



Open Networks Project Reliability Standards & Emergency Requirements (WS1 P4)

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Executive Summary

This document reviews the current versions of the distribution and transmission security planning standards and draws out the common elements between how these standards are approached. Any planned changes are also reviewed to understand the trajectory of changes in light of whole system planning.

It also seeks to ensure any barriers to meeting whole system planning requirements are identified and outlines further development required to best facilitate planning across the transmission/distribution boundary.

There are differences between the P2 and SQSS planning standards, however these differences are not perceived to prevent whole system planning. The planning standards themselves will not be the key catalysts for whole system planning and processes contained within other codes (e.g. Grid Code and CUSC) should be the correct route to allow this to happen. Any future modifications to SQSS and P2 must be viewed through the lens of whole system planning to ensure they would not create a barrier in the future. Care should be taken to identify any future modifications needed to P2 and SQSS early enough so that the two independent lengthy governance processes do not pose an issue.

Review of P2-7 and SQSS v34

1. Purpose as a minimum standard

Both documents are set out as being a minimum design standard. It is permissible to design to standards higher than those set out in the two documents, provided the high standards can be economically justified. Additional cost on one side of the transmission/distribution boundary which then enables a more economic whole system solution would not be prohibited as long as the whole system solution was economically justified. Both transmission and distribution systems can be developed to a lower technical standard subject to a derogation sought from the regulator.

2. Defined credible fault conditions

SQSS explicitly differentiates the type of outage (fault vs planned) and equipment (circuit, busbar, coupler circuit breaker, mesh corner etc) in order to exactly define the requirement for security. P2 also defines the type of outage, by referencing circuit outages which inherently includes all items of equipment within the circuit, however does not explicitly define the required security following the outage of an individually specified item of network equipment.

3. Likelihood of faults

SQSS quantifies the likelihood of outages by explicitly determining the maximum linear assets within a circuit, depending on energy output. This approach is not directly mirrored within P2, albeit the materiality as to which these factors affect distribution network assets may have been considered negligible. Both P2 and SQSS limit the impact of outages using a risk based approach centred on expected energy not supplied.

4. Security of generation;

The SQSS, requires that generation have system access following an outage (N-1) and that the system would have sufficient capacity to accommodate the full MW capacity and the reactive capability of the power station both at intact conditions and following specific fault outages. Generation connections on the distribution network tend to favour connections with N-0 security, or lower levels of security through ANM systems, due to cost.

5. Using generation to secure demand

Both standards allow the use of generation to secure the demand although the scope varies. For SQSS Section 3, The security contribution of Small and Medium EG is determined based on DNOs submissions. Rules for Large generation are specified in the standard.

Under P2 metered generation and estimates of unmetered generation are to be taken into account, either according to EREP130 or other methodologies used by the DNOs. Non metered generation is covered as only measured demand is secured for.

6. Pre & post fault loading criteria

SQSS defines the pre and post fault loadings, including the static & dynamic electrical characteristics, e.g. voltage, stability, etc. which must be maintained. These are not defined within P2, with voltage limits being defined in other standards, however, post outage loads are limited by a functional requirement that assets are not excessively overloaded.

7. Economic test.

SQSS describes how investment in transmission capacity should be completed to meet the deterministic criteria and how operational measures can be used to secure beyond the deterministic criteria if this is more economic. P2-7 does introduce the concept of using DSR automatically dispatched by ANM, DERMS or other methods to secure the network, but mainly to ensure the DNO is suitably assessing the common mode failure of these operational measures, including the probability of DSR providing the required security. Operational measures on the transmission network have historically been deterministic intertripping schemes, which do not require this risk-based analysis, or balancing service or outage planning, which do.

Identified barriers to whole system planning

- There are multiple differences between P2 and SQSS currently and further alignment to capture best practice within these security standards, which may mitigate the impacts caused by an increase in DER, could be completed. These current differences do not pose any immediate barriers to whole system planning.
- P2-6 was published in July 2006, with P2-7 still being in draft. Similarly, SQSS v2.2 was published in March 2012 and v2.3 was published in February 2017. Security standards underpin one of the main outputs of system and network operators and ensure vital electrical robustness. Alterations to the standards should not be taken lightly, however the current pace of change for proposal, review and implementation of these security standards may present a significant barrier to whole system planning in case a need to implement such alterations is identified in the future. This would particularly be the case, should the modifications which would better facilitate whole system planning be implemented incrementally. Should any required changes be identified, then the implementation of a whole system planning approach in the next 1-2 years would need commitment from all parties. It should also be noted that the methodology for whole system planning is not likely to be codified from the outset, so a period of collaborative development outside of codification is likely.
- SQSS and P2 come under different governance procedures and revisions are not currently published in alignment so assimilation of the two standards, if and when required, is not likely to occur simultaneously. This may present a barrier to whole system planning as the implementation would only be possible after both documents are altered, potentially increasing the time taken for implementation. However, there is a possibility to have joint Distribution Code and SQSS workgroups. Also, changes to implement SQSS and P2 both have to be signed off by Ofgem, so there is a common point in the governance process, which could be used to provide better alignment.
- Whilst both security standards permit the network to be designed to a higher specification than required as a minimum, the additional costs incurred will have to be justified and borne by the party carrying out the works. Whilst cost recovery between transmission and distribution is theoretically possible, the lack of an agreed process or framework will hinder.
- Until codes are fully reflective of a whole system approach it is possible that there may be uncertainty between parties (DNO, TO, SO) as to who has the responsibility to identify network needs and who should co-ordinate and lead any assessment work. This could slow down the identification and delivery of best options. There may also be uncertainty as to how any one licence can demonstrate compliance with licence requirements when that compliance is dependent on an independent 3rd party.

Recent & Planned changes

P2-7 has recently been through a public consultation period, introducing a number of new considerations, namely:

- some demand customers are modifying their electricity consumption in response to market signals; this means that further consideration has to be given to establishing the true demand on the network;
- in addition to providing security of supply from network assets and distributed generation, demand side services can also contribute to security of supplies; and
- the nature and type of distributed generation connected to the network mean that their contribution to security of supplies is different to that in preceding versions of ER P2.

The latest version of SQSS v2.4 introduces some minor additional considerations around sub-synchronous oscillations and this has also recently been through a public consultation period. There is also a modification that is currently being considered by Ofgem that facilitates consistent treatment of all embedded generation in wider system planning studies.

For subsequent versions of P2 and SQSS, the working groups are looking at reviewing the size of demand groups, particularly when calculating the security requirements using gross demand as an input. A focus on achieving closer alignment between P2 and SQSS Section 3 will have to be maintained as they both use this to calibrate security requirements.

Further development required to best facilitate whole system planning

- The extent to which generation is and is not secured on the distribution network, and how much this generation can contribute to demand security will be a key issue as DNOs transition to DSOs. This will also affect the reliance the SO has on services procured from DER. Whilst the current security standards do not pose a barrier to enabling this, P2-7 is not prescriptive in its approach. ETR130 does go further in developing this methodology and process for distribution networks, but needs updating to capture the latest developments in DER technology and growth.
- The balance between network security and economic development of networks is a key challenge, particularly in the face of increased embedded generation on the distribution network. Further work in ensuring the balance of maintaining secure network capacity versus facilitating the contribution of security from embedded generation and DSR should be undertaken.
- The minimum security standards do not pose a barrier to one network or system developing an enhanced solution which provides a more economic whole system solution, however the lack of a clear shared methodology and framework or process for sharing the costs between network or system operators may inhibit progress.

Learning from RDPs and other trials

Following work within UKPN & WPD's Regional Development Programmes undertaken in collaboration with National Grid SO, significant value has been demonstrated by increasing operability through utilisation of short-term ratings on distribution networks. SQSS distinguishes between pre and post fault ratings for network equipment and this may need further formal consideration within P2, beyond the emergency ratings currently referenced.