Australian Government

Department of Climate Change, Energy, the Environment and Water

Inquiry into solar panel reuse and recycling in Australia

Submission to the House of Representatives Standing Committee on Climate Change, Energy, Environment and Water

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Introduction

The Department of Climate Change, Energy, the Environment and Water (the department) welcomes the opportunity to provide a submission to the House of Representatives Standing Committee (the Committee) on Climate Change, Energy, Environment and Water's inquiry into solar panel reuse and recycling in Australia.

The department is the Australian Government (the Government) lead agency supporting the transition to a circular economy. Circularity is an essential tool in minimising the amount of waste generated and sent to landfill while reducing our carbon footprint and restoring ecosystems. Australians dispose of nearly 76 million tonnes of waste every year, much of which ends up in landfill. Globally, the World Bank projects that waste generation will increase by 70% by 2050 unless immediate action is taken.[1]

In 2024, the Government released Australia's Circular Economy Framework[2], outlining how Australia can double its circularity by 2035 and transition from a linear 'take, make, dispose' model to one where waste is minimised, materials circulate for longer, and products are designed to last.

Australia is the largest per capita adopter of solar energy in the world: As of late 2024 a cumulative total of 4 million rooftop solar systems had been installed across the country, with an estimated 300,000 rooftop systems installed per year.[3] In part, this is due to government programs and a push for clean energy.

Australia is now entering its first significant wave of end-of-life rooftop solar systems. With the rate of solar installations increasing, it is important that we address the growing challenge of managing solar panels once they reach the end of their life.

This submission aims to inform the Committee about the current state of solar reuse and recycling in Australia and outline the department's role and responsibilities in this area.

Current and projected waste volumes

Approximately 1 in 3 Australian households have roof top solar panels. In 2025, an estimated 60,000 tonnes of panels (around 3 million solar panels) reached their end of life, with more than 90,000 tonnes expected annually by 2030[4]. Without government intervention, it has been predicted that the cumulative total volume of end-of-life solar panels in Australia will reach 1 million tonnes (around 50 million solar panels) by 2035.

However, this figure may be significantly underestimated: Recent trials undertaken by the Smart Energy Council and the Queensland Government (2024-25) found that 62%

[1] Kaza, Silpa; Yao, Lisa C.; Bhada-Tata, Perinaz; Van Woerden, Frank., *What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050* Washington, DC: World Bank 2018. Referenced in Department of Climate Change, Energy, the Environment and Water, *Australia's Circular Economy Framework*, 2024. Available at Australia's Circular Economy Framework. Accessed 4 March 2026.

[2] Department of Climate Change, Energy, the Environment and Water, *Australia's Circular Economy Framework*.

[3] Clean Energy Council, *Rooftop Solar and Storage Report July-December 2024*. Available at rooftop-solar-and-storage-biannual-report_final.pdf. Accessed 26 February 2026.

[4] Deng, R, et al, *Scoping Study: Solar Panel End of Life Management in Australia*, 2024, p. 6. Available at https://www.acap.org.au/post/research-reports. Accessed 4 March 2026.

of solar panels disposed of in Queensland are only 7–10 years old[5] — well short of the expected 25-30 year lifespan used in earlier estimates. If this trend continues this could significantly increase waste arising by 2035.

Current disposal practices and trends

There are no formal data collection mechanisms for decommissioning rates for solar systems and the outcomes of end-of-life solar panels. Data on disposal practices and trends in Australia are projections developed by academics and industry.

The available evidence suggests that solar panels are being decommissioned sooner than expected due to the increasing efficiency and decreasing price of new solar panels, which is incentivising early replacement of domestic solar systems. This is supported by findings from recent trials in Queensland and the department assumes these findings are applicable for other states and territories. At the same time, there are limited incentives for, and coordination of, initiatives to increase recycling and reuse of solar panels.

Currently only a small proportion of end-of-life panels are recovered for recycling due to high logistics and recycling costs and limited processing capacity. It is estimated that in the absence of a landfill ban in most jurisdictions, between 5% and 10% of system waste will to go directly into landfill, with more than half being moved to low efficiency recycling and one-third of system waste expected to go indirectly to landfill as shredder floc.

The remainder is assumed to be stockpiled, illegally dumped or exported.

Second-hand solar panels may be exported for reuse without a hazardous waste export permit under the *Hazardous Waste (Regulation of Exports and Imports) Act 1989*, provided the reusability of the panels can be demonstrated in accordance with the Basel Convention *Technical guidelines on transboundary movements of electrical and electronic waste and used electrical and electronic equipment,* with particular reference to the distinction between waste and non-waste. However overseas markets for secondary use are shrinking because of competition from cheaper new generation solar panels[6].

The comparative costs of reuse, recycling and landfill disposal

Reuse

The department has commissioned research on solar panel reuse, which shows a lack of financial incentive for reused systems[7]. New systems outperform reused systems under most circumstances: Although second-hand panel costs are lower, other costs, such as transport, mounting, testing and installation and maintenance, as well as the reduced efficiency of second-hand panels, results in higher total private costs of approximately $4,500 per year for a large system of 101kW or more. However,

[5] Smart Energy Council, *Queensland Household Solar Panel Recovery Pilot final report*, 2025, p. 4. Available at Queensland Household Solar Panel Recovery Pilot final report. Accessed 26 February 2026.

[6] Smart Energy Council, Queensland Household Solar Panel Recovery Pilot final report.

[7] Centre for International Economics, Final Report: Reuse of Decommissioned Solar Panels, Economic regulatory and technical advice, 2025 (unpublished – commercial in confidence)

significant benefits exist where reuse can increase the amount of solar capacity installed, as opposed to displacing new panels.

Recycling

Data from the Queensland trials indicates per panel recycling costs of $43 in metropolitan areas and $80.50 in remote regions (inclusive of collection and transport costs). Research commissioned by the department indicates nationwide recycling costs could vary significantly, from $266,000 to $1.16 million per tonne of waste, depending on the type and efficiency of the recycling method. This suggests that the high costs of large scale, high efficiency solar recycling, combined with significant transport and logistics costs, is not generally economically viable solely for the material recovery benefits.

Landfill disposal rates in Australia are determined primarily by state and territory governments by setting the waste levy rates for landfill operators per tonne of waste sent to landfill. These levies are designed to reduce waste to landfill and promote recycling.

Potential benefits of expanding onshore reuse and recycling of solar panels

Increasing collection of end-of-life solar panels for recycling and reuse will benefit the environment. These benefits are the avoided direct harms to the environment resulting from:

- amenity and safety impacts from solar panels dumped on public land
- leaching of toxic materials from dumped waste and landfill sites into the environment, and
- pollution, loss of habitat and depletion of finite resources from mining minerals for manufacturing new solar panels.[8]

Increasing solar panel recycling capacity would also increase recovery rates of critical and valuable materials like silver, silicon, copper, gold and tin. Enhancing recovery of these materials supports Australia's circularity, aligned to the targets of the Circular Economy Framework, and reduces dependence on imported raw materials.

A nationally consistent product stewardship scheme could incentivise the development of a sustainable solar panel recycling industry in Australia, expand onshore circularity and reduce the volume of waste sent to landfill, including hazardous materials. In 2023, the department released the *Wired for Change*[9] discussion paper, which included a proposed product stewardship model for solar photovoltaic systems. A preliminary cost-benefit analysis commissioned by the department based on variations

[8] Centre for International Economics, Final Report: Cost-benefit analysis of options for e-product stewardship – Solar photovoltaic systems, 2023 (unpublished – commercial in confidence).

[9] Department of Climate Change, Energy, the Environment and Water, *Wired for change: Regulation for small electrical products and solar photovoltaic systems*, 2023. Available at: Wired for change: Regulation for small electrical products and solar photovoltaic systems. Accessed 27 February 2026.

of the stewardship model in *Wired for Change* estimated a national scheme would deliver a significant total net economic and environmental benefit of $7.2 billion[10].

The current state of Australia's solar panel reuse and recycling capabilities and domestic markets

Australia's solar panel recycling industry is emerging. Current recycling infrastructure is limited, geographically concentrated on the East coast, and not equipped to manage the volume of panels being decommissioned now or projected in the future. Supporting infrastructure for collection, transport and storage are also limited.

Due to insecure feedstock and high costs, where panels are recycled this tends to be through low efficiency recycling (which recovers materials like glass, aluminium and copper wiring) but results in critical and higher value materials being discarded. Recyclate is commonly sold on to manufacturing and construction markets.

States and territories have different regulatory arrangements for managing solar panel waste. The New South Wales Government, on behalf of all jurisdictions, has led the development of a Regulatory Impact Statement on options for a national solar panel recycling arrangement, in response to an Energy and Climate Change Ministerial Council commitment in August 2025[11].

End-of-life solar panels exports for recycling are likely to require an export permit under the *Hazardous Waste (Regulation of Exports and Imports) Act 1989*, as solar panels generally contain hazardous constituents. This regulatory framework ensures Australian exports of hazardous wastes meet international standards for their environmentally sound management, such that human beings and the environment are protected from the harmful effects of the waste.

Barriers to reusing and recycling solar panels at scale in Australia

Reuse

There are no established standards specifically governing the installation of reused panels, and no testing audits exist to ensure quality and consistency in such assessments. The current installation standard for solar arrays (AS/NZS 5033:2021) does not explicitly refer to reuse or specify whether testing is required before reuse. Due to the long operational life of solar systems, a material portion of Australia's installed solar capacity does not meet current installation standards for solar arrays: While these panels were compliant when they were installed, evolving standards mean that they would not be compliant with current standards for installation at reuse. In the secondary solar market, warranties are often voided upon resale, as manufacturers cannot verify how the panels have been used after panels leave the original owners.

Internationally, there are no universally recognised or established standards available which specially address reused solar panels. While there is a growing effort to develop dedicated standards to support the secondary solar market – the International

[10] Centre for International Economics, Final Report: Cost-benefit analysis of options for e-product stewardship – Solar photovoltaic systems (unpublished – commercial in confidence)

[11] Energy and Climate Change Ministerial Council, *Meeting Communique Friday 15 August 2025*. Available at Energy and Climate Change Ministerial Council meetings and communiques. Accessed 3 March 2026.

Electrotechnical Commission (IEC) International Standards Committee for photovoltaic modules is working on this issue – the progress has been reported as slow. The department understands that Australian Standards are based on IEC standards and cannot be amended until there is a clear international approach to reuse.

This absence of clear and consistent technical and safety guidelines creates uncertainty for both reuse operators and consumers.

Recycling

The high costs associated with recycling, logistics and transport tend to be prohibitive and are not offset by the market value of materials recovered during the process. As a result, only a small proportion of end-of-life solar panels are currently recovered for recycling. These barriers currently preclude collection and reduce the availability of feedstock for recyclers. Finding viable markets for recovered materials, especially glass, also remains challenging. At present, recycled glass is predominantly used as a sand substitute in construction materials because Australia does not have a domestic solar manufacturing industry that could utilise higher value recycled glass.

The recycling of solar panels also has to compete with the option of export, either as used panels or as scrap metal, which may offer lower logistical and processing costs.

Alternative policy options for governments

Australia is well-positioned to offer a strong foundation for the recycling industry and recycling supply chain, as one of the few countries with panel recycling capabilities. To have an effective scheme, we need:

- a better understanding of the full range of costs - including collection, aggregation, transport and recycling - across different regions and systems, and options to manage these costs;
- a clearer picture of industry capability and capacity; and
- investment in recycling infrastructure to accommodate a growing waste stream.

In January 2026, the Government announced funding of $24.7 million over three years to deliver a national pilot for recycling solar panels[12]. The pilot will establish up to 100 collection sites nationwide and recycle up to 250,000 solar panels. This will collect data and test assumptions about transport, storage and recycling pathways for used solar panels across Australia over a 12-18 month period starting in mid-2026. The department intends to appoint a pilot Administrator to deliver the pilot following a competitive procurement process. The department intends to publish on AusTender an Approach to Market in early 2026.

The Government will also support states and territories to develop options for a national approach for managing end of life solar panels. This work is led by the New South Wales Government under the auspices of the Energy and Climate Change Ministerial Council.

[12] The Hon Dr Jim Chalmers MP, Treasurer, The Hon Chris Bowen MP, Minister for Climate Change and Energy and Senator The Hon Murray Watt, Minister for the Environment and Water, *Joint media release: Labor pilots national solar panel recycling program, 16 January 2026.* Available at: Joint media release: Labor pilots national solar panel recycling program. Accessed 4 March 2026.