Ms Anne Urquhart MP
Chair
Standing Committee on Climate Change, Energy, Environment and Water
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Submitted via online portal

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Dear Ms Urquhart, MP

Re: Inquiry into Solar Panel Reuse and Recycling

Thank you for the opportunity to provide feedback to the Committee about the current state of solar panel reuse and recycling in Australia. The Waste Management and Resource Recovery Association of Australia (WMRR) is the national peak body representing Australia's $21 billion waste and resource recovery (WARR) industry. With more than 2,300 members from over 400 entities nationwide, we represent the breadth and depth of the industry, including representation from business organisations, the three (3) tiers of government, universities, and Non-Government Organisations (NGOs), including research bodies. As a fierce advocate of the waste and resource management hierarchy, WMRR supports moving beyond end-of-life management toward the safe reinvestment of valuable materials back into the economy so that fewer resources are used for longer. Raw material extraction drives most manufacturing emissions—so enabling reuse, repair, recycling, and remanufacturing of solar panels reduces both waste and emissions, whilst also improving material productivity, enhancing market opportunities, and driving local jobs and investment.

Australia's rapid uptake of rooftop solar whilst beneficial for decarbonising and energy resilience, is also creating a fast-growing waste challenge, with annual solar panel waste projected to nearly double by 2030. Panels are often decommissioned well before their expected lifespan, highlighting systemic issues across the full product lifecycle. Despite the high value of some of these recoverable materials- in particular the critical minerals used, less than 5% of panels are recycled, given Australia to date has been unable to establish the infrastructure, markets, and logistics needed to manage current and future volumes effectively at scale.

High transport costs, limited recycling and reuse infrastructure, and reliance on consumer-paid disposal have led to low participation and industry instability. At the same time, significant barriers—such as the absence of standards, warranties, and regulatory clarity—are preventing the development of reuse markets and broader circular solutions. Quite simply, this is due to the fact that it is not commercially viable at scale to establish an integrated cradle to grave recovery and reuse system, given the cost of managing the lifecycle and in particular the end of life process is treated as a negative externality by the generator and producer of the panels.

In WMRR's view, national, mandatory product stewardship as part of an Extended Producer Responsibility (EPR) scheme is urgently needed for solar panels to ensure responsibility for costs lies with those that produce (or

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those that supply the products to the Australian market). The OECD defines Extended Producer Responsibility (EPR) as an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of its life cycle. This approach underlines the idea that producers must take financial and/or organisational responsibility for their products' end of life through measures applied throughout their life cycle, from design to management of waste generated by these products. Over time, EPR encourages companies to produce more sustainably, innovate and contribute significantly to reducing their own environmental impact. If Australia adopted this policy approach, it would drive the requisite investment, and enable a coordinated, system-wide solution to managing and recovering critical minerals that are essential in Australia as well as mitigating waste and impacts. Coupled with policy incentives to encourage reuse and repair, this would further support a transition to a circular solar supply chain—reducing waste, recovering valuable materials, and aligning with Australia's net zero and circular economy goals.

What has been done to progress solar reuse and recycling?

Australia has correctly been rapidly scaling solar deployment given the clear role is has in decarbonizing, without however a corresponding system to manage decommissioned and upgraded systems. Solar panels have been identified as a priority product stream for federal product stewardship since 2016. However, current federal activity to address the economic and environmental opportunities presented by implementing a solar stewardship scheme remains limited to investigating pilot programs focused on end-of-life material data collection, as opposed to creating a genuine product stewardship scheme to take responsibility for their products impact in an environmentally sound manner (as per the *Recycling and Waste Reduction Act* 2020), including through improvements in product design; improving the durability, reparability and reusability of products; and managing products throughout their (entire) life cycle. As such, there is no consideration at this time of system transformation to implement producer obligations to design solar panels for improved circularity.

Prolonging life and extending use of solar panels is further hampered by the fact that there are also existing regulatory barriers to reuse of functional solar panels, with no national standards for testing and certifying used panels leading to legal and compliance barriers to resale and export. This misalignment prevents circular outcomes for end-of-life solar panels. The Queensland Government's Household Solar Panel Recovery Pilot final report ("the Queensland pilot"), released in September 2025, provides useful data and articulates the existing hurdles to Australia implementing a sustainable solar product stewardship scheme.

The 2024/ 2025 Queensland pilot found that solar panel waste is emerging sooner and at a greater scale than previously anticipated, largely driven by early replacements due to rapid technological upgrades. The effectiveness of end-of-life management systems depends heavily on efficient logistics and professional collection, with installer-led models playing a critical role in capturing value from panels suitable for reuse and supporting a financially viable recovery system. Establishing a safe and trusted reuse market will require standardised, multi-step testing protocols to ensure product quality and consumer confidence.

However, current recycling infrastructure is not equipped to handle the projected volume of waste and will need significant expansion. At the same time, private sector investment remains constrained by a lack of long-term policy certainty. Without a properly funded recovery pathway, households are likely to continue relying on less responsible options such as landfilling or stockpiling panels as they are not willing or able to pay for the cost of recycling. As such, WMRR welcomed the August 2025 commitment at the Energy and Climate Change

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Ministerial Council meeting to progress work on a national product stewardship scheme for solar panels and look forward to this progressing rapidly.

In early 2026, the Federal Government announced funding of $24.7 million over three (3) years to deliver a national pilot to establish up to 100 collection sites nationwide to 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. The pilot only applies to decommissioned panels and does not fund the decommissioning activities. It does not address design, accountability, or system-wide change, and in WMRR's view, fails to consider the key learnings already established by the Queensland pilot and risks delaying action while waste volumes grow.

WMRR trusts that this inquiry will bring this important issue front of mind for the federal government and propel action on a national mandatory stewardship scheme.

i. The rapid growth of solar

Annual solar panel waste is forecast to nearly double from 59,340 tonnes in 2025 to 91,165 tonnes by 2030. As solar panels become more readily available, existing systems will be upgraded. Data from the Queensland pilot suggests that panels are being decommissioned well before their expected lifespan of 25-30 years. It estimated that 600,000–800,000 units are removed each year from households in Queensland due to breakage, weather-related damage, and technological upgrades. Notably, 62% of these panels are only 7–10 years old. This highlights a system failing not just at end-of-life—but across the full product lifecycle.

Rooftop solar contributed 14.2% of national electricity in 2025, up from 7.2% in 2020, indicating that uptake of rooftop solar has been accelerating. By 2050, 98% of electricity in the NEM is projected to be renewable and Australia's rapid uptake of solar energy is creating an equally rapid waste challenge. According to the Clean Energy Council's latest rooftop solar and storage biannual report, 4.3 million households (almost one-third of homes) now have rooftop solar and 139,080 systems installed in just the second half of 2025, with New South Wales and Queensland holding over half of all rooftop PV installations across Australia. The Queensland pilot has established that Australia lacks the appropriate infrastructure and systems to deal with the existing let alone the forecasted volumes of solar panel waste.

ii. Solar panels and the WARR sector

a. Existing infrastructure and system gaps

Australia lacks sufficient recycling, reuse and collection infrastructure for solar panels. The Queensland pilot showed that logistics are the primary cost driver in panel recovery, accounting for over 60% of total expenses, while recycling costs remain relatively low and stable ($10–20 per panel). This means economic viability depends more on efficient transport and high collection volumes than on recycling technology. Australia has struggled to sustain solar recycling infrastructure with Reclaim PV going bankrupt in 2023 and more recently, Sircel entered receivership and voluntary administration on 31 October 2025 reporting debts exceeding $60 million. Reclaim PV reportedly had been stockpiling panels in its Brisbane and Adelaide warehouses for processing but could not secure offtake partners for recovery. Sircel was Australia's largest e-waste recycler operating across NSW, Victoria and Queensland and had launched a state-of-the-art PV processing facility in Parkes, NSW which was part of the Queensland pilot. This underscores the urgent need for government action and policy to drive a local, circular solar supply chain.

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Moreover, logistics and efficiencies do not necessarily align to state-based approaches. For example, the Queensland pilot involved transporting PV panels from Queensland to the Sircel facility in Parkes NSW for recycling. This clearly would not be an affordable option for participants in a voluntary scheme. There is an obvious challenge with the transport logistics across a dispersed population and capital intensity of solar recovery equipment. Prioritising the reuse of functional, decommissioned solar panels offers significantly greater cost efficiencies. It follows that government planning and investment should be put into establishing regional infrastructure that can be utilised by installation providers for recycling and recovery, and perhaps more importantly, that obstacles for solar panel reuse are removed.

b. Costs

Since the end of the Queensland pilot at the end of April 2025, substantial decreases in the volume of panels received at the facilities from homeowners may indicate that homeowners do not want to pay the cost to get solar panels to a recycler and have them recycled. This is not surprising given the costs and challenges associated with transport and logistics of collecting panels from the point of decommissioning and the lack of existing infrastructure. It follows that a voluntary scheme will not be commercially viable at scale. This reinforces the need for the system to emphasise producer obligations for full lifecycle management of the solar panels they place on the market. A national, mandatory approach is critical because Australia operates as one common market for product supply and industry requires certainty and scale to invest in facilitating recycling and recovery systems. A national, mandatory scheme also places the cost impacts on those that are responsible for making these products –as opposed to continuing to privatise profits whilst externalising costs.

c. Economic inefficiencies and lost value

According to the Australian Centre of Advanced Photovoltaics' (ACAP) Scoping Study Solar Panel End-of-Life Management in Australia, on average, a typical 20 kg solar panel contains about $22.60 worth of recoverable materials, equating to over $1,000 per tonne. However, the Queensland pilot report suggests that less than 5% of solar panels are being recycled despite their potential high recoverable value (particularly given the demand for metals such as copper into growing markets for these such as for digitisation and AI applications) and projections for the potential value of these materials from decommissioned solar panels to exceed $6.5 billion by the mid-2030s.

Landfilling discarded solar panel materials results in the loss of valuable materials and critical minerals that could otherwise be recovered and reused. Landfill levies across Australia vary, with some states banning the landfilling of solar panels altogether, which can lead to illegal dumping and stockpiling. Having a funded, reliable, preferably circular pathway should be prioritised. In WMRR's view, referring to decommissioned solar panels as a 'waste' gives social licence to downcycling and unnecessary landfilling. To enable the necessary paradigm shift from downcycling to the upstream prevention of these valuable materials being disposed, Australia should:

- Introduce as a priority, lifecycle responsibility framework legislation to enable regulation of products across their full lifecycle — including design, reuse, repair, and end-of-life management. This recommendation has already been made to the Federal Government by the Circular Economy Ministerial Advisory Group (CEMAG) report '*The Circular Advantage*' which echoes much of this key sentiment held by WMRR – noting the significant gaps in terms of Commonwealth regulation for product and material design standards and genuine EPR. If this cannot be actioned by the federal

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government, states should align with the framework legislation set by the *NSW Product Lifecycle Responsibility Act* 2025, and

- Mandate design requirements for solar panels for durability, modularity, repairability, reuse and recoverability, in order that decommissioned panels can safely be recovered and reinvested into the economy. Given the highly fragmented solar market, a national, mandated approach is needed to hold all suppliers accountable for full lifecycle responsibility.

iii. Barriers to reuse

The main barrier to greater reuse and repair is the lack of mandatory EPR – obligations must be placed on those that supply solar panels to the Australian market to remain compelled to participate in all parts of the product lifecycle including sustainable design standards to facilitate greater reuse and repair opportunities.

This was reinstated by the report of the Queensland pilot which identified the challenges to establishing a reuse market as being:

a. The lack of a clear, national regulatory framework for solar panel reuse.
There is no agreed-upon Australian standards exist for the testing, grading, approval, and safe reinstallation of used panels, undermining consumer confidence in quality and safety of reused panels. Given the long lifespan of solar systems, a significant share of Australia's installed panels were compliant at the time of installation but no longer meet current standards . WMRR is aware that the current solar installation standard (AS/NZS 5033:2021) does not address panel reuse or clarify whether testing is required prior to reuse. Warranties are typically void upon resale, as manufacturers cannot verify how panels have been handled once they leave the original owner. This causes a significant hurdle for the uptake of functional solar panels that are decommissioned when a system upgrade takes place. To address this, efforts should be directed to the start of the supply chain to provide technical guidelines aligned with product design to provide certainty of reuse of functional solar panels.

b. The low cost of new panels making second-hand panels uncompetitive and the absence of standardised warranties for used panels deterring buyers.

c. High collection, transport, and storage costs, particularly for regional areas, due to a lack of dedicated reuse infrastructure.

d. A shortage of accredited training for tradespeople in the safe removal and handling of panels for reuse, coupled with low public awareness of reuse options. The Queensland pilot showed that panels handled professionally at the time of a system upgrade have the highest likelihood of being suitable for a second life, whereas, panels left unattended, unsecured, or in long term storage at a residence are highly susceptible to damage.

e. The export of solar panels for reuse is restricted due to the presence of hazardous constituents, such as lead.

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iv. The need for national, mandatory stewardship (EPR)

Australia's approach to managing end-of-life solar panels must go beyond 'recycling what we can' and look to a systematic change that requires solar panels to be sustainably minimize waste and designed to extend product life through repair, maintenance and reuse, and recover materials at end-of-life. Encouraging system upgrades that retain functioning panels (supporting repair, cleaning, and component replacement) and developing a second-hand panel market are key addressing the growing volume of solar PV waste.

Australia currently lacks comprehensive EPR scheme similar to the European Union's *Waste from Electrical and Electronic Equipment (WEEE)(WEEE Directive 2012/19/EU),* which underpins solar panel recycling by requiring manufacturers and importers to fund and manage the collection and treatment of end-of-life panels. It sets high recovery (85%) and recycling (80%) targets, which countries implement through national systems, including widespread collection networks and specialised facilities (such as PV Cycle). The WEEE Directive requires manufacturers and distributors to establish collection points where consumers can dispose of their panels free of charge. This producer responsibility model has driven investment, innovation, and strong environmental standards, creating a more effective and sustainable system for managing solar panel waste. To meet WEEE requirements, recycling facilities must invest in specialised equipment to process PV panels to cost effectively and efficiently remove components and recover materials like silicon and silver using advanced sorting technologies, achieve environmental compliance and adapt to growing PV waste volumes with automated, high-throughput systems.

NSW made a commitment at the August 2025 Energy and Climate Change Ministers Meeting to lead the way on mandatory solar PV stewardship, and WMRR is hopeful that given the expediency under which NSW implemented its battery regulations under the *Product lifecycle Responsibility Act* 2025, that this jurisdiction will lead the way if a national mandatory solar scheme is not implemented. However, consistent action across all jurisdictions is essential. Solar recycling involves highly complex processes and is a nascent industry. Solar panels contain components which are very difficult to recycle at low cost – notably, specially manufactured solar glass is heavy and therefore expensive to ship. Given Australia has very little solar manufacturing, with most panels manufactured overseas by numerous suppliers, a circular pathway to facilitate solar panel reuse and recycling needs government intervention to ensure that suppliers bear the cost of the scheme, thereby embedding genuine EPR. Without government intervention, solar PV waste volumes will surge, valuable materials will continue to be lost and processing/recycling instability will continue. However, with the right policy settings, Australia can build a circular solar supply chain as has been done in the EU. A national, mandatory stewardship scheme underpinned by strong EPR is essential to achieving this.

WMRR trusts that these comments are useful to the Committee and welcomes the opportunity to give evidence at hearing. Please contact the undersigned if you wish to further discuss WMRR's submission.

Yours sincerely

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Waste Management and Resource Recovery Association of Australia