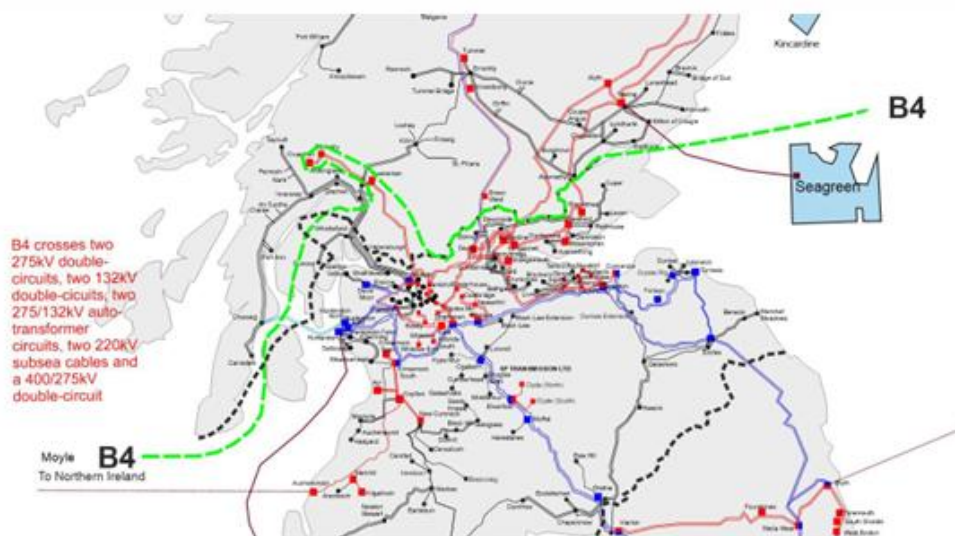


Annex 03 – Case Studies 1, 2 and 4

Case Study 1 – Scotland (Constraint)



The NESO SME explained that this scenario shows a North-to-South power flow across the Boundary B4 in Scotland, where cascade tripping –subsequent tripping of the overloaded circuit– allowed an outage to proceed without breaching SQSS clauses, resulting in significant cost savings. The NESO SME clarified that the relaxed criteria used in Scotland facilitated such outages.

There are no mitigating actions that can be taken post fault to reduce the overloads whilst keeping the same constraint limit. The overload on the circuit is approximately 130% – 150% of its post fault continuous (PFC) rating and has a short-term rating (STR) rating of approximately 108% to 115% of its PFC. It was identified that cascade tripping this circuit does not cause widespread disturbance on the network. No impact to DNO, TOs or generators were seen. By cascading and instead securing for the subsequent fault, the constraint limit can be increased by 300MW – 350MW. As the excessive overload was successfully managed without resulting in any noncompliance with the SQSS requirement in clause 5.3, the outage was permitted to proceed. The unavailability of the cascade would incur significant boundary cost.

Workgroup members questioned the technical and regulatory implications of this scenario, including the use of backup protection and the distinction between acceptable and unacceptable overloading.

A question was also asked in regard to whether the assumed cascade tripping is a planned mitigation or merely an emergency response, and whether such reliance should be formalised through a risk assessment if applied outside Scotland.

In summary the case study illustrates that a cascade tripping scheme can be a means of complying with SQSS clause 5.3. In this case study there would be no need to consider application of a risk-based approach proposed for clause 5.11.3.

Case Study 2 – Scotland

The NESO SME explained that this case study is in regard to an outage request in the Northwest of Scotland. The substation consists of three Super Grid Transformer (SGT)s and several Main Interconnected Transmission System (MITS) circuits.

In this scenario, an outage on two SGTs and a circuit was considered. A fault on the double circuit in the region would lead to overloading of the remaining SGT between 108% – 120% of its STR rating and 130% –150% of its PFC rating. Although the SQSS does not contain specific clauses requiring the NESO/TO to secure for the aforementioned Double Circuit (DC) fault, as a prudent system operator, NESO would implement these security measures to avoid incurring costly balancing actions.

The overload would continue during the fault because the Over Current (OC) protection threshold would not be met. Without an agreement for cascade tripping the remaining SGT, the outage would not have been able to proceed as it would lead to operability challenges on the network. Alternatively, the SGT would need to be taken pre-fault, which reduces demand security. Workgroup members cautioned that this type of scenario may not directly justify an SQSS change but remains relevant in understanding how risk is already assessed in practice.

In summary, the case study illustrates that whilst a cascade tripping scheme may not be required to ensure compliance with the SQSS, they can be helpful to manage network risks beyond those in the SQSS, which a prudent system operator would consider. In this case study there would be no need to consider application a risk-based approach proposed for clause 5.11.3.

Case Study 4 – England & Wales: Circuit overload and constraint reduction

The NESO SME explained that this scenario examines south-to-north power flows where there is a circuit outage in Northeast of England. The assessment identified that the most severe trip scenario, which is a DC fault. Such DC fault overloads an adjacent circuit, which in turn creates the constraint. (SQSS 5.4.3)

The NESO SME confirmed that cascade tripping of the overloaded circuit was studied. However, no widespread thermal or voltage issues on the network were identified. Generators stability assessments were carried out by RMS modelling and no issues were identified. Cascading the overloaded circuit when the DC fault occurs would allow for an increase in the constraint limit of around 600 MW. The

Workgroup noted that while constraint savings are important, they cannot override safety or asset integrity considerations.

In summary, the case study illustrates that a cascade tripping scheme can be a means of complying with SQSS clause 5.4. In this case study, there would be no need to consider the application of a risk-based approach proposed for clause 5.11.3.