Tesla Consultants
Specialist Consultants to the Electric Power Industry

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Electricity Authority
PO Box 10041
Wellington 6143

Re: Issue paper – Part 8 common quality requirements

Tesla Consultants is committed to collaborating with local stakeholders in New Zealand to reach 100% renewable energy use, and offers a range grid connection, distribution and transmission engineering services to facilitate the connection of new generation.

Our Engineers have extensive experience with connection of synchronous and inverter-based generation, and regularly complete assessments to demonstrate compliance with Part 8 of the Electricity Industry Participation Code. We have developed great relationships while working with stakeholders across the Electricity Industry, including generators, Electricity Distribution Businesses (EDBs), Transpower and various large customers. Tesla strives to understand the views and objectives held by each stakeholder and represent these fairly in the services it delivers.

We have responded below to the questions raised by Electricity Authority in its '*Issue paper Part 8 common quality requirements'* document, as part of its consultation process for its '*Future security and resilience'* project.

Question		Comment
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 clauses in Part 8 relating to frequency control should be addressed as a high priority. We disagree with the description that inverter-based resources cause more frequency fluctuations. Investigations into similar fluctuations in Australia indicated the issues were more due to the mechanism for regulating frequency: https://wattclarity.com.au/articles/2017/03/fast-frequency-service-treating-the-symptom-not-the-cause/ https://www.aemc.gov.au/sites/default/files/2022-09/PFR%20Incentive%20Arrangements_%20Final%20Determination_8SEPT2022.pdf Inverter-based resources can play an important role in

		improving frequency control; Battery Energy Storage Systems (BESS) are particularly well suited for provision of near instantaneous frequency control.
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 clauses in Part 8 relating to voltage control should be addressed as a high priority. We disagree with the description that voltage deviations and changing reactive power flows are primarily linked with inverter-based resources, though notes increased diversity of intermittent generation sources (both synchronous and inverter-based) may increase the operational complexity of the grid. To achieve the priorities of available low-carbon electricity and affordable electricity listed by Electricity Authority on its website, the grid needs to remain stable for the most economic generation mix based on resource availability. We note that significant research is underway internationally to optimise the control algorithms and associated parameters for inverter-based resources, and expect further research will be required to determine suitable requirements for implementation on the electricity network in New Zealand.
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 disagree with the description of the third common quality issue (that inverter-based resources can cause network performance issues) and the need to address it as a high priority. As more generating sources connect to New Zealand's electricity network, there will be more generation units connected to the grid at any given time. As the total MW capacity of the network grows, the relative proportion supplied by each generating site reduces, making the grid more resilient for a performance issue at any individual site. At present, there is considerable diversity in the generation technology used and their applied settings, which makes common mode failure involving multiple generating sites unlikely.
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 disagree with the description of the fourth common quality issue (that inverter-based resources can cause network performance issues) and the need to address it as a high priority – *in the context of Part 8 of the Electricity Industry Participation Code.* In our view, operating requirements for generation connected at the consumer level are best defined by international standards, and should generally align with the

	common quality requirements of the Code. Most proposed generating sites with a size between 10-30 MW are already assessed according to Transpower's guidelines for the connection of new generation (GL-EA 953) during the grid connection process and any significant risks are highlighted during this activity. Accordingly, we do not believe this issue needs to be addressed as a high priority.
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 with the description of the issue, and the need to address this as a high priority. Ambiguity of harmonic standards and management of harmonic issues has the potential to slow the grid connection process, hindering New Zealand's transition to low-emissions energy sources.
Q6. If you are a distributor, what is your experience of asset owners sharing information with you for network operation purposes?	-
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 with the description of the issue, and the need to address this as a high priority. We believe that more discussion is necessary between all stakeholders, so that the performance characteristics of each network component are well understood. This will ensure the effective operation of New Zealand's electricity network.
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 with the description of the issue, and the need to address this as a high priority. We anticipate further thought is required to update Part 8 such that it recognises and encourages each generator to provide the unique benefits offered by the selected generation and/or demand response technology, without requiring a 'one size fits all' approach.
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?	We believe the following issues would also benefit from review, in conjunction with the issues identified above: **<u>Asset capability due to simultaneous application of voltage and frequency obligations (clauses 8.19 & 8.23)</u>** It is unclear in Part 8 whether clause 8.19 (contributions to frequency support in under-frequency events) should be applied simultaneously with clause 8.23 (voltage support obligations). Simultaneous application of both of these clauses implies that synchronous generators must remain near maximum terminal voltage down to very low frequencies; often this is in conflict with their continuous or short-time overfluxing capabilities, resulting in some cases in dispensation applications for a scenario which is

	extremely onerous, and unlikely to be met by any generator manufacturer. We suggest that these clauses be reviewed or clarified with a view to align them with typical flux withstand capabilities offered by many generator manufacturers. **<u>Co-ordination of Power System Stabiliser (PSS) Settings</u>** At present, the System Operator is not able to assist with determination of appropriate PSS settings. At present, the connecting party is responsible for selecting the most appropriate settings, but the connecting party generally has insufficient information to determine them; namely accurate dynamic models of the entire system, and information on the modes of oscillation that require damping. This has resulted in multiple projects where the PSS is either 1) turned off or 2) enabled with no thought as to the best outcome for power system stability. This contrasts with other countries, such as Australia, where AEMO is more 'hands on', and will support the connecting party with the selection of settings, so it is well coordinated with other systems. **<u>Ambiguity around Part 8 Protection Requirements</u>** The requirements in part 8, Technical Code A pertaining to protection are specific only for 220 kV assets (exclude guidance on protection for busbars). Given the ambiguity at all other voltage levels, Tesla has observed a wide variance of practice and currently observe that protection co-ordination activities constitute a significant risk to a project's viability. If substantial quantities of generation are connected to the distribution and 110 kV networks, it is likely (except where the asset owner proactively decides to install duplicate protection systems) that most will use at best one protection system with remote (slow acting) backup. This could result in degraded system stability.

We look forward to engaging further with the Electricity Authority and other stakeholders on this project, during subsequent stages of the review process.

Yours Sincerely,

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