

GC0077 and GSR018 update Sub-Synchronous Oscillations

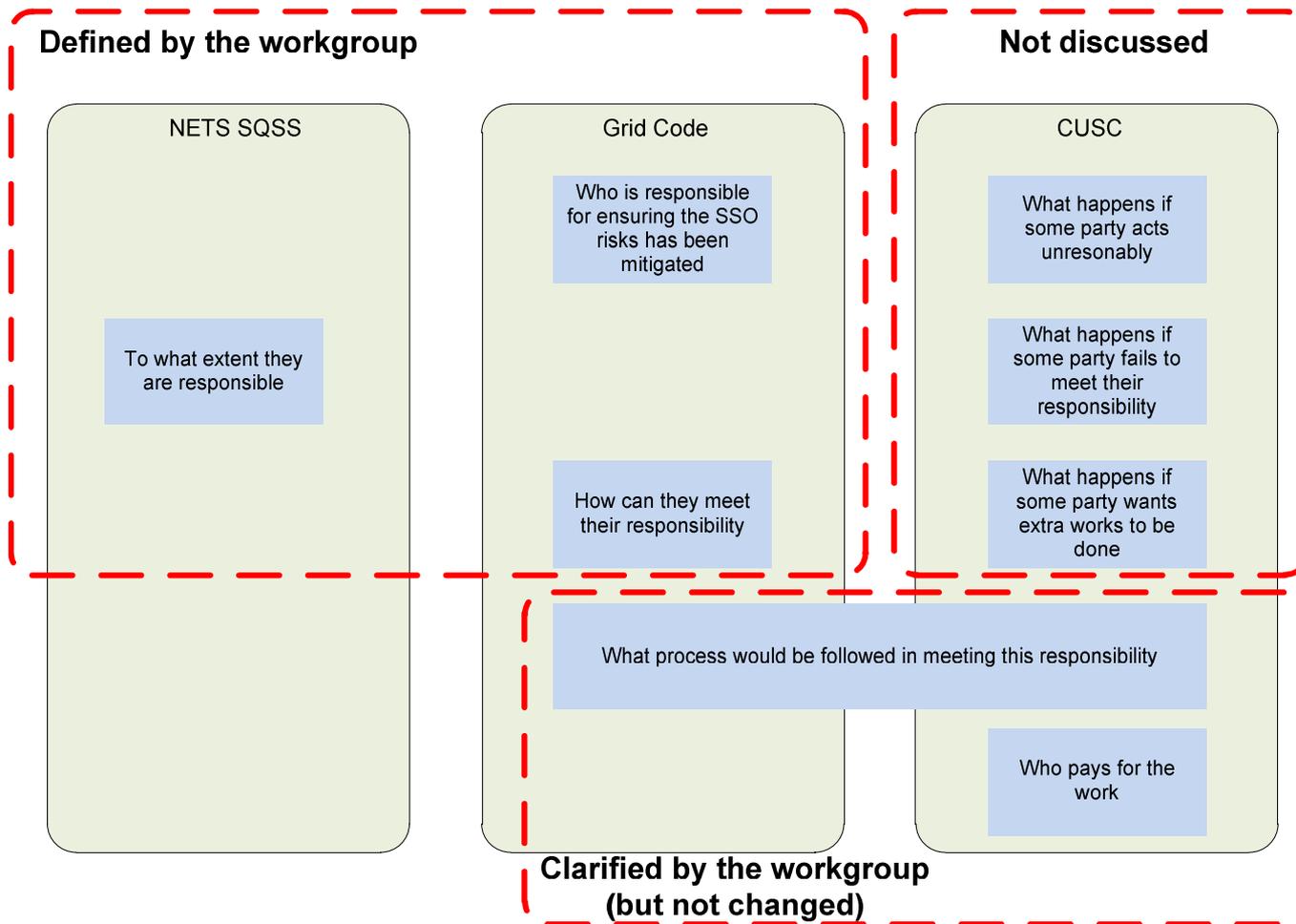


Bieshoy Awad

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What has been considered in the proposal



Points that Invite Clarification

SSE Generation

- We believe that the proposal is consistent with this
- There are already mechanisms in CUSC to address disagreements between Transmission Licensees and Users

a new generator who is connecting should have ability to negotiate the most economic solution with the TO which may involve work on the TO's assets rather than solely the new generator's assets.

How is it agreed what level of monitoring is required and how is a disagreement between an existing generator and the TO resolved? (i.e. an existing generator could believe that more monitoring is required to safeguard the generator than the TO believes is necessary – how would this be resolved?)

Points that Invite Clarification

Scottish Power Transmission

- The proposal described “a reasonable process” to meet the requirements.
- Data availability is critical. This is less of an issue for new plant.
- Plant impedance data should be available early in the design stages. However, if this change later in the process, the analysis could change.
- The process has not been embedded in the code and, provided that all parties (User/TO/SO) are comfortable, could be changed for a specific connection.

Without knowledge of the impedance characteristics of a new or proposed synchronous generator, Transmission Licensees will not be able to provide a generator-specific damping characteristic. However, as TO, SPT would identify any machine considered at risk of SSO and work with the User to achieve an appropriate level of damping and mitigate any SSO risk. Network impedance characteristics are useful when assessing SSO risks and, as TO, we would agree with using this approach where appropriate.

Points that Invite Clarification

Scottish Power Generation

- Once the User has a firm connection, their rights will be protected. However, similar to any other connection, the viability of the connection might be affected by restrictions on the system that require reinforcements that are either costly or would require a long time to deliver. This is not limited to SSO related works.
- With discussions with SPG, it was established that the response cover the case where the SSO risks are triggered by a new Transmission Plant. Whereas, changes that are triggered by a new User's connection or a modification to the plant of an existing User, costs are to be covered by the User

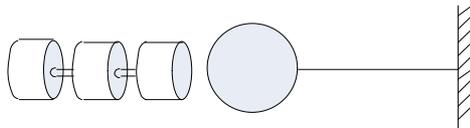
Defining a "specific Generator electrical damping characteristic" for a new generator will probably be location specific and hence Users may be restricted from installing certain generator types at certain location, but it is difficult to see how this can be avoided.

Yes provided the costs of implementing site specific requirements by a user are met by the Transmission Licensees as it is their obligation.

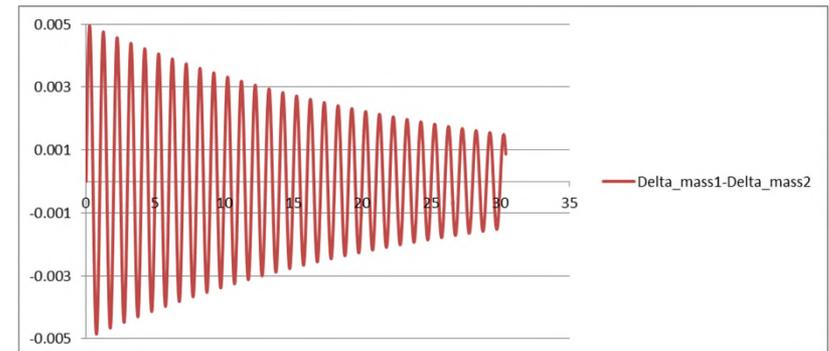
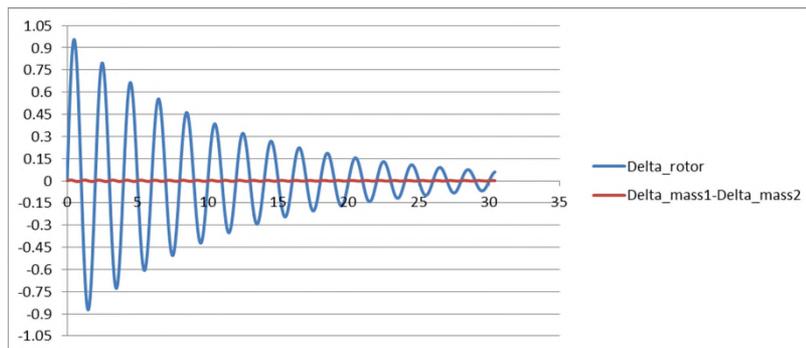
Points that Invite Clarification

Horizon Nuclear Power

- Question is related to the applicability of the 12s time constant specified in the system instability criteria to SSO
- Time constants of some mechanical modes are inherently longer than 12s
- The proposal requires that all SSO modes have sufficient damping but time constants below 12s are not guaranteed



Clearly any insufficient damping of SSO will have a negative impact on synchronous generators, and may be of a level that will cause long term loss of plant life which is difficult to quantify and attribute to a particular source. Monitoring of at-risk plant appears to be the most effect way of mitigating this, but any monitoring has to go hand-in-hand with an agreed plan on what actions to take if unacceptable levels are observed.



Points that Invite Clarification

Horizon Nuclear Power

- The conclusions are based on empirical evidence and the assumption that the existing NETS SQSS provides the right balance between operational costs/risks and between capital costs/operational costs for pole slipping events.
- This is not an SSO specific issue. Users' plant might be damaged due to several reasons. This include unacceptable overvoltage, harmonics, pole slipping, etc. It is expected that any damage arising from SSO will be treated in the same manner as anything else.

Although the costs of potential constraints have not been quantified,....

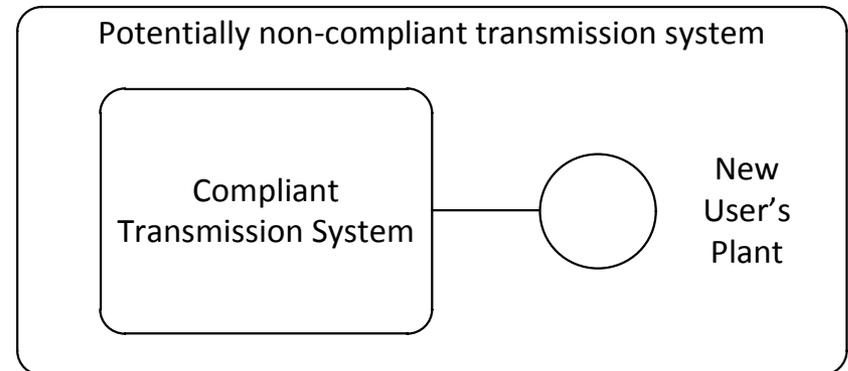
The proposal has not quantified the potential capital or operational expenditure.

The subject of compensation for damage caused to users' plant as a result of another party has not been addressed. In the event that SSO damage can be directly linked to an SSO source which has not been mitigated correctly, the compensation to the affected users must be reasonable.

Issue raised by HNP

Funding modifications to new User's Plant

- The change to the system is the new User's Plant.
- The party who triggers the change, *i.e. the new User*, would ordinarily incur the costs associated with maintaining compliance.
- The responsibility of compliance might lie down with someone else (e.g. HVDC Converter owner or Transmission Licensee).
- This has been applied consistently for other Grid Code requirements such harmonics and voltage step changes.



Issue raised by HNP

Funding modifications to new User's Plant

- Assuming that a User applies to connect a synchronous generating unit and there is a risk of interaction with
 - Case 1: Another User's HVDC converter
 - Case 2: A Transmission Licensee's plant (converter or series capacitor)
- Case 1: The new User incurs all the costs.
- Case 2: The new User incurs only the costs of modifications to their plant

	Case 1	Case 2
Existing plant	User's HVDC Converter	Transmission plant
Applicable Grid Code provisions	CC.6.3.16	GC0077
Applicable NETS SQSS provision	N/A	GSR018
Party accountable to mitigate SSO risks	HVDC Converter owner	Transmission Licensees
Funding of any modifications to existing plant (User's HVDC Converter/Transmission Licensee's HVDC Converter/Transmission Licensees series capacitor)	New User	Transmission Licensee
Funding of any modifications to new User plant	New User	New User

Issue raised by HNP

Funding modifications to new User's Plant

- The proposal relieves the new User from funding any modifications to existing Transmission Plant/installations of new Transmission Plant that are required to mitigate SSO risks.
- This assumes that the Authority will allow Transmission Licensees funding for SSO mitigation measures where it is economic to do so.
- The workgroup took a view that this is consistent with the existing practice and transmission charging methodologies.
- If this is deemed to be inconsistent, we could revert back to an arrangement where a new User funds all the works required to mitigate SSO risks in line with the practice used to comply CC.6.3.16.

Issue raised by HNP

Potential scope of SSO related User Works

- The proposal assumes that both Transmission Licensees and Users will work closely with their suppliers to identify the appropriate SSO mitigation measures.
- It is expected, in general, that modifications to new plant are cheaper and easier to implement than modifications to plant that are already in service.
- The optimal solution would be a User procuring an of-the-shelf Generating Unit that does not interact with existing transmission plant. Where this is not feasible, e.g. expensive/technically challenging, other options will be explored.
- It is expected that the costs associated with any specific SSO mitigation measure will be taken into account when specifying these measures.
- It is not unreasonable to expect that the costs associated with a specific User mitigating SSO risks arising from their own choice of a plant and a connection site will be paid for by this User.

Issue raised by HNP

Text proposed for the Bilateral Agreement

- Once SSO mitigation measures have been identified, the responsibility of ensuring that no Unacceptable SSO take place will be shared between NGET and the User
 - NGET will operate the system in a manner that does not reduce the damping levels below that which have been agreed with the User.
 - The User will operate their plant in a manner that ensures that their plant does not interact with this transmission system to cause Unacceptable SSO.

- Consistent with existing practice

- The intention of the clause is to ensure that the User will not
 - Overlook a certain SSO risk in design time scales
 - Switch off any equipment that are required to mitigate SSO risks
 - Re-tune their AVR, PSS, any additional supplementary control loop, or any of their Power Park Module control system parameters in a manner that triggers unacceptable SSO.

Conclusions
