasonable number of links to include in the event frequency analysis and diagrams to be checked by BA		WG8/9	Open
38	7	BA	Event frequency/probability analysis to be updated with 2GW and 2.5GW links, cases with wind and consideration of meshed connections.		WG8	Open
39	7	BA, SQSS Panel	Offshore Transmission Owners to be contacted about the likelihood of mechanical failures (which can be handled confidentially) for the Proposer to assess.	BA to draft an email to be shared via Panel	WG8/9	Open
40	7	BA, FW	Proposer to look into why HND costs for landing points haven't been available and to look for missing text for this section.		WG8	Open

Attendees

Name	Initial	Company	Role
Teri Puddefoot	TP	Code Administrator, ESO	Chair
Elana Byrne	EB	Code Administrator, ESO	Tech Sec
Bieshoy Awad	BA	ESO	Proposer
Fiona Williams	FW	ESO	Proposer
Marko Grizelj	MG	Siemens	Workgroup member
Nicola Barberis Negra	NN	Orsted	Workgroup member
Roddy Wilson	RW	SSENT	Workgroup member
Steve Baker	SB	ESO	Workgroup member

Xiao-Ping Zhang	XZ	Academia	Workgroup member
Benjamin Marshall	BM	National HVDC centre	Observer
George Arvanitakis	GA	Xlinks	Observer
Mick Chowns	MC	SSENT	Observer