Submission.

Maximising benefits from local generation

Submitter	Nu'uali'itia Andrew Redwood
Submitter's organisation	

Executive Summary.

I agree with the overall intent of the proposals to increase export limits. However these proposals don't provide much benefit to households with 2 phase or 3 phase connections. I propose that the default 10kW export limit should be per phase, meaning an effective default export limit of 20kW for 2 phase connections, and 30kW for 3 phase connections. And if a distributor sets a default export limit of less than 10kW for part or all of their network, then that limit should also be per phase. As there is often a mixture of single phase, 2 phase, and 3 phase houses in an area and sometimes connected to the same transformer. Any blanket rules that don't consider the number of phases places unnecessary restrictions on export and inverter capacity for multi phase properties. As 10kW on 3 phase is only 3.33kW per phase.

Reason is almost all LV distribution networks in NZ use 3 phase transformers and wiring. But there are varying policies as to how individual households connect. Single phase to each house is most common. But some networks require 2 phase per house. And for large houses, often 3 phase. However in rural areas especially, where often there is only a small transformer serving very few houses, typically a 3 phase connection is mandated, to help maintain balanced loads on the small transformer. And having 3 phases, but less load per phase reduces volt drop on long lines. When there is a large imbalance in load or export between the different phases, this causes high currents on the neutral wire going back to the transformer. The higher voltage drop, combined with the differences in phase angle between the different phases, causes the voltage on the other phases to increase higher than the voltage at the terminals on the transformer. This can especially be a problem if the LV network was originally built with a smaller neutral wire Vs the phase wires. Because when the load on all 3 phases is equal, the current on the neutral wire is zero. This also means that a 15kW 3 phase inverter will cause less increase in the voltage on the LV network compared to a 5kW single phase inverter. Due to the single phase inverter causing neutral current to increase.

Properties with 2 phase or 3 phase are already at a disadvantage due to NZ metering rules, which don't allow subtractive metering, resulting in import and export not being netted across the phases. Which makes it harder to design and install a

solar system for max power savings. As often different phases will be exporting and importing at the same time. Larger inverters, with active phase balancing are needed to counteract that. Some solar companies refuse to install solar in houses with 2 phase or 3 phase due to that. As there are higher risks that the customer might be disappointed with the performance / savings from the solar system. 3 phase properties will become more common in the future. As all electric houses with EV charging for multiple EVs become standard. As often existing large houses are on single phase, because they use gas for hot water, cooking, and sometimes heating. Converting those houses to all electric would likely require 3 phase.

Questions	Comments
Q1. What are your views on the proposal to set a default 10kW export limit for Part 1A applications?	I agree, as long as the default is 10kW per phase. Vector already allow up to 30kW for part 1A applications (10kW per phase). As long as compliant inverters are used.
Q2. What are your views on the Code clarifying that a distributor cannot limit the nameplate capacity of a Part 1A application, unless the capacity exceeds 10kW?	The nameplate capacity should be limited to the connection capacity of the property. As there are houses which only have 8kW single phase connections. A 10kW inverter on such a connection creates extra safety hazards. Meanwhile some 3 phase houses have 45kW capacity. Plenty of extra capacity to host larger inverters. Connection capacity information is already available on the EA Your Meter website. So consumers and solar companies can easily check the max inverter size for any property, before submitting a DG application.
Q3. There are requirements for distributors in Proposal A1. Which of these do you support, or not support, and why?	Support in general. But as above, capacity should be based per phase. The max inverter capacity for part 1A should be increased to 30kW (10kW per phase)
Q4. What are your views on the proposal for industry to develop an export limits assessment methodology?	Agree
Q5. What would you do differently in Proposal A1, if anything?	Amend the application fees structure to be based on export capacity per phase. Up to 5kW per phase – no application fee. Above 5kW per phase – fees as per the existing 10kW and above application process. This will better align the cutoff between free and paid

	applications with the likelihood that a proposed solar installation might cause network problems. Avoid fees being charged to people who want to install large inverters, but who have no intention of exporting. EG batteries for time shifting their peak demand. Or they use lots of power, therefore almost all solar power they generate will be self consumed instead of exported. As well as provide a disincentive for people to install large solar systems that can only export any meaningful power in the middle of summer. Vs systems that can export all year long. When assessing single phase and 2 phase applications. A big part of the process will be checking which phase a single phase household is connected to, and how many other households with DG are also connected to that phase. As a large imbalance between the amount of DG on each phase will cause problems. And there might even be a scenario where a phase might be at it's max DG capacity, but there is spare capacity on the other phases. Therefore 2 identical houses next to eachover, one might not be able to install DG, while the other house can. Depending on which phase goes to each house.
Q6. What concerns, if any, do you have about requiring the 2024, rather than 2016, version of the inverter installation standard for Part 1A applications?	Some hybrid inverters can have grid connected inverters wired to their backup load ports in a "Slave" configuration, and can even allow the grid connected inverter to be used off grid. 2016 compliant inverters should still be allowed to be used with hybrid inverters that support that configuration. Will allow reuse of older inverters with very little risk to the grid, and for use where the inverter will never be connected to the national grid.
Q7. Do you support amending the New Zealand volt-watt and volt-var settings to match the Australian values for Part 1A applications - why or why not – what do you think are the implications?	Fully Support.
Q8. What would you do differently in Proposal A2, if anything?	Allow distributors to require that when the connection is 2 phase or 3 phase, the inverter must be a model that supports active phase balancing. And / or place restrictions on using multiple single phase inverters

	on 3 phase. To help maintain voltage stability across the phases. Also allow distributors to set higher curtailing / disconnection setpoints for 3 phase inverters, or lower setpoints for single phase inverters. Tripping / Curtailing single phase inverters reduces the current in the neutral wire, which in turn reduces voltage drop. Tripping / curtailing a 3 phase inverter doesn't reduce neutral current. In a scenario with a 3 phase inverter, and multiple single phase inverters in different houses, but the single phase inverters aren't evenly spread across the phases. One of the phases would have over voltage problems before the other phases. If a 3 phase inverter trips, only 1/3 of its capacity is removed from the phase that is over voltage. But the inverter owner looses all of their production / export. Since the inverter is no longer exporting on the other phases that were within voltage limits. Different setpoints for single and 3 phase inverters would help ensure that the minimum amount of inverter capacity is curtailed / disconnected if an over voltage condition happens. And making it less likely that inverters will cycle their output Vs settling into a state with a small number of inverters curtailed / disconnected, and the majority of inverters unaffected. If a 3 phase inverter with active phase balancing disconnects, and that property also has unbalanced loads turned on. The neutral current would actually increase, making the over voltage situation even worse.
Q9. Do you have any concerns about the Authority citing the Australian disconnection settings for inverters when high voltage is sustained?	As above.
Q10. Do you have any concerns about the Authority requiring the latest version of the inverter performance standard for Part 1A applications?	As per Q6.
Q11. What are your views on the proposal that where distributors set bespoke export limits for Part 2 applications, they must do so	Fully Support, assuming that part 2 only applies for inverters of more than 10kW per phase. Which can be implemented by increasing the inverter size limit in

using the industry developed assessment methodology?	part 1A, and saying that If the application doesn't meet part 1A, then part 1 or 2 applies as applicable.
Q12. What are your views on the several requirements that must be adhered to regarding the distributors' documentation (see paragraph 5.96) relating to setting export limits under Part 2?	No Concerns.
Q13. Do you agree it is fair and appropriate that where distributors set export limits for Part 2 applications, applicants can dispute the limit? If so, what sort of process should that entail?	Agree it is fair that limits can be disputed. But clarification should be made on what grounds an export limit can be disputed. Especially in relation to potential future DG applications from other consumers. EG someone applies to use up all spare export capacity. Should the distributor withhold some capacity in case other people want to use it? Or should it be First in First Served?
Q14. What would you do differently in Proposal B, if anything?	The cutoff between process's 1/1A and process 2 should be increased. As there is a massive difference between 12kW solar system and a 250kW solar system. Make the cutoff 30kW (10kW per phase).
Q15. What are your thoughts on requiring the inverter performance standard (AS/NZS 4777.2:2020 incorporating Amendments 1 and 2) for low voltage DG applications in New Zealand?	It should only mandatory for all part 1A applications. But allow distributors the freedom to set different export limits or other requirements where the DG is something other than inverters that comply with AS/NZS4777. As this clause would otherwise make it impossible to have diesel generators connected and synchronised to the LV network. Modified diesel generators are also sometimes used to burn biogas from landfills or sewage treatment. Im not aware of any problems caused by such generators being connected to the LV network. Or what problem would be solved if such generators were to be banned from connecting to the LV network.
Q16. Do you consider the transitional arrangements workable regarding requirements and timeframes? If not, what arrangements would you prefer?	No concerns.

Q17. What are your views on the objective of the proposed amendments?	Agree with the overall objective. But prioritization should be given to changes that allow larger solar systems / batteries etc for self consumption of power Vs exporting. As they will add very little if any costs to distributors, while still giving a large benefit to the DG owner. Especially in scenarios where a household with high fossil fuel use is switching to all electric.
Q18. Do you agree the benefits of the proposed amendments outweigh their costs? If not, why not?	Mostly agree. Subject to what I have already mentioned. Especially in relation to assessing export capacity on a per phase basis.
Q19. What are your views on the Authority's estimate of costs of lost benefits from a 5kW export limit?	Only somewhat agree. As some LV networks have a very large number of customers per transformer, mostly in areas built in the 1950s and earlier. As those houses all had gas / wood / coal heating / cooking / hot water at least in part from new. Therefore not much capacity per house. A higher than 5kW export capacity limit probably can't be supported in those areas. And since some retailers pay more for export from customers with inverters smaller than 10kW. If there were already larger export limits, those retailers would probably only pay the same that they offer to customers with larger inverters.
Q20. Are there costs or benefits to any parties (eg, distributors, DG owners, consumers, other industry stakeholders) not identified that need to be considered?	Consideration should be given to households without solar. As extra costs on distributors might cause the power bills of non solar households to increase. Need to try and avoid a repeat of what happened in Australia. Lots of solar installations caused import kWh tariffs to become really expensive. Negatively affecting people without solar. And encouraging fossil fuel use. Due to the marginal cost per kWh of electricity becoming higher Vs the marginal cost per kWh of natural gas or other fossil fuels. Distributors will need to be allowed to increase their daily fees for all customers. To avoid unnecessary increases to import kWh tariffs to cover fixed or general costs, which would become an indirect subsidy for fossil fuels. Although higher daily fees would be unpopular. They would allow retailers to sell off peak power for a similar price to what they pay for solar export. Allowing consumers without solar to access cheaper power, and giving higher payments for export to solar customers. As there will be buyers for the extra solar

	export enabled by these proposed changes. As the marginal cost per kWh has a bigger effect than electricity daily fees on peoples behaviour, when deciding on whether or not to use electricity, fossil fuels etc for a task.
Q21. Do you agree the proposed Code amendments are preferable to the other options? If you disagree, please explain your preferred option in terms consistent with the Authority's main statutory objective in section 15 of the Electricity Industry Act 2010	Agree subject to what I have already mentioned.
Q22. Do you agree the Authority's proposed amendments comply with section 32(1) of the Act?	Can't comment on this.
Q23. Do you have any comments on the drafting of the proposed amendment?	Needs to be modified to incorporate what I have suggested above.