Northpower

Future Security and Resilience – Review of Common Quality Requirements in Part 8 of the Code

30 May 2023

Overview

Northpower welcomes the opportunity to provide feedback on the Electricity Authority's review of Part 8 Common Quality Requirements.

If you have any queries or would like further information please contact

Mike Gibbs
GM – Network Investment and Strategy
Mike.gibbs@northpower.com

Q1. Do you agree with the description of the first common quality issue and that addressing it should be a high priority? If you disagree, please provide your reasons.

We agree that changes in the generation landscape in coming years are likely to make management of system frequency more challenging, in particular:

- Increases in intermittent inverter-based generation (eg. wind and solar)
- Gradual retirement of synchronous generators (eg. gas, coal). - falling inertia as a result
- New general plant sizes are likely to be distributed and therefore have a smaller average size, compared to historically where very large generators were constructed on a single site.

Possible consequences include increased risk of 'blackouts' and increased reliance on automatic load shedding for under frequency events i.e., a more vulnerable and less reliable grid.

Q2. Do you agree with the description of the second common quality issue (ie, first voltage-related issue) and that addressing it should be a high priority? If you disagree, please provide your reasons.

We agree that the changes in the generation landscape in coming years are likely to make management of Voltage more challenging. The electricity networks were designed with one way power flow in mind and two-way power flows will push the Voltage beyond the present operational limits (if large enough). This may lead to the distribution network operating beyond the limits specified in the Electricity (safety) Regulations 2010.

As renewable generation is being installed at all Voltage levels, (LV, HV distribution, sub-transmission and transmission), this issue is pertaining to all levels of the electricity network.

Q3. Do you agree with the description of the third common quality issue (ie, second voltage-related issue) and that addressing it should be a high priority? If you disagree, please provide your reasons.

We agree that the changes in the generation landscape in the coming years are likely to impact network performance due to system strength. This could lead to cascade tripping of generation and load that is sensitive to Voltage and frequency. From a consumer's point of view this equates to a reduction in the reliability of the network.

There is also a safety issue for both the public and electrical workers due to the potential to cause the protection to mal-operate, as the protection is more likely to not operate for a fault.

Q4. Do you agree with the description of the fourth common quality issue (ie, third voltage-related issue) and that addressing it should be a high priority? If you disagree, please provide your reasons.

We agree that there will be more generating stations of less than 30MW. A key reason for this is that the distribution network and sub-transmission network are close to more potential PV solar farm sites than the transmission network. Because of the scalable nature of PVs and the ability to secure medium size parcels of land PV solar farms of less than 30MW are becoming more viable.

A second point about the Voltage / duration curves in Part 8, for EDBs with large motor loads the Voltage depression will be greater than that measured at the grid for a grid disturbance.

Q5. Do you agree with the description of the fifth common quality issue and that addressing it should be a high priority? If you disagree, please provide your reasons.

We agree that there is some ambiguity in regard to harmonic standards or codes, however we also believe that some are no longer fit for purpose.

- NZECP 36 was published in 1993 and has never been revised. When published there were no inverter-based appliances nor network connected inverter-based generation. Not only does the technical content need to be updated but the scope as well.
- IEC 61000 series of standard (including the AS/NZS version) are technically more up to date but have some deficiencies around the harmonic diversity and harmonic allocation when there are multiple connected parties.

The EEA 'Power Quality (PQ) Guidelines' is technically a better document however it cannot be cited in the Code or regulations is it is an 'Industry' publication.

Q6. If you are a distributor, what is your experience of asset owners sharing information with you for network operation purposes?

The below summarises our experience from both Large and Small DG developers.

Large DG

- There has been some reluctance to share information regarding generator behaviour or technical models, citing confidentiality of their manufacturer
- Generators dislike having responsibilities to both system operator and distributor. They argue that instructions from system operator should override distributor.

Small DG

- Distributors have little control over what gets installed. There are widespread examples of unbalancing the system by placing everything on 1ph to use a cheaper inverter. The unbalancing of the system has the potential to cause overloading and voltage issues for customers on the LV network.
- Distributors have little visibility of what is behind the meter, no meter data is available so distributors no visibility of how the DG is operating.
- Distributors have no control over small DG

Q7. Do you agree with the description of the sixth common quality issue and that addressing it should be a high priority? If you disagree, please provide your reasons.

We agree in general about the statements made. However, a significant amount of DG was always going to be invisible to the System Operator given the amount of DG installed at consumer's installations. The economics of consumers displacing load with generation are better verses the economics of a stand-alone generator selling to a retailer.

Part 6 of the Code has been written to make it extremely easy to connect DGs to the EDB's network and further streamlined with part 1a. The issue for EDBs is not so much knowing where the DGs are, size and type of energy source but the operational status and if any alterations have been made. Equipment has a lifecycle and therefore equipment will be changed over time. In addition, the inverter settings are programmable and can be changed, which could change the performance of the DG system. Potentially this issue could apply to larger generation schemes as well.

Q8. Do you agree with the description of the seventh common quality issue and that addressing it should be a high priority? If you disagree, please provide your reasons.

We agree, the Code needs to keep up to date with recent technology and the associated new terminology as well as clarify ambiguous terms or add definitions that are missing.

We would suggest in some cases using generic terms such 'reactive power compensation equipment e.g. SVC, STATCOM, SSSC etc' rather than stating just one type of reactive power equipment.

Q9. Do you consider there to be other high priority common quality issues not identified in this paper that are occurring or that you expect to occur because of:

a) the uptake of inverter-based resources, and/or

b) how the Code enables different technologies?

While we believe that the Code applies to network connected batteries, the Code should state this point more clearly. Batteries are already appearing at all levels of the network and customer installed solar PV + battery systems are becoming common. Large scale Grid connected batteries may be a partial solution to some of the issues discussed in the paper.

The rapid uptake of EVs need to be considered (not just inverter connected generation). EV charging is a non-linear load and will produce harmonics whether the EV charger is on-board the EV (mode 2 & 3 AC charging) or external (mode 4 DC charging).