

Guidance note

Existing PV array compliance requirements when installing Battery Energy Storage Systems (BESS) (repairs vs alterations)

This guidance note is provided for industry guidance only. The responsibility for compliance of the electrical installation (to the relevant standards) rests with the electrical contractor performing the work. Each site and situation may be different, meaning a thorough inspection and assessment of the installation and the rating and condition of the equipment is needed to determine what additional work is required to ensure the installation is safe and fit for purpose following alterations and or repairs.

AS/NZS 3000 and AS/NZS 5033 provide the following specific requirements for when an alteration or repair will be deemed compliant with the standard.

AS/NZS 3000:2018 – definitions

Clause 1.4.8 – alterations

- A modification to part/s of an electrical installation.

Clause 1.4.101 – repairs

- The work to restore the electrical installation to safe and sound working condition after deterioration and damage has occurred.
- **Note:** Repairs are not alterations.

AS/NZS 3000:2018 – means of compliance

Clause 1.9.3.1 – alterations

- Alterations to electrical installations shall comply with all relevant provisions of this standard (AS/NZS3000). Alterations to electrical installations shall not cause any portion of the original electrical installation, or electrical equipment connected thereto, to –

- carry currents or sustain voltages in excess of those permitted by this standard; or
- be used in any manner that is not in accordance with this standard.
- Alterations to an electrical installation constructed to a Part 1 design and installation solution shall not alter the compliance of that installation with Part 1 of this standard (AS/NZS 3000).

Clause 1.9.3.2 – repairs

- Repairs to existing electrical installations or parts thereof may be affected using methods, fixtures and fittings that were acceptable when that part of the electrical installation was originally installed or with methods, fixtures and fittings currently available as direct replacement, provided that the methods satisfy the fundamental safety principles of Part 1 of this standard (AS/NZS 3000).

AS/NZS 5033:2021 – requirements for PV systems

Clause 4.7.1 – verification

- Contains the general verification requirements that must be applied in conjunction with AS/NZS3000. Prior to placing a PV system into service (for the first time or if recommissioning following an alteration or a repair) the system shall be inspected and tested to ensure that the fundamental safety requirements of the standard has been met including the following:
 - visually inspecting the installation in accordance with AS/NZS 5033 Clause 4.7.2; and
 - testing the installation in accordance with AS/NZS 5033 Clause 4.7.3.
- Precautions shall be taken to ensure the safety of persons and to avoid damage to the property and the electrical installation of equipment during the inspection and testing.
- Where the PV array is an alteration to an existing array, it shall be verified that the alteration conforms to this standard and does not impair the safety of the existing electrical installation.
- Where a repair is made to an existing array or part thereof, it shall be verified that the repair conforms to the standards that were applicable when the PV array was originally installed and does not impair the safety of the existing installation.
- **Note:** An example testing and commissioning check sheet for PV installations can be found in 'Appendix E of AS/NZS 5033:2021'.

Examples

Scenario – inverter replacement

The replacement of a PV inverter with one that has multimode capability to facilitate the installation of a BESS that is compatible with the existing PV array and its wiring may not automatically initiate the replacement of the PV array. However, the PV array installation needs to be verified that it is safe and compatible with the new inverter by performing a visual inspection of the installation in accordance with AS/NZS 5033 Clause 4.7.2 and testing the installation in accordance with AS/NZS 5033 Clause 4.7.3.

Below is a guide to any repairs and alterations required to the existing PV array or any of its components:

- **Repair:** If any existing component is unsafe, broken or deteriorated, then a 'repair' is required to replace the component in a like-for-like manner to ensure the repaired component complies with the standard that was applicable at the time of the existing installation. However, it is good practice to undertake the repair to current standards where practicable.
- **Alteration:** If the PV array, any of its components or its wiring is not compatible or needs to be upgraded, extended or modified in any way to make it compatible with the new inverter, then that constitutes an 'alteration'. Those parts of the PV array or wiring that have been altered need to comply with the current standards and must be backwards compatible with those parts that have not been altered.
- Importantly, the new or non-direct replacement inverter and its installation will need to comply with the latest inverter standards AS/NZS 4777 Parts 1 and 2.

Existing PV system safety and compliance verification checks

A PV array safety verification must be performed to determine if portions of the existing array installation were not compliant to the standards applicable at the time of installation or are unsafe to remain in service.

Below is a guide for safety and compliance checks:

1. PV arrays installed from 2015 onwards (after AS/NZS 5033:2014) can be retained if compatible with the installed or new inverter and proven safe – including but not limited to checking of:
 - a. correct disconnect rating and installation;
 - b. proper cable rating;
 - c. low impedance earth connection; and
 - d. good insulation resistance on DC circuits.

Any non-compliant (with the standards applicable at time of installation) or unsafe portions must be repaired or otherwise altered where a repair cannot be made to make compliant or safe.

2. PV arrays installed before 2015 (before AS/NZS 5033:2014) may require alteration, repair or replacement – including but not limited to checking of:
- lack of proper earthing (i.e. incompatible with modern inverter earth fault monitoring requirements); and
 - disconnecter installation method being a safety risk (e.g. no shroud/inaccessible/water ingress/incorrect cable entries).

Any repairs to pre-2015 PV arrays should be made as a minimum to AS/NZS 5033:2014 including amendments No.1 (2018) and No.2 (2018) to mitigate any risks of pre-2015 installations. However, this may initiate an alteration instead of a repair, which must be done to current standards on the portions to be altered.



Examples of alterations vs repairs

The following table provides examples of alterations and repairs in the context of inverter installation and PV array compliance:

Alteration – altered portions require compliance with current standards	Repair – requires compliance with the standard at the time of the original installation
Adding more or removing some PV panels or replacing panels for ones that are bigger and better.	Replacing a broken panel for one of the same rating and physical size as the original or manufacturers deemed equivalent.
Replacing, extending or re-routing existing AC or DC wiring.	Repairing damaged cable insulation, fixings or mechanical protection.
Existing cable connectors are replaced with ones that are compatible with a new inverter (alteration compliance is limited to the new cable connectors, unless where required from safety and compliance checks existing cables need to be altered or replaced, which then includes cable and wiring system).	Replacing a broken connector with one equivalent to that of the original (assuming existing cable is compatible with new cable connector and inverter, and no alteration is made to the cable).
Replacing a switch disconnecter with a disconnection point.	Repairing an unsafe or deteriorated switch disconnecter and enclosure, with no wiring alterations
Removing an existing PV array switch disconnecter adjacent to an inverter because the inverter has an integral switch disconnecter (includes any necessary wiring alterations).	Repairing an unsafe or deteriorated switch disconnecter and enclosure, with no wiring alterations.

Alteration – altered portions require compliance with current standards	Repair – requires compliance with the standard at the time of the original installation
Upgrading the inverter to one that has enhanced features or increased capacity (alteration compliance is limited to the new inverter installation, unless where required from safety and compliance checks the existing PV array equipment needs to be altered or replaced).	Replacing a broken inverter for one that has the same features, ratings and operating parameters.
Removing an inverter and re-installing the same inverter in a different location in the installation.	Removing an inverter and re-installing the same inverter in the same location in the installation.
Increasing the size or setting of a protection device or upgrading a protection device/type.	Replacing a blown fuse for one of the same size or defective protection devices with an equivalent type.

Further information on repairs and alterations can be found at Clean Energy Council's educational content services [Learn LAB](#).

Disclaimer – The information contained in this fact sheet is provided as general information and a guide only. It should not be relied upon as legal advice or as an accurate statement of the relevant legislation provisions. If you are uncertain as to your legal obligations, you should obtain independent legal advice.

Building and Energy | Department of Local Government, Industry Regulation and Safety

1300 489 099

8.30am – 4.30pm

Level 1 Mason Bird Building

303 Sevenoaks Street (entrance Grose Avenue)

Cannington Western Australia 6107

M: **Locked Bag 14 Cloisters Square Perth WA 6850**

W: www.lgirs.wa.gov.au/building-and-energy

E: be.info@lgirs.wa.gov.au

Regional Offices

Goldfields/Esperance	(08) 9021 9494
Great Southern	(08) 9842 8366
Kimberley	(08) 9191 8400
Mid West	(08) 9920 9800
North West	(08) 9185 0900
South West	(08) 9722 2888

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