RESEARCH BRIEF

Towards an Australian Circular Economy for Solar Photovoltaic Technologies

A Policy Brief for Government, Industry and Research Stakeholders



This research was sponsored by the Australian Commonwealth Department of Industry, Science and Resources.

40.6 gigawatts
of installed solar capacity—the world's highest per capita

1.1 million tonnes
of cumulative end-of-life waste by 2035, including all historical waste

$1 billion+
of recoverable material value from end-of-life panels by 2035

With more than 40.6 gigawatts of installed capacity across more than four million systems, Australia leads the world in per-capita solar photovoltaic (PV) deployment. However, **Australia is approaching a structural inflection point in its clean-energy transition**.

Australia's Solar Photovoltaic Waste Inflection Point

The infrastructure, regulation and market mechanisms required to manage end-of-life (EoL) solar panels—a consequence of Australia's clean-energy success—do not yet exist at scale. Panels that were installed during a period of rapid expansion that began in the 2010s are now approaching decommissioning. Estimates indicate that Australia is already generating approximately 40,000 tonnes of EoL PV waste annually, and that could surge to more than 100,000 tonnes per year by the early 2030s. Cumulative PV waste is projected to reach **approximately 1.1 million tonnes by 2035**—a number that could double or even triple by 2050.

The timing pressures created by Australia's solar waste trajectory demand urgent attention. The consequence of the installation spike from 2018 to 2024 is a corresponding decommissioning surge that will arrive regardless of policy settings. The question is whether Australia has the circular infrastructure in place to intercept it. To achieve an affirmative answer, the window between 2025 and 2030 is crucial. This is the only viable period in which Australia can establish a national regulatory framework, fund the necessary infrastructure and build the market mechanisms needed to handle projected volumes of PV waste. To miss this window of opportunity is to allow PV waste volumes to exceed the capacity of any post-2030 ad hoc response.

Critically, **the window to plan and implement a comprehensive national approach to tackling PV waste closes before Australia's next federal election, which is expected in late 2027 or early 2028**. Each year of inaction increases the infrastructure deficit, entrenches linear disposal pathways and permanently restricts Australian industry access to recycled critical materials that cannot be retrieved once downcycled or landfilled.



Australia's Solar Photovoltaic Waste: A Sovereign Capability Issue

China dominates more than 80 per cent of all PV manufacturing stages—including the production of polysilicon, ingots, wafers, cells and modules—while controlling critical mineral processing at the global scale. Australia imports around one gigawatt of solar panels per year. The majority of life-cycle emissions from these panels occur during the manufacturing stage, and shipping alone generates 30,000 to 100,000 tonnes of carbon dioxide. Raw materials extracted in Australia are routinely exported to China for processing and imported back as manufactured panels. This is a structural dependency that is economically inefficient, leaving Australia strategically exposed in the absence of local PV manufacturing or scaled circular material–recovery pathways.

If Australia recovered the raw materials embedded in EoL panels, it could recoup at least some of the critical materials that it exports. Projections indicate that, from 2041 to 2050, EoL panels could supply more than 60 per cent of the silver, more than 30 per cent of the silicon, and more than 20 per cent of the copper and aluminium used in domestic manufacturing.

A circular PV economy is not just an initiative with exclusively environmental benefits. It is a direct representation of the Future Made in Australia policy agenda and a practical mechanism for reducing a structural dependence on imports. Importantly, in 2026, a circular PV economy increases Australia's resilience to global supply chain impacts, including energy shocks.

Solar PV Waste Projections, 2025–2040

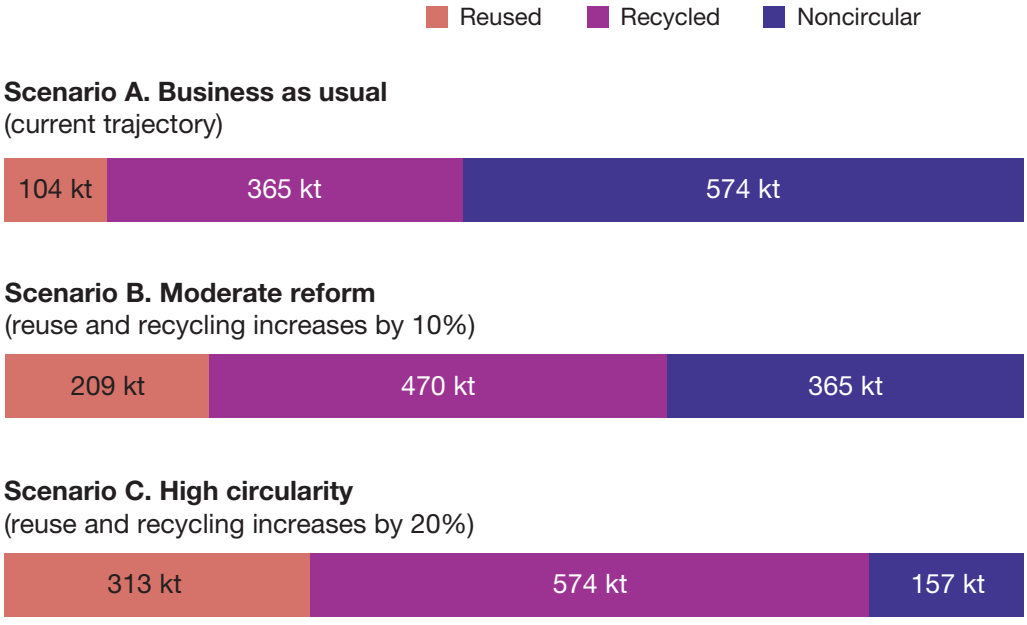
Where does ~1 million tonnes of decommissioned solar PV go over the next 15 years? The answer depends on the investment and policy choices made now.

Disposal Pathways, by Scenario

Scenario	Reused	Recycled	Noncircular
A. Business as usual	10%	35%	55%
B. Moderate reform (+10%)	20%	45%	35%
C. High circularity (+20%)	30%	55%	15%

Cumulative Material Fate, by 2040

~1 million tonnes of PV panels are decommissioned across all scenarios. Scenario differences lie in the proportion of reuse, recycling and noncircular decommissioning pathways, such as landfilling and stockpiling.



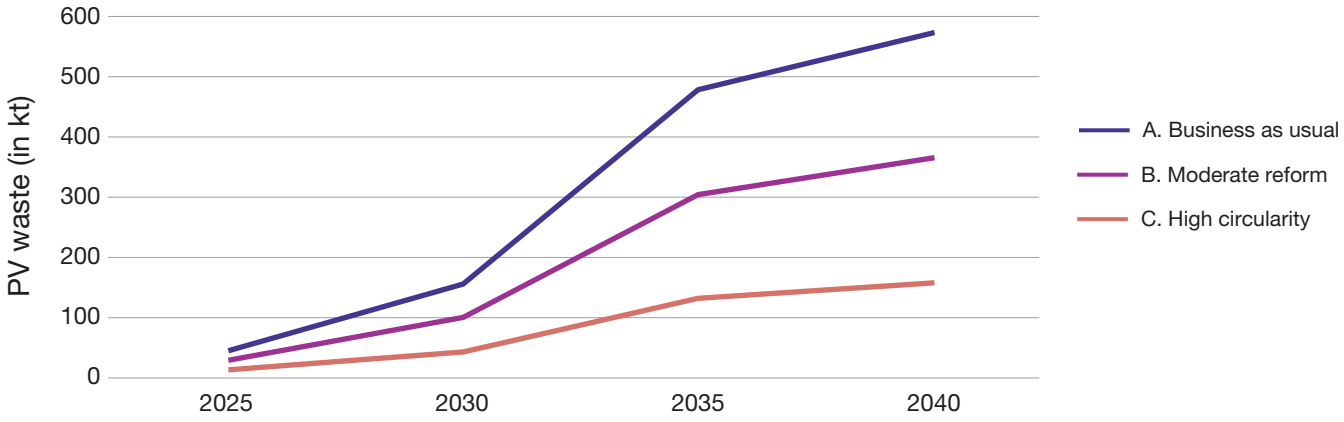
>418 kt

Diverted from landfill and other noncircular pathways between Scenarios A and C

SOURCES: The cumulative waste data projections are based on the latest industry data from Nick Florin, Hengky Salim, and Benjamin Madden, *Managing End-of-Life Photovoltaic Systems in Australia: Key Findings from Installer Survey*, Institute for Sustainable Futures, University of Technology Sydney, June 2023; historical installation rates across Australian postcodes from Australian PV Institute, PV Postcode Data, dataset, undated; and Blue Tribe Company, interview with the authors, 2025.

Cumulative Noncircular PV Waste, from 2025

Accumulation over time from 2025 (*not* accounting for historical waste)



The Critical Window (2030 to 2035): Installation spikes from 2018 to 2024 drive a decommissioning surge starting around 2030. Infrastructure must be ready.

The Cost Gap

$28 per panel to recycle
$4 to $5 per panel to landfill

Without policy, the market defaults to disposal.

Employment Multiplier

9.2 jobs per 10,000 tonnes (with recycling)
2.8 jobs per 10,000 tonnes (with landfilling)

There are 3.3x more jobs from recycling than disposal.

Recoverable Value

$1B+ material value by 2035
~45–65% of decommissioned panels suitable for reuse

A reused panel has 133x more value than a recycled panel.

Sovereignty context and mitigating the unavoidable wave of waste: The three scenarios send very different amounts of PV waste to landfill and other noncircular pathways, even though the same volume of panels is decommissioned in each. Higher reuse keeps more panels in service, and higher recycling keeps more materials in use. For example, Scenario C increases reuse and recycling by 20% over Scenario A, which equates to 73% less cumulative noncircular waste by 2040 (157 kt compared with 574 kt). In turn, this reduces the circular economy infrastructure investment needed to accommodate PV waste in the future. With China currently dominating the PV supply chain at the global level, an enhanced circular economy infrastructure also reduces import dependencies and builds domestic capabilities.

NOTE: This infographic models only PV panels installed before 2025 and the subsequent waste expected from those panels. It does not include panels installed after 2025 and does not include panel waste accumulated before 2025. Cumulative waste projections (1.0 to 1.2 million tonnes by 2035) include all historical waste. The projections include the following assumptions: (1) the average new panel lifespan (i.e., the number of years until a panel enters decommissioning streams) is 12 years, (2) the average reuse panel operational lifespan is 12 years based on a 25-year design life and average lifespan until decommissioned, and (3) a panel's weight is 25 kilograms. kt = kilotonne.

Government Signal: National Solar Panel Recycling Pilot

On 16 January 2026, the Australian government announced $24.7 million for a National Solar Panel Recycling Pilot. The pilot aims to collect up to 250,000 panels from 100 sites, generating national data on collection logistics and recycling costs. The flagship pilot project was anticipated to start mid-2026; however, as of July 2026, it was suspended pending resolution of a procurement process complaint.

The primary value of this pilot lies in its generation of logistical and cost data that are needed to underpin a future product-stewardship proposal. The evidence base for a PV product-stewardship scheme (and for the broader regulatory and infrastructure architecture that are required) is exactly what the research underpinning this research brief provides.

Why the Market Cannot Self-Correct

Three structural barriers prevent market forces alone from resolving Australia's PV waste challenge. Each represents a distinct class of market failure that requires targeted policy intervention.

Industrial Capability and Capacity

Existing PV recycling facilities are scarce across the country and operate well below the scale needed to handle projected PV waste volumes. Australia's industrial practices in the PV recycling sector are characterised mainly by chemical-free mechanical recovery methods, including manual dismantling, mechanical processing and separation techniques. These low technology readiness level (TRL) methods significantly limit the recovery of high-value materials, such as silver and pure silicon. Existing industrial capability, measured by TRL and processing capacity, cannot effectively process the incoming PV waste wave. Such methods often downcycle materials by reducing their purity or removing them from circular pathways (by crushing panel components into a powder that is used as an additive in building materials). Testing decommissioned panels for reusability prior to their entering waste or recycling streams is a potentially high-value method for capturing and retaining the panel's embedded material value. This approach is underutilised without the certification infrastructure needed to scale it.

Infrastructure and Skills Gap

Industry testing indicates that approximately **45 to 65 per cent of decommissioned panels remain suitable for reuse,** refurbishment or continued operation. Yet Australia lacks the collection logistics, workforce skills, testing infrastructure, certification frameworks and domestic remanufacturing capacity to capture this value. The absence of a functioning national marketplace for secondary panels compounds the problem. Logistics costs can constitute up to 60 per cent of total scheme costs, making a geography-optimised collection infrastructure a prerequisite—not an optional enhancement.

Economic Distortion

Recycling costs approximately $28 per panel; landfill disposal costs between $4 and $5 per panel. Without policy corrections, the market will perpetually default to disposal. This cost gap is worsened by subsidised recycling operations that are, in practice, downcycling, including the mechanical crushing of panels for incorporation as additives in construction materials. This process permanently destroys the silicon, silver and copper embedded in solar panels, and these valuable materials cannot be recovered once they are dispersed in such applications as cementitious matrixes. Subsidising these downcycling practices slows the market-led development of genuine high-value circular infrastructure.

The Compounding Cost of Delay

Sovereignty cost: Continued dependence on Chinese supply chains for both panel imports and any future recycling processing capacity directly contradicts the Future Made in Australia agenda. Australia has no domestic capacity to close the PV materials loop.

Stranded value cost: The reuse window closes permanently as panels degrade. In *The Case for Solar Panel Reuse in Australia*, James McGregor notes that a reused panel carries 133 times the economic value of a recycled panel. The Blue Tribe Company, which ran a recent (2025 to 2026) large-scale PV reuse trial in Queensland, found that—although more than 50 per cent of decommissioned panels were suitable for reuse—on average, panels were decommissioned after only 12 years of service (well before the end of their 20-to-25-year manufactured lifespan). This research highlights the multiple policies, commercial arrangements and consumer behaviours that function as perverse incentives to drive the premature decommissioning of reusable panels at scale. Panels installed in the 2018-to-2024 surge will mostly remain functional from now until the late 2040s, but the data show that more than one-half will likely be decommissioned in the 2030s.

Lock-in cost: Each year without a national framework allows linear disposal infrastructure (e.g. landfill contracts, unregulated collection networks) to entrench further, compounding the structural costs of a future energy transition. The 2030-to-2035 decommissioning surge will arrive regardless of whether Australia is ready for it.



Five Pathways to a Circular Economy for Photovoltaics

The research that underlies this brief demonstrates that Australia can build circular PV capabilities through coordinated action across five activity areas. These pathways are not sequential and should proceed in parallel. The policy and market pathways provide the enabling conditions for the technical and logistical pathways to scale. The Three Horizons timeline (presented in Table 1) is drawn from a detailed implementation roadmap in the main report. The timeline maps each pathway across three planning horizons aligned with Australia's Net Zero 2050 plan.

TABLE 1
The Three Horizons Timeline

Activity Area	Horizon I: Build Foundations Now to 2030 **Establish a national regulatory framework by 2027, develop a digital marketplace for secondary panels, launch the first commercial-scale recycling facilities and build workforce capabilities.**	Horizon II: Scale Rapidly 2031 to 2040 **Deploy testing and certification facilities nationwide, expand high-throughput disassembly and integrate with critical mineral supply chains.**	Horizon III: Sustain and Lead Beyond 2040 **Cultivate a competitive circular marketplace with continuous improvement towards 100-per-cent circularity.**
Research and development	Accelerate TRLs for high-purity silicon, silver and copper recovery; conduct feasibility studies; and guide RMIT, UNSW and CSIRO capabilities towards commercial readiness.	Improve cost-effectiveness, integrate with critical minerals and battery storage supply chains, and develop second-life silicon anode pathways for lithium-ion batteries that yield a 10-fold increase in capacity.	Keep pace with evolving panel design and material composition and enable greater supply-chain situational awareness.
Policy and regulatory reform	Extend the Product Stewardship Act, set minimum recycling efficiency standards, establish reuse liability indemnification, legislate before the 2028 federal election and align with the EU's EPR framework.	Mandate stewardship contributions, harmonise cross-jurisdictional standards via the National Cabinet, and advance workforce development programs, including safe panel removal standards to ensure reusability.	Continually refine policy, harmonise international circular economy standards and wind down incentives as the market becomes self-sustaining.
Market scaling	Launch a digital marketplace for secondary panels, establish national reuse certification on the Circular PV certificates foundation and build consumer and industry awareness.	Expand processing capacity, develop domestic PV module remanufacturing, scale certified reuse markets and develop insurance products for reused panels.	Maintain a self-sustaining competitive circular marketplace with retail enterprises based on reuse and support continuous improvement towards 100-per-cent circularity.
Logistics	Establish EoL collection and storage, design jurisdiction-specific models (e.g. modular, decentralised, mobile models in Queensland; regional, fixed models in Victoria), and provide each metro facility with access to 5,000 to 10,000 tonnes of PV waste per year.	Deploy testing and certification facilities nationally, expand high-throughput disassembly capacity and integrate with battery waste streams.	Maintain a mature, efficient national logistics network and fully circular supply chain that includes cross-waste-stream economies of scale.
Stakeholder engagement	Build community and council relationships, launch public awareness campaigns and establish solar reuse and recycling trade associations.	Scale stakeholder engagement; provide technical and further education training and university workforce training; establish vocational pathways for installers, testers and recycling technicians; and deepen international partnerships.	Achieve recognition for Australia as a global continuing education excellence centre, continually upskill the PV workforce and distribute equitable benefits across metropolitan, regional and remote communities.

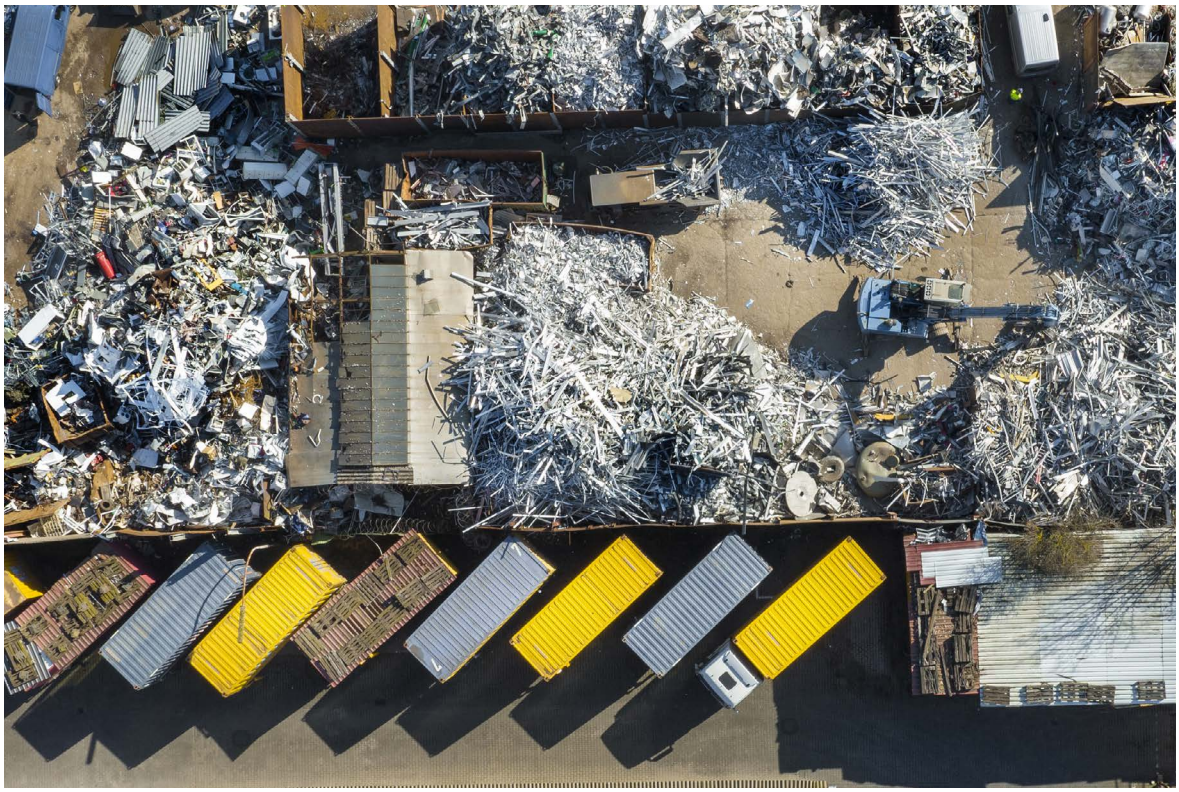
NOTE: CSIRO = Commonwealth Scientific and Industrial Research Organisation; EPR = extended producer responsibility; EU = European Union; RMIT = Royal Melbourne Institute of Technology; TRL = technology readiness level; UNSW = University of New South Wales.

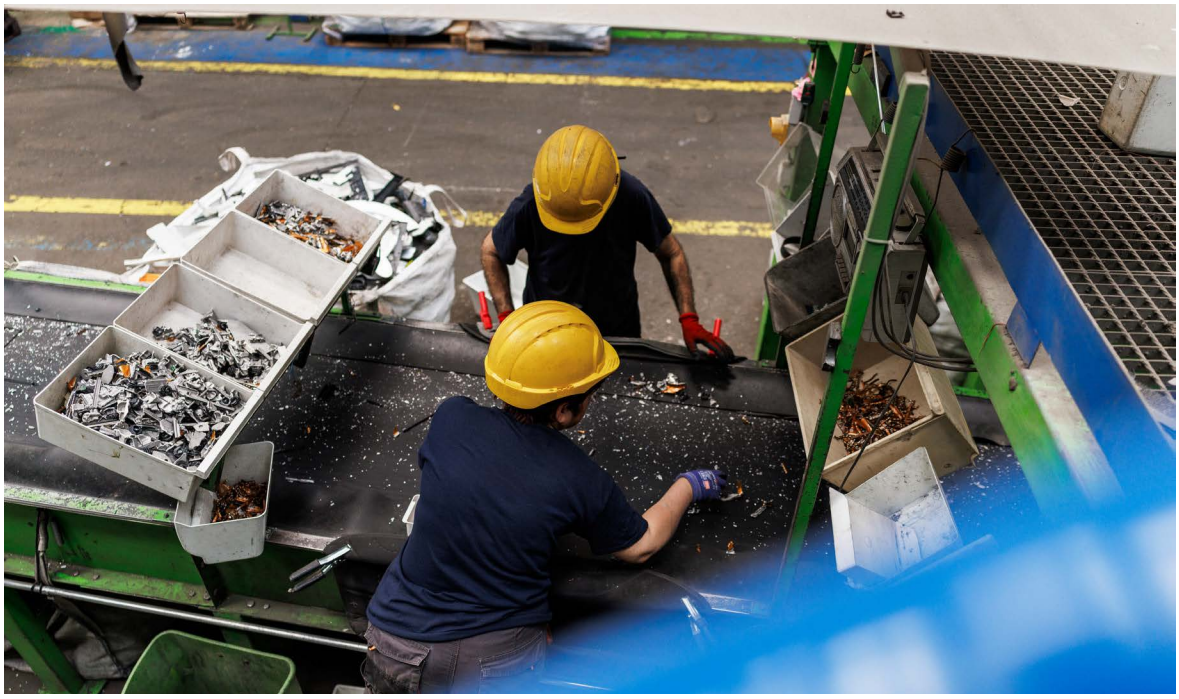
Reuse as the First Priority

The economic case for prioritising reuse above recycling is unambiguous. Recovery technology that has been available since 2023 demonstrates that **the economic value of a reused PV panel is 133 times greater than that of a recycled panel**, primarily because reuse captures the remaining power generation value of a functional asset rather than only its raw material content. Given that 45 to 65 per cent of decommissioned panels remain suitable for continued use, reinstalling all available used panels by 2035 could raise the total national PV capacity by up to 17 per cent. The continuing subsidisation of new panel installation has inadvertently created economic conditions that favour premature replacement over life-cycle optimisation; panels that could serve functional secondary lives are directed to waste streams because of the absence of both viable reuse markets and accompanying reuse certification infrastructure. Reuse must be the first-order circular intervention, and then recycling handles what reuse cannot.

Jurisdiction-Specific Logistics

A functioning circular economy requires significant logistical infrastructure to remove, sort, test, store and transport EoL panels. Logistics costs can constitute up to **60 per cent of total scheme costs**. Jurisdiction-specific infrastructure models are essential. For example, Queensland's waste distribution, which is dispersed across large distances, favours a modular, decentralised and mobile collection infrastructure, while Victoria's concentrated metropolitan settlement pattern supports a network of regionally located and fixed collection and reuse testing hubs. Metropolitan recycling facilities in Brisbane, Melbourne, Sydney, Adelaide and Perth could each access 5,000 to 10,000 tonnes of PV waste annually. A uniform national infrastructure model would be suboptimal in both contexts and financially unviable in dispersed geographies.





Australian First-Mover Innovations

Australia has already demonstrated early global leadership that policy has not yet matched. The **Queensland Household Solar Panel Recovery Pilot** is the world's largest test of reused solar panels in active operation. **Circular PV certificates** (developed by the Circular PV Alliance) are also a world-first innovation that have already certified two solar farms and are an operational proof-of-concept for which Australian industry can be a global leader. In the Netherlands, Biosphere Solar has demonstrated a modular panel design that enables disassembly at EoL. This is a design-for-circularity model that has direct relevance to Australia's manufacturing ambitions. These innovations require a national regulatory framework to scale. Without a coherent national regulatory framework, Australia's first-mover advantages will be commercialised elsewhere.

Material Recovery and Value

Recovered materials from EoL PV panels have significant downstream value across energy technology supply chains. Recycled silver from EoL modules maintains conductivity suitable for direct remanufacturing in PV cells, silver-zinc batteries and conductive inks for flexible solar cells. Copper recycled at more than 90-per-cent efficiency is indispensable for a renewable-energy infrastructure that includes power transmission cables, inverters, battery storage and hydrogen production systems. Aluminium, most frequently recycled at more than 98-per-cent recovery from PV panel frames, finds wide reuse in PV support structures and energy storage. Silicon recovered to high purity (the threshold required for direct reintegration into new solar cells) has emerging applications in next-generation lithium-ion battery anodes because it has approximately ten times the capacity of conventional graphite. The transition to a circular economy for PV systems offers 30-to-50-per-cent reductions in solar greenhouse gas emissions and significant energy savings: Recycled aluminium requires only one-twentieth of the energy of virgin material.

The Techno-Economic Case for Government Investment

The full report presents a national techno-economic assessment (TEA) of PV recycling infrastructure viability across five states: Victoria, New South Wales, South Australia, Western Australia and Queensland. The analysis evaluates three infrastructure configuration models:

- a fully centralised hub combining collection, screening and recycling in a single large facility
- a decentralised network of regional recycling sites supported by independent screening and collection operations
- mobile screening units deployed to accumulation points, feeding sorted recyclable fractions into fixed recycling facilities.

These configurations each have different geographical, environmental, logistical and commercial viability implications against capital requirements, operating costs, transport exposure and long-range net present value performance from 2025 to 2055. The findings provide a replicable planning model and direct basis for government infrastructure funding decisions and demonstrate that the investment case does not depend on breakthrough technology.

The analysis highlights the interdependency between reuse and recycling: Diverting suitable panels to reuse reduces the recycling volume and supports more efficient use of recovery infrastructure. When high-quality panels are diverted to reuse markets, only genuinely EoL material enters the recycling stream, improving average material recovery yields and reducing per-tonne processing costs. This interdependency between reuse market development and recycling economics reinforces the case for simultaneous investment across both pathways.

Techno-Economic Findings

Capital requirement: A commercial-scale facility processing 2,500 tonnes per year requires an approximately $7.5 million capital expenditure.

Financial returns: Under the modelled revenue, gate-fee and stewardship assumptions, the baseline 2,500-tonne-per-year facilities have estimated payback periods of 7.2 to 8.0 years.

Material value: Under the techno-economic assessment assumptions, silver is the dominant contributor to recovered-material revenue. At scale, total recoverable material value exceeds $1 billion by 2035.

Employment: Recycling generates 9.2 jobs per 10,000 tonnes of PV waste processed versus 2.8 for landfilling—more than three times the employment benefit per tonne. A 2024 study by the Australian Centre for Advanced Photovoltaics estimates that each facility could support 146 to 335 jobs by 2030.

State-specific models: The decentralised fixed-site network is the preferred configuration in both Queensland and Victoria. Queensland requires a more geographically distributed network of regional facilities, with mobile screening providing supplementary coverage for remote areas, whereas Victoria can implement the same model through a smaller number of closely connected regional hubs.

The TEA also models the *full-inflow assumption* that all projected EoL panels enter a formal screening pathway prior to allocation between reuse and recycling streams. In practice, up to approximately 10 per cent of EoL panels are screened or tested for potential reusability; the majority flow through informal or untracked pathways. This gap between modelled and actual participation rates is itself a product of the absence of a national product-stewardship mandate, which is the primary structural policy intervention required.

Importantly, these returns are achievable with existing technologies. They do not depend on breakthrough research and development outcomes from advanced separation processes. They require a policy signal that mandates producer responsibility and eliminates the $23-per-panel cost advantage of landfilling over recycling. The $24.7 million pilot from the Department of Climate Change, Energy, the Environment and Water (DCCEEW) that was announced in January 2026 will provide the logistics and cost data to optimise state-level infrastructure planning for collection, reuse screening and recycling models. A funded national infrastructure program should follow from pilot findings with minimal further rounds of evidence gathering.



Three Priority Recommendations

The evidence and techno-economic analyses that underlie this brief point to three actions that require immediate attention from Australia's current and future governments (Table 2). All three are time-bound to the critical preelection legislative window from 2026 to 2027. The sequence matters: The first recommendation creates the regulatory framework that enables both the second recommendation's infrastructure investment to occur with market certainty and the third recommendation's marketplace to operate with legal standing. The recommendations made here are evidenced in the full report, including state-by-state techno-economic modelling, materials science analysis, social and behavioural analysis, policy landscape review and the full Three Horizons implementation roadmap.

Recommendation 1:
Establish a National Photovoltaic Circularity Framework by Mid-2027

The Australian government should extend the Product Stewardship Act to cover solar panels, set minimum recycling efficiency standards that prioritise high-purity material recovery over downcycling, and establish liability indemnification for panel reuse. These actions could address critical gaps related to the absence of a national regulatory framework and inconsistencies across states and territories. This framework must be legislated before the next federal election (expected in late 2027 or early 2028) to provide the regulatory certainty that unlocks the private-sector infrastructure investment required in Horizon 1. DCCEEW's pilot product-stewardship proposal process is the natural vehicle and must conclude with binding regulation—not voluntary guidelines.

Recommendation 2:
Fund Commercial-Scale Recycling and Reuse Infrastructure by 2028

The Australian government should commit Australia Renewable Energy Agency (ARENA) and state coinvestment funding for at least three jurisdiction-specific pilot facilities targeting Queensland, Victoria and New South Wales. Each facility should process at least 2,500 tonnes of PV waste per year. Payback periods are expected to be 7.2 to 8.0 years. These facilities are commercially viable investments that require only the policy signal to unlock private coinvestment. A 2024 study by the Australian Centre for Advanced Photovoltaics estimates that each facility could support 146 to 335 jobs by 2030. Queensland's preferred model is a decentralised network of fixed regional recycling facilities, with mobile screening providing supplementary coverage for remote or dispersed areas. Victoria's preferred model is also a decentralised fixed-site network, implemented through a smaller number of closely connected regional facilities. Both models are drawn from state-specific TEA modelling. ARENA's Solar Sunshot initiative provides a natural existing funding mechanism.

Recommendation 3:
Launch a National Photovoltaic Reuse Certification System and Digital Marketplace by 2027

Building on the world's largest active test of reused solar panels (the Queensland Household Solar Panel Recovery Pilot) and Australia's world-first Circular PV certificates (which have already certified two solar farms), the Australian government should establish a nationally recognised certification system for reused panels and a digital platform connecting decommissioned panel supply with secondary market demand. A reused panel is 133 times more valuable than a recycled panel, and 45 to 65 per cent of decommissioned panels remain eligible for reuse. Reuse must be the first-priority circular pathway. The digital marketplace could also generate the provenance and condition data needed to underpin downstream recycling efficiency. Business models that focus on leasing, which have been identified as commercially promising, should be developed alongside the certification framework.

TABLE 2
Priority Actions and Summary of Responsibilities

Priority Action	Lead Actor	Time Frame	Mechanisms
Establish a national PV circularity framework	Federal government	By mid-2027 (preelection)	Extend the Product Stewardship Act, set minimum recycling efficiency standards that prioritise high-purity recovery and establish liability indemnification for panel reuse
Fund commercial-scale recycling and reuse infrastructure	Federal and state governments, ARENA	By 2028	Commit ARENA and state coinvestment, build three jurisdiction-specific facilities (targeting Queensland, Victoria and New South Wales) that can each process at least 2,500 tonnes of PV waste per year with a payback period of 7.2 to 8.0 years, and write government procurement rules that mandate reuse thresholds for public-sector solar (supporting government fleet electrification and regional projects) to create incentives for commercial investment in reuse infrastructure
Launch a national PV reuse certification system and digital marketplace	Federal government and industry (Clean Energy Council, Circular PV Alliance)	By 2027	Build on Circular PV certificates and the Queensland Household Solar Panel Recovery Pilot and create a digital platform connecting decommissioned panel supply with secondary market demand

The Window Is Closing: A Final Case for Action

The choices made in the next three years will determine whether Australia's solar leadership translates into circular economy leadership or whether it accumulates a waste crisis of foregone economic value, entrenched import dependence and locked-in linear infrastructure. The inflection point is not 2035—it is now.

The DCCEEW National Solar Panel Recycling Pilot demonstrates that the federal government has recognised the problem, but the pilot alone will not resolve the structural market failure, mandate producer responsibility or fund the infrastructure capacity needed before the 2030-to-2035 decommissioning surge. Findings from this pilot must translate directly into supporting these reforms and a national infrastructure investment program within this parliamentary term.

Australia has a narrow window to convert solar deployment leadership into circular economy leadership. Technical capabilities exist locally—for example, RMIT leads advanced materials science research in PV recycling, separation technologies and remanufacturing applications. It led several international research-industry collaborations focused on the PV circular economy, supply-chain diversification and recycling research and development. Additionally, UNSW researchers have developed cutting-edge mechanical recycling methods, and the CSIRO brings national capability in materials science and process engineering. The economic case is proven without reliance on breakthrough research and development, and the TEA demonstrates commercially viable returns for scaled recycling facilities under existing TRL levels. Circular PV certificates and reuse trials show global leadership that policy has not yet matched.

The social dimensions of this transition also require deliberate management. The full report demonstrates that psychological and behavioural traits can undermine the viability of technically sound solutions if community acceptance and trust are not established. A successful circular economy must address dimensions of justice by ensuring that benefits and burdens are shared equitably, that First Nations communities are engaged early and substantively and that regional and remote communities do not bear disproportionate environmental burdens while metropolitan centres capture economic benefits. These are not peripheral considerations but prerequisites for the social license that large-scale infrastructure deployment requires.

The choices made in the next three years will determine whether Australia's solar leadership translates into circular economy leadership or whether it accumulates a waste crisis of foregone economic value, entrenched import dependence and locked-in linear infrastructure.



Contributing Institutions

RAND (USA and Australia) | RMIT University (Australia) | University of New South Wales (Australia) | Universidad de Castilla-La Mancha (Spain) | Universidad de Murcia (Spain) | New York University (USA) | University of Melbourne (Australia) | University of Sydney (Australia) | Circular PV Alliance (Australia) | Smart Energy Council (Australia) | Blue Tribe Company (Australia)

This research brief summarises the key findings of an 11-chapter technical report, *Towards an Australian Circular Economy for Solar Photovoltaic Technologies*, ed. by Ylias Sabri, James Bond, Alejandra Nunez Madrigal, Mohammad Al Kobaisi, Mahdokht Shaibani, Xavier Mulet, Namita Roy Choudhury, Stephen Kennedy, Carlos Miralles Sánchez, and Benjamin Lee Preston, RR-A4495-1, 2026 (available at www.rand.org/t/RRA4495-1). The report was prepared by the Royal Melbourne Institute of Technology, RAND Australia and other collaborators under the International Clean Innovation Research Networks program with funding and commissioning support from the Department of Industry, Science and Resources. Xavier Mulet of RMIT University contributed to writing this brief. To view this research brief online, visit www.rand.org/t/RBA4495-1.

RMIT University Strategy Alignment: This research is consistent with RMIT University's Knowledge with Action Strategy, especially its commitment to applied, transdisciplinary research for social and economic impact and to advancing sustainability through civic partnership.

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