Outlook

Export Limits Submission

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To Connection Feedback <connection.feedback@ea.govt.nz>

1 attachment (141 KB)

ECA Submission by Derek Chapman.pdf;

[redacted]

To whom it may concern,

Please find attached my submission on “Maximising benefits from local electricity generation” consultation paper.

Please note I am proposing something slightly different that may not have been considered as part of the original proposal. Even if the PV Export limit is raised, the Voltage constraint will remail.

Regards
Derek Chapman
Mob: [redacted]

Derek Chapman
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Mobile: [redacted]

17 November 2025.

Electricity Authority - Te Mana Hiko
PO Box 10041
Wellington 6143

Submission on *Maximising Benefits from Local Generation* Consultation Paper

Dear Electricity Authority Team,

Thank you for the opportunity to provide feedback on the consultation paper *Maximising Benefits from Local Generation*. I strongly support the Authority's objectives to remove barriers to distributed generation and enable more efficient export limits (10kW/Hr), as these changes will help strengthen network resilience, reduce emissions, and empower consumers to participate in New Zealand's energy transition. My submission is from a point of view that may not have been considered as part of the original proposal.

Recommendation: Adjustment to Nominal Voltage

While endorsing the EA's proposal for "*Maximising Benefits from Local Generation*", I recommend that serious consideration be given to a complementary change to the regulated nominal voltage settings under the Electricity (Safety) Regulations:

- **Nominal voltage:** Propose lowering of the Nominal voltage from **230 V ±10%** to **220 V** +15%/-6%
- **Permitted range:** Retain Upper limit **253 V**, lower limit **207 V**.

Why This Matters

1. **Current Daytime Voltages in NZ**

   Many low-voltage networks in New Zealand operate near the upper end of the current tolerance band during daytime, regularly exceeding 240 V at consumer points due to distributed generation and light loads. Including my own Solar installation, which regular peaks at 245V AC, resulting in current limiting and Power Injection falling below the allowable 5kW/hr. I also see significant increases in Reactive power, which is touched upon later in this submission.

   This creates headroom issues for hosting additional solar PV and EV charging breaching voltage limits.

The increasing use of distributed generation (particularly rooftop solar panels) is expected to change the pattern of power flows in low voltage networks. During the day, a large amount of solar PV generation flowing into the network (often refer to as exporting) coinciding with relatively low household demand could result in overvoltage (voltage exceeding the regulated upper limit) if no mitigating actions are taken.[MBIE: Amendments to the Electricity. To expand the permitted voltage]

2. **The Problem**

With the rise of solar panels and other local generation, voltage can increase and approach the 253V upper legal limit, causing some equipment like EV chargers and PV inverters to automatically trip as a protective measure.

Studies and network monitoring show that daytime voltages in many low-voltage networks often exceed 240 V due to light loads and distributed generation, reducing hosting capacity for solar PV. This can also have a negative effect on Inverter equipment (with increased Reactive Power) as sighted by National Renewable Energy Laboratory, USA, potentially causing premature equipment failure. [Effects of Reactive Power on Photovoltaic Inverter Reliability and Lifetime]

Voltage related impact are also cited by the University of Wollongong, Australia [Voltage Control and PV Hosting Capacity of Distribution Networks]

3. **Improved Hosting Capacity**

As I have proposed, lowering the nominal voltage reduces the risk of overvoltage if export limits are raised, enabling more distributed generation without costly network upgrades. Hosting capacity studies confirm that voltage control is a primary constraint for low power network integrations; reducing nominal voltage widens the margin for safe operation. As sighted by University of Wollongong, Australia [Voltage Control and PV Hosting Capacity of Distribution Networks]:

Adjusting off-load tap changers is highly effective for urban and short rural feeders in mitigating voltage problems. By decreasing voltage levels, it also prevents PV curtailments significantly.

4. **Impact:**

Acknowledging that there may also be some negative effects, overall, the effects are positive. Negative impacts may include:

Results show that overload problems mostly affect LV transformers rather than conductors. In this case, LV transformers face overload issues at lower PV levels (less than 40 % PV penetration) while conductor congestions happen at higher *levels (above 80 % PV penetration). Therefore, augmentation might be necessary for those over utilised transformers.*

Utilising PV inverter power quality response mode capabilities is highly effective in limiting overvoltage problems in both rural and urban feeders, keeping the maximum voltage below 1.12 p.u across all feeders. It was also observed that PV curtailments are very low for all studied PV penetration levels (less than 2 %). However, enabling PV inverter power quality response modes can increase the utilisation of assets due to the absorption of large amounts of reactive power by inverters. This can lead to the LV transformer overload at much lower PV levels compared to the case when the Volt/VAR function is not used. This function also creates problems in maintaining the power factor within the limits at the transmission-distribution interface.

Above Ref: University of Wollongong, Australia [Voltage Control and PV Hosting Capacity of Distribution Networks]

For most users, this change would be imperceptible. Most modern appliances have been designed for a wide voltage range (207V to 253V) for decades as part of a 1990s EU-wide harmonisation effort. No rewiring or adjustments would be necessary for standard household equipment or Lines Company High Voltage/Low Voltage equipment.

5. Alignment with Standards

A change from 230V AC to 220V ac on Low Voltage Distribution networks does not adversely modify the intent of the standards, to protect the Distribution Network.

- IEC 60038:2019 – Standard Voltages: Defines nominal voltage for LV systems as 230 V with permissible variations of ±10%. Adjusting to 220 V with a range of 207–253 V remains compliant.
- AS/NZS 60038:2012 – Standard Voltages: Aligns with IEC and allows flexibility within ±10% of nominal voltage.
- These standards provide the technical basis for adopting a lower nominal voltage without compromising safety or equipment performance.
- Moving to 220 V ac with a range of 207–253 V ac remains compliant and aligns with global best practice for flexibility and resilience. [en.wikipedia.org]

6. Future-Proofing for Electrification

As EV uptake and rooftop solar accelerate, voltage flexibility will help manage network constraints cost-effectively, avoiding expensive infrastructure upgrades. Although MBIE's 2025 Cabinet paper on expanding voltage ranges does not directly support the proposed approach, it sits within the proposed voltage range to accommodate more distributed generation and EV charging. [mbie.govt.nz]

7. **MBIE Guidance**

MBIE's 2024 Cabinet paper on voltage management and distributed generation integration recommends exploring wider voltage ranges and lower the nominal settings would be in accordance these findings to accommodate EV uptake and rooftop solar growth. This proposal aligns with the Authority's objectives to maximise benefits from local generation.

Benefits

- **Extra capacity for local generation exports** without breaching voltage limits.
- **Reduced curtailment** for solar PV owners, improving investment returns.
- **Lower network reinforcement costs**, ultimately benefiting consumers.
- **Reduce nuisance tripping** of renewable energy systems and EV chargers, allowing more capacity for green energy integration into the grid without expensive infrastructure upgrades.
- **Reduces premature inverter failure** of inverter equipment as sighted by National Renewable Energy Laboratory, USA.

I believe this adjustment, alongside the Authority's proposed Code changes, will deliver a more resilient, efficient, and consumer-focused electricity system. Without a change to the nominal voltage, even if EA do increase the upper limit for PV injection, the current voltage constraint (of 244-245V ac where inverter reduce Amp injection) will remain and the benefit to the customer will be negligible.

Thank you for considering our submission.

Ngā mihi nui,
Derek Chapman

Reference:

Amendments to the Electricity (Safety) Regulations 2010 to expand the permitted voltage range on low voltage electricity networks
https://www.mbie.govt.nz/dmsdocument/30799-amendments-to-the-electricity-safety-regulations-2010-to-expand-the-permitted-voltage-range-on-low-voltage-electricity-networks-proactiverelease-pdf

MBIE: Amendments to the Electricity. To expand the permitted voltage -
https://www.mbie.govt.nz/dmsdocument/29625-discussion-document-amendments-to-the-electricity-safety-regulations-to-expand-the-permitted-voltage-range-for-electricity-supply-pdf

National Renewable Energy Laboratory, USA. Effects of Reactive Power on Photovoltaic Inverter Reliability and Lifetime
https://docs.nrel.gov/docs/fy19osti/73648.pdf

University of Wollongong, Australia - Voltage Control and PV Hosting Capacity of Distribution Networks
https://documents.uow.edu.au/content/groups/public/@web/@eis/@secte/documents/doc/uow272598.pdf

Wikipedia - IEC 60038
https://en.wikipedia.org/wiki/IEC_60038