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Solar product technical specification

A technical specification for efficient and demand flexible solar systems

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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.

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.

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 developed this technical specification which can be used to determine products that meet a minimum level of performance for energy efficiency and demand flexibility.

This specification does not replace the requirement for solar system to meet all legal requirements to be supplied and installed included 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.

Scope

The specification is intended to cover efficiency and demand flexibility, not other aspects like safety.

It covers panels, inverters, and batteries specifically designed for residential (10kW or less) and small business solar systems.

The specification covers inverters in three-phase or single-phase configuration. It covers string inverters, micro-inverters, and optimized inverters. It also includes grid tied inverters, inverters, hybrid inverters, and grid forming inverters. Also, inverters for batteries.

The specification covers batteries modules, and integrated battery systems. It includes lithium-based batteries but excludes lead-acid.

Definitions

IEC 61215 2021 series refers to:

- IEC 61215.1 2021: Terrestrial photovoltaic (PV) modules - Design qualification and type approval - Part 1: Test requirements, and
- IEC 61215.2 2021: Terrestrial photovoltaic (PV) modules - Design qualification and type approval - Part 2: Test procedures, and
- IEC 61215-1-1:2021: Terrestrial photovoltaic (PV) modules - Design qualification and type approval - Part 1-1: Special requirements for testing of crystalline silicon photovoltaic (PV) modules.

EN 50530:2010 refers to EN 50530:2010 +A1: Overall efficiency of grid connected photovoltaic inverters.

AS/NZS 4777.2:2020 refers to AS/NZS 4777.2:2020 + A1 + A2: Grid connection of energy systems via inverters, Part 2: Inverter requirements.

IEC 62933-2-1:2017 refers to IEC 62933-2-1:2017: Electrical energy storage (EES) systems - Part 2-1: Unit parameters and testing methods - General specification.

Revisions to specifications

The specification will evolve over time as technology and standards develop. Any revision to the specification will have a suitable transition period. EECA welcomes feedback on the specification, which can be sent to star@eeca.govt.nz.

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 (CEC) Solar product programme: Products | Clean Energy Council.

EECA consulted on a draft specification and feedback was used in the development of this specification, See Appendix A: Consultation on specification.

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	**Suitability for long-term operation in open-air climates**	Meet the requirements of IEC:61215 2021 series.	Listing on the CEC approved PV modules list or Test report to the IEC 61215:2021 series.

Inverters

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

System component	Area	Requirement	Method to show compliance
Inverters	**Efficiency for photovoltaic inverters***	Weighted efficiency of at least ≥ 94%, using the method in EN 50530:2010.	Test report to EN 50530:2010.
	Standby power	Less than 10W.	Standby power measurement.

	Interoperability	• Uses IEEE 2030.5 (2018 or newer) or OpenADR (2.0 or newer). Can be
		  ○ On-board the inverter, or
		  ○ A separate device supplied with the inverter, or
		  ○ Through a cloud based sever where the inverter communicates with the server and the external party communicates to the server using IEEE 2030.5 or OpenADR.
		• Has Wi-Fi connectivity (IEEE 802.11)
		• All supporting keys etc. are supplied with the inverter and only connection during installation is required to enable a remote agent to control it.
			Product documentation showing how communication is completed including the product response and measurement.
			
			Listing on the CEC approved inverter list with Software Communication Client listed (showing IEEE 2030.5 CSIP-AUS compliance).

	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),	Test report to AS/NZS 4777.2:2020 showing compliance with applicable DRM modes, or test results

		○ 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).	showing functionality or Listing on the CEC approved inverter list with Software Communication Client listed (showing IEEE 2030.5 CSIP-AUS compliance).
	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 or Listing on the CEC approved inverter list with Software Communication Client listed (showing IEEE 2030.5 CSIP-AUS compliance).
	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.

*A photovoltaic inverter is one which is designed to take power from photovoltaic cells and convert it to AC. They can also be hybrid inverters which also work with batteries.

Batteries

System component	Area	Requirement	Method to show compliance
Battery*	**Efficiency battery****	Round-trip efficiency ≥ 85%.	Equivalent method to IEC 62933-2-1:2017.
	Efficiency integrated battery	Round-trip efficiency ≥ 80%.	Test report to IEC 62933-2-1:2017 or equivalent.
	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. • Operating mode.	Product documentation.

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

**Efficiency battery is for batteries with no inverter. For batteries with inverters, please see efficiency integrated battery.

Appendix A: Consultation on specification

Between the 13th of September and 29th of September EECA consulted on a draft technical specification. The changes made between the draft specification and the specification above are listed below:

- The photovoltaic panel specification had significant overlap with the CEC specification, and so the final specification aligns with the CEC specification.
- For inverters the specification has applied a weighted efficiency requirement as it is more reflective of real-world performance and is widely used.
- There was support for interoperability using IEEE 2030.5 and/or OpenADR, but concerns were raised that there are limited models that have on-board the inverter

and so pathways have been added to enable a separate device, or cloud server to be used.

- There was support to introduce a round-trip efficiency requirement but to set one requirement for battery modules and one for integrated batteries which acknowledges the difference in efficiency.