Appendix A Format for submissions: Integrating hosting capacity into Part 6 on low voltage networks

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A.1 Please use the following table to provide your feedback on the questions included in this paper.

Question	Response
Q1. Have we adequately outlined the issues with increasing levels of SSDG, particularly inverter-connected solar PV systems?	The paper outlines the challenges well, including local effects on voltage, low voltage ride-through requirements, and harmonic levels. These challenges may affect power quality to all consumers connected to the same low voltage network and may affect the reliability of small-scale distributed generation systems (for example, an inverter that cannot ride-through intermittent low voltage events may manifest as an unreliable inverter, possibly requiring callouts by technical personnel to reset it). The paper also addresses wider power system considerations such as system frequency, and the utmost importance of inverters responding correctly to system frequency excursions. During the development of the EEA guide for the connection of small-scale inverter-based distributed generation (the EEA Guide) a number of submissions were made to Standards Australia to have the appropriate New Zealand system frequency, local voltage and harmonic parameters included in the AS/NZS 4777.2:2015 standard. Submissions were also made on the draft version of AS/NZS 4777.1:2016. Parameters for both standards are reflected in the EEA guide, which also includes additional requirements specific to New Zealand (harmonics for example). The changes were based on substantial research, led by the University of Canterbury, and contributed to by the EEA, Transpower, numerous distributors, and

	inverter manufacturers.
Q2. What other factors are relevant to these technical network considerations?	Other relevant technical considerations are anti-islanding protection requirements of the AS/NZS 4777.2 standard and the EEA Guide. These are relevant to ensure safety of consumers and of personnel working on low voltage networks during network outages. It is noted that large scale deployment of DG in low voltage networks may also result in power quality issues on medium voltage feeders, particularly long rural feeders. The methods of voltage control required in the EEA Guide are important in limiting those power quality issues in medium voltage networks also. In some situations, hosting capacity may be determined by the capacity of medium voltage feeders.
Q3. Do you agree these options broadly represent the range of actions we could consider at this time? Are there other broad conceptual options we should consider that are not covered by these three approaches?	Yes
Q4. Do you think the Authority should pursue the types of measures that Option B would require? If not, please outline your alternative preferred approach, including if possible the costs and benefits. If you consider there is a valid Option C-style alternative, please provide details, including your view on how your alternative would meet the Authority's statutory objective.	Option B is supported.
Q5. Do you have any comments on the draft EEA guide's stated objectives?	In its preface the EEA Guide states that the Guide was developed to: "…promote a consistent approach to managing the connection of PV-Inverter systems in a safe, efficient and equitable manner throughout NZ. This will enable customers to invest in confidence without creating overloading, power quality, and safety issues for local networks." This objective is supported. A consistent approach throughout New

	Zealand is important given that a number of PV solar installers operate nationally.
Q6. What advanced power quality capabilities do inverters sold into the New Zealand market possess?	
Q7. Is it reasonable to assume that the advanced power quality modes outlined are currently available in the marketplace at no additional cost? If not, what are the likely incremental costs involved to obtain these modes?	
Q8. Would a default requirement to provide volt-var and volt-watt modes for all future inverter installations that use the Part 1A connection process have any unintended adverse consequences (for example, leaving a stock of unsold inverters that are otherwise compliant with the superseded AS4777:2005 standard suite)? Are these adverse consequences surmountable?	A phase in period of inverter compliance with the AS 4777.2 standard to the AS/NZS 4777.2 standard may assist.
Q9. What comments do you have about the hosting capacity assessment process described in detail in the draft EEA guide?	The 'traffic light' system described in the EEA Guide provides a practical means of self-assessment of small-scale DG installation requirements in terms of their inverter requirements and size. This could potentially be undertaken by the consumer wishing to install DG, or the DG installer, if the local distributor made hosting capacity available by address (such as via a lookup on its website). The traffic light system described in the EEA guide does still allow for AS 4777.2:2005 compliant inverters to be installed that may not have power quality response modes available. I believe that: (1) only AS/NZS 4777.2:2015 compliant inverters should be installed because only this standard has appropriate voltage and frequency settings for New Zealand (as per Q1); and (2) power quality response modes should always be enabled because this will maximise the capacity of each low voltage distribution network to host small-scale DG and will provide the

	greatest protection against voltage quality issues and overloading. In this respect I further support Option B. In terms of actual determination of hosting capacity, it may be appropriate for the EEA Guide to remain silent on commercial tools available for this, to ensure no commercial advantage to any one provider of that service.
Q10. Do you support the Code amendment request discussed in the draft EEA guide? If not, please explain why and, if possible, suggest an alternative approach.	Yes
Q11. Do you think there is a problem or conflict with the '10 kW total' versus '5 kW per phase' thresholds respectively adopted in the Code and AS/NZS 4777.2:2015? If so, would you support aligning the Code threshold with the inverter standard?	
Q12. Do you think there are emerging problems with capacity or power quality from in-home electric vehicle chargers, or is it too early to tell? We are keen to hear industry views and experiences and from parties that supply electric vehicle charging equipment.	Electric vehicle chargers have the potential to congest low voltage networks in particular through overloading of transformers and lines, as well as reducing voltage. Harmonics may possibly be is issue with large scale deployment.