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Solar product technical specification for consultation

A consultation paper seeking feedback on technical specification for efficient and demand-flexible solar

EECA
TE TARI TIAKI PŪNGAO
ENERGY EFFICIENCY & CONSERVATION AUTHORITY

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Contents

Background and purpose

EECA's mission is to mobilise New Zealanders to be world leaders in clean and clever energy use, and as part of this EECA has a strategic focus to accelerate renewable energy.

The uptake of renewable energy can support energy security and energy affordability. One form of renewable energy is solar, which contains two main components - photovoltaic panels and an inverter, which can also be paired with batteries. There are many different types of solar systems, but the focus of this consultation is residential (10kW or less), and small commercial (including farms and schools). It does not cover utility-size solar systems.

EECA has a number of activities supporting the uptake of solar – for example, we recently funded the development of the Solar and Batteries Publicly Available Specification and consumer research to understand the value of solar. EECA is also developing specific resources and programmes, such as for farms.

Alongside these activities, EECA is considering what else we can do to remove barriers preventing the more widespread uptake of solar systems such as increasing consumer confidence. As EECA research has shown, customers frequently report being overwhelmed by conflicting or overly technical information. Trust in sources is a major concern, not just in the messenger but whether information is current. Independent, neutral information is highly valued and can be difficult to find. There is a need for clearer, more accessible, and up-to-date content tailored to individual circumstances that supports customers at each stage of the journey.

Considerations for an approved products list

Voluntary product specifications from a neutral and trusted third party can provide assurance in a product's energy performance, and support product uptake.

This is a similar approach to the EECA EV charger list: EV Smart Charger Approved List, which was launched in 2024 and now lists a broad range of products. The list is a useful resource for consumers and businesses to guide purchase decisions and to support funding and finance offers, such as green loans.

For solar products, it is important that solar systems provide a minimum level of performance and are future-proofed as they are expected to have a long lifetime (20 years+).

Demand flexibility has the potential to increase energy security, reduce consumer costs, and support the energy transition to more intermittent renewable generation (e.g. solar and wind).

To support the uptake of demand flexible solar, EECA has created a draft specification for consultation which covers panels, inverters, and batteries. The feedback from the consultation will be used to inform next steps across our work, such as best practice guidance, or the development of an approved list of products similar to EECA's list of approved EV chargers: EV Smart Charger Approved List. **The specification will focus on aspects of energy performance, and does not cover safety or product longevity etc**.

All system components will need to meet all applicable local requirements, including, but not limited to, those set either by Electricity Distribution Businesses, or Local Councils (such as Building Consents and any Resource Management Act requirements).

All system components must also satisfy all legal requirements to be supplied and installed including relevant components of the Building Act 2004, Building Regulations 1992 (The Building code), Electricity (Safety) Regulations 2010, Electricity Act 1992, Wiring Rules, Electricity Industry Participation Code 2010, and any other requirements.

Specification

The specification below is based on Table B2 Key component-specific installation requirements in NZ PAS 6014:2025 Residential solar photovoltaics (PV) and battery storage systems guideline. It has also considered alignment with requirements in Australia such as the Clean Energy Council Solar product programme: Products | Clean Energy Council. Appendix B provides an overview of the differences between the Clean Energy Council Solar products programme specification and the specification below.

Photovoltaic panels

Panels are key in solar systems as they are the main components which convert light into electricity, are installed on roofs, and have a very long life (20 years+).

System component	Area	Requirement	Method to show compliance
Photovoltaic panels	Efficiency	At least 15% for polycrystalline. At least 20% for monocrystalline. Efficiency is the ratio of the maximum output power compared to the irradiance power provided to the panel.	Product datasheet using results from IEC 60904 series tests.
	Degradation of panel output Watts per m^2	Polycrystalline: A power-output warranty of 25 years, with an annual degradation of no more than 0.8% per year when averaged over 25 years – 80% output after 25 years. Monocrystalline: A power-output warranty of 25 years, with an annual degradation of no more than 0.5% per year when averaged over 25 years – 87.5% output after 25 years.	Product warranty information based on results from IEC 61215:2021 series tests.

Inverters

Several other countries already have a higher uptake of residential and commercial solar, including Australia. They have found that high uptake of non-demand flexible solar can create grid instability issues, and reduce the ability for system contributors to participate in a flexible system. For this reason, it is important to ensure that as uptake increases in New Zealand, demand flexibility is incorporated.

Requirements for demand flexible solar include:

- standardised communication protocols
- a range of product responses e.g. turn on, turn off, turn up, turn down
- measurement of key information, to enable that to be communicated e.g. current power being exported.

The Electricity Authority and WorkSafe cite AS/NZS 4777.1 and AS/NZS 4777.2[1] which contain demand-response modes (9 in total) covering product response such as: disconnect, do not consume more than 50% of rated power, increase power consumption, etc. The only mandatory demand-response mode in the AS/NZS 4777.2 Standard is to operate the disconnection device, and it does not specify communication protocols. This means products that comply with AS/NZS 4777.2 may not offer complete flexibility as defined above.

The inverter specification below covers inverters used for solar, and/or batteries.

System component	Area	Requirement	Method to show compliance
Inverters	Efficiency	Peak efficiency of at least 90%	Product documentation based on results from IEC 61683:1999 tests.
	Standby power	Less than 10W	Standby power measurement.
	Interoperability	• Uses IEEE 2030.5 (2018 or newer) or OpenADR (2.0 or newer) • Has Wi-Fi connectivity	Product documentation showing how communication is completed including the product response and measurement.

[1] The Electricity Industry Participation Code 2010 cites AS/NZS 4777.1:2016 and AS/NZS 4777.2:2020. WorkSafe cites AS 4777.1:2005, but will move to cite AS/NZS 4777.1:2024 and AS/NZS 4777.2:2020.

System component	Area	Requirement	Method to show compliance

Inverters	Product response	The following can be met by meeting the applicable Demand Response Mode (DRM) in AS/NZS 4777.2:2020, or through other means e.g. direct control rather than demand response mode.
		• Generation
		  • Do not generate power (AS/NZS 4777.2:2020, DRM 5)
		  • Decrease power generation/set limit (AS/NZS 4777.2:2020, DRM 6, DRM 7)
		  • Increase power generation (AS/NZS 4777.2:2020, DRM 8)
		• Consumption (if applicable e.g. charging a battery, or providing power to a DC load)
		  • Do not consume power (AS/NZS 4777.2:2020, DRM 1)
		  • Decrease power consumption/set limit (AS/NZS 4777.2:2020, DRM 2, DRM 3)
		  • Increase power consumption (AS/NZS 4777.2:2020, DRM 4)
			Test report to AS/NZS 4777.2:2020 showing compliance with applicable DRM modes, or test results showing functionality.

	Measurement	• Voltage • Frequency • Active power • Reactive power • Apparent power • Measure or calculate the electricity imported (consumed) and exported and the time with visibility to the owner of this information or their authorised agent.	Test report to AS/NZS 4777.2:2020 showing compliance, or test results showing functionality.

System component	Area	Requirement	Method to show compliance
Inverters	Cyber security	SNZ PAS 6014:2025	Declaration
	Home Energy Management System integration	Use one or more of the following IP protocols: • REST API • MQTT • Modbus • KNX • Matter	Product documentation

Batteries

Batteries can be an important part of a solar system, but it is important that they last a reasonable number of cycles and have measurement and product response similar to inverters.

System component	Area	Requirement	Method to show compliance
Battery*	Exclusions	Lead acid-based batteries	N/A
	Degradation	At least 60% of new usable capacity after 3,000 cycles with at least 70% depth of discharge e.g. 20% to 90%, or 30% to 100%, etc.	Product warranty information based on test information.
	Measurement	• State of charge • Current maximum usable capacity • Battery set mode e.g. self-consume, peak-shaving	Product documentation.
	Product response	Ability to set: • Minimum state of charge • Maximum state of charge	Product documentation.

*If the battery has an inverter, then the inverter must also comply with the inverter specification as above.

Consultation questions

General and specification:

1. Inverter efficiency can either be measured at peak performance or through a weighted average (using different load points). **Q**. Should the specification use a peak efficiency or weighted average (e.g. European method or California method, see Appendix A)?
    a. If you support a weighted efficiency requirement, what should the requirement be (e.g. ≥ 94%)?
    b. If you support a weighted efficiency requirement, is this information readily available for your products (please provide a link if possible)?
2. Should the specification require inverters to be hybrid inverters, capable of both battery integration and grid connection to future proof solar systems?
3. Should the specification specify a grid-forming requirement for inverters, and if so, what should that requirement be?
4. An efficiency metric for batteries is round-trip efficiency which provides a measure of the power discharged from a battery to the power you put into it (accounting for losses during this process). **Q**. Should the specification require a minimum round-trip efficiency?
    a. If you support a round-trip efficiency requirement, what should this requirement be (e.g. ≥ 85% battery only, ≥ 80% battery with integrated inverter)?
    b. If you support a round-trip efficiency requirement, how should compliance be assessed (e.g. IEC 62620 for batteries, or IEC 62933-2-1 for batteries with inverters)?
    c. If you support a round-trip efficiency requirement, is this information readily available for your products (please provide a link if possible)?
5. Given that the specification is intended to cover efficiency and demand flexibility, is there any requirement missing from the specification, or any changes required to the specification or method of assessment?
6. If you are an Electricity Distribution Business, would you use an EECA created approved inverter list in place of your own approved inverter lists? If so, is there anything that the specification is missing?
7. Do you have any other feedback?

Additional questions over page.

Product availability:

8. Do you have products available that would meet the PV panel specification? If so, how many models (please provide a link if possible)?
    a. If you have PV panels that **don't** meet the specification, which part(s) do they not meet?
9. Do you have products available that would meet the inverter specification? If so, how many models (please provide a link if possible)?
    a. If you have inverters that **don't** meet the specification, which part(s) do they not meet?
10. Do you have products available that would meet the battery specification? If so, how many models (please provide a link if possible)?
    a. If you have batteries that **don't** meet the specification, which part(s) do they not meet?
11. If you have indicated that your current products may not meet the specification above, can you change your supply to meet this specification? Would this affect the lead time or availability of products?
12. The Clean Energy Council in Australia has a list of approved solar panels, inverters and batteries, are the products you supply also on this list?

Feedback can be provided to star@eeca.govt.nz with the subject line "Solar specification".

Under the Official Information Act 1982 (OIA), information held by EECA is to be made available to requestors unless there are grounds for withholding it. The grounds for withholding information are outlined in the OIA.

If you are making a submission, you may wish to indicate any grounds for withholding information. Reasons for withholding information could include information that is commercially sensitive or personal (such as names or contact details). An automatic confidentiality disclaimer from your IT system will not be considered grounds for withholding information.

EECA will consider your preference when determining whether to release information. Any decisions to withhold information requested under the OIA may be reviewed by the Ombudsman.

Appendix A: Weighted inverter efficiency

Weighted efficiency of inverters. Eff10% means efficiency at 10% of nominal power output.

European Efficiency method = 0.03 x Eff5% + 0.06 x Eff10% + 0.13 x Eff20% + 0.1 x Eff30% + 0.48 x Eff50% + 0.2 x Eff100%.

California Efficiency method = 0.04 x Eff10% + 0.05 x Eff20% + 0.12 x Eff30% + 0.21 x Eff50% + 0.53 x Eff75%. + 0.05 x Eff100%.

Appendix B: CEC specification comparison

System component	Clean Energy Council (CEC) specification	EECA proposed specification	Difference
Photo-voltaic panels	IEC 61215:2021 series covering PV design including endurance and environmental testing, and some safety aspects.	Panel efficiency and panel degradation.	CEC and the EECA proposed specification overlap: • EECA's proposed specification covers efficiency, and • Degradation is determined in both cases, but different requirements are set.

Inverters	AS/NZS 4777.2:2020 + A1 + A2
	Optional: IEEE 2030.5 CSIP-AUS either on the inverter, or gate way device, or network operator utility server.
		• Efficiency
		• Standby power
		• Demand flexibility
		  • Interoperability
		  • Product response
		  • Measurement information
		  • Cyber security
		• HEMS integration
			CEC covers AS/NZ 4777.2 compliance, and optional demand flexibility. EECA's proposed specification covers demand flexibility, efficiency, and HEMS integration.

Battery	Best practice battery safety guide.	• Degradation of useable capacity • Battery measurement information • Battery product response	CEC covers safety aspects, whereas EECA's proposed specification focuses on battery energy and flexibility performance.

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