

Cover letter

Dear Committee Secretary,

Please find attached my submission to the House of Representatives Standing Committee on Climate Change, Energy, Environment and Water in relation to the Inquiry into Solar Panel Reuse and Recycling in Australia.

The submission addresses the Terms of Reference (a) through (h), with particular emphasis on projected end-of-life volumes, comparative disposal economics, domestic recycling capability, and system-level policy considerations relevant to long-term waste minimisation and circular economy development.

I confirm that the submission is prepared for consideration and publication in accordance with the Committee's requirements. No confidential material is included, and no individuals are adversely reflected upon.

Should the Committee require clarification or further information, I would be pleased to assist.

Thank you for the opportunity to contribute to this important inquiry.

Yours Sincerely

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

Inquiry: Solar Panel Reuse and Recycling in Australia

Date referred: 4 February 2026

Submissions close: 27 March 2026

Submission Title

**Solar Panel Reuse, Recycling and System-Level Energy Design:
Avoiding Australia's Next Remediation Liability**

Submitted by

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Yours Sincerely



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Executive Summary

Australia has been a global leader in rooftop solar photovoltaic (PV) adoption. However, early installation waves are now entering end-of-life phases, and waste volumes are expected to accelerate sharply through the 2030s (IRENA, 2016; Department of Climate Change, Energy, the Environment and Water [DCCEEW], 2023).

Historically, Australia has underestimated the downstream material consequences of industrial and energy transitions. Asbestos, plastics, fossil fuel residues and mine waste each followed a similar trajectory: rapid adoption, insufficient end-of-life planning, fragmented responsibility and eventual public remediation costs (OECD, 2022).

This submission argues that:

1. Solar waste must be treated as a structural energy transition liability, not a niche waste issue.
2. Landfill pricing currently underrepresents lifecycle and remediation risk.
3. Recycling can become economically viable only if waste volumes stabilise within an absorptive industrial capacity.
4. System-level energy design influences long-term waste flows.
5. Incorporating high-energy-density firm clean energy technologies, including emerging fusion systems internationally, may reduce material overbuild pressures and stabilise lifecycle waste.

Handled correctly, solar recycling becomes a domestic industry.
Handled poorly, it becomes another long-tail taxpayer burden.

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1. Historical Energy Transitions and Waste Externalisation

Australia’s economic history demonstrates a recurring pattern:

Rapid deployment → Delayed lifecycle planning → Public remediation liability.

Examples include:

- Asbestos widely embedded in housing and later removed at public expense.
- Plastics distributed faster than recycling systems matured.
- Coal ash and fossil fuel residues requiring site rehabilitation.
- Mine tailings subject to ongoing monitoring.

In each case, immediate cost efficiency masked long-term liabilities.

Solar PV deployment is now approaching a similar inflection point. Early installation surges from 2008 onward are converging toward end-of-life simultaneously.

The issue is not the technology itself. The issue is lifecycle governance.

2. Current and Projected Waste Volumes (ToR a)

Australia has one of the highest per-capita rooftop solar adoption rates globally (IEA, 2023).

Panels typically have operational lifespans of 20–30 years. Degradation, storm damage and system upgrades may shorten this period.

Table 1

Indicative Installation Cohorts and Retirement Windows

Installation Period	Estimated Retirement Window	Waste Trend
2008–2012	2028–2035	Rapid acceleration
2013–2018	2033–2045	Peak volume
2019–2024	2040–2055	Sustained high flow

The key structural issue is clustering. Installation waves produce retirement waves.

Without coordinated recycling expansion, waste accumulation risks exceeding processing capacity.

3. Current Disposal Practices (ToR b)

Present disposal pathways include:

- Landfill
- Limited specialist profitable commercial recycling
- Stockpiling
- Informal resale

Landfill remains economically attractive due to:

- Lower immediate cost
- Incomplete internalisation of long-term risk
- Inconsistent landfill levies across jurisdictions

The OECD (2022) notes that waste pricing often fails to reflect lifecycle environmental cost, distorting market signals.

Solar panels contain heavy metals and valuable materials. Landfill disposal forfeits recoverable value while creating future monitoring obligations.

4. Comparative Costs: Reuse, Recycling and Landfill (ToR c)

Immediate disposal cost comparisons often treat landfill as a neutral benchmark. This is misleading.

Table 2

Comparative End-of-Life Cost Characteristics

Pathway	Immediate Cost	Lifecycle Risk	Economic Multiplier
Landfill	Low	High (deferred)	Negative
Recycling	Moderate	Low	Positive (jobs/materials)
Reuse	Low–Moderate	Moderate	Conditional

Landfill represents deferred environmental liability.
 Recycling represents capital investment in material recovery.

True valuation must include:

- Lost resource value
- Future remediation exposure
- Supply chain resilience

CSIRO (2022) identifies critical minerals recovery as an economic opportunity within circular economy frameworks.

5. Economic Value of Material Recovery (ToR d)

Solar panels contain:

- Glass (~70%)
- Aluminium frames
- Copper
- Silver
- Silicon

Table 3

Strategic Significance of Recovered Materials

Material	Application	Strategic Relevance
Glass	Construction	Domestic reuse
Aluminium	Manufacturing	Energy-intensive production
Copper	Electrical networks	Critical mineral
Silver	Electronics	High value
Silicon	Semiconductor & PV	Industrial input

Onshore recycling supports:

- SME growth
- Regional employment
- Reduced import reliance
- Energy security resilience

6. State of Australian Recycling Capability (ToR e)

Australia’s recycling capability remains:

- Emerging but fragmented
- Limited in high-purity silicon recovery
- Dependent on pilot-scale operations
- Inconsistent across states

Regulatory frameworks vary by jurisdiction. A unified national product stewardship scheme is not yet fully mature.

DCCEEW (2023) identifies circular economy alignment as an ongoing policy objective.

7. Barriers to Scaling (ToR f)

Barriers include:

1. Volatile feedstock supply.
2. Energy input cost uncertainty.
3. Transport logistics across a dispersed population.
4. Capital intensity of recovery equipment.
5. Policy fragmentation.

Recycling processes require significant thermal and mechanical energy input. Energy cost volatility undermines financial viability.

8. Alternative Policy Options (ToR g)

The Committee may consider:

1. National Extended Producer Responsibility framework.
2. Harmonised landfill levies reflecting embedded material value.
3. Mandatory product stewardship for PV systems.
4. Incentives for onshore advanced material recovery.
5. Regional clean industrial precinct development.

Policy must balance environmental integrity with economic viability.

9. System-Level Energy Design and Waste Stabilisation (ToR h)

Energy system architecture influences material throughput.

Low-energy-density systems require:

- Large land areas
- Higher material volumes
- Shorter replacement cycles

High-energy-density systems reduce:

- Infrastructure duplication
- Material intensity per unit energy
- End-of-life flow rate

Internationally, emerging fusion energy systems are being developed as firm clean energy technologies distinct from Nuclear Fission (U.S. Nuclear Regulatory Commission, 2024; UK Atomic Energy Authority, 2022).

Fusion characteristics include:

- Extremely high energy density
- Minimal long-lived radioactive waste
- Long operational lifetimes
- Small land footprint

Fusion does not replace solar PV. Rather, its potential role as firm clean energy could stabilise renewable build-out rates and reduce over-deployment pressures that drive material intensity.

By moderating total system material throughput, high-density firm technologies may indirectly reduce future waste volumes.

This is a systems-design consideration, not a technology endorsement.

10. Risks of Deferred Remediation

If solar waste growth exceeds recycling capacity:

- Landfill dependence increases.
- Recycling remains subsidy-dependent.
- Future levies become politically necessary.
- Insurance and liability exposure rises.

Taxpayers may ultimately pay through:

1. Installation subsidies
2. Network integration costs
3. Waste management charges
4. Remediation programs

Historical precedent suggests early intervention is less costly than delayed correction.

11. Recommendations

The Committee should recommend that Government:

1. Recognise solar PV waste as a structural energy transition issue.
 2. Develop a nationally harmonised product stewardship framework.
 3. Align landfill pricing with lifecycle risk.
 4. Support domestic material recovery industries.
 5. Integrate waste planning with long-term energy system design considerations.
 6. Monitor high-energy-density firm clean energy technologies internationally as part of future material-intensity reduction strategy.
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Conclusion

Solar energy remains central to Australia’s decarbonisation pathway. However, lifecycle planning must match deployment scale.

The objective is not to constrain clean energy. It is to ensure it does not replicate the remediation failures of previous industrial transitions.

A circular economy cannot be sustained if waste flows exceed absorptive industrial capacity.

Energy policy and waste policy must now be integrated.

References

CSIRO. (2022). *Circular economy roadmap for Australia*. <https://www.csiro.au>

Department of Climate Change, Energy, the Environment and Water. (2023). *National waste report 2023*. Australian Government.

International Energy Agency. (2023). *Renewables 2023*. <https://www.iea.org>

International Renewable Energy Agency. (2016). *End-of-life management: Solar photovoltaic panels*. <https://www.irena.org>

OECD. (2022). *Global material resources outlook to 2060*. OECD Publishing.

U.S. Nuclear Regulatory Commission. (2024). *Fusion safety framework review*. ADAMS Accession No. ML24234A100.

UK Atomic Energy Authority. (2022). *Fusion regulation and open data framework*. <https://opendata.ukaea.uk>