"Submission to the House of Representatives Standing Committee on Climate Change, Energy, Environment and Water – Inquiry into solar panel reuse and recycling in Australia".

Submitted by:

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[redacted]

ESRA is a women-led startup based in Bowral, NSW, focused on solving end-of-life solar panel waste through our regional reuse and recycling infrastructure

2. Summary

2.1 The problem in brief

- Australia's world-leading solar rollout is creating a rapidly growing end-of-life challenge, with national PV waste projected to rise from around 59,000 tonnes in 2025 to more than 91,000 tonnes by 2030 and toward ~1 million tonnes by 2035.
- Less than 5% of panels are currently recycled, meaning most are landfilled, stockpiled, or informally re-used without traceability, despite containing recoverable glass, aluminium, silicon and critical metals.

2.2 What this inquiry needs to unlock

- Australia now has millions of rooftop systems, and utility-scale solar is accelerating, so the waste stream is locked-in and predictable.
- If managed well, end-of-life solar represents a major circular-economy and 'Future Made in Australia' manufacturing opportunity, particularly in recovering critical minerals and supporting regional jobs.

2.3 Key recommendations

1. Introduce a nationally consistent, staged ban on landfilling solar PV modules, coordinated with capacity-building so panels actually move into reuse and recycling.
2. Establish a mandatory national product stewardship scheme for solar PV systems within this parliamentary term, with clear, enforceable targets for reuse and recycling, funded by manufacturers/importers.
3. Co-fund a network of regional and metropolitan collection hubs and accredited recyclers, so the stewardship scheme and landfill bans can be practically implemented.
4. Explicitly prioritise safe reuse (where panels still meet performance and safety standards) before recycling, with incentives for second-life deployment into social, community and agrivoltaic projects.
5. Align ARENA, Future Made in Australia and other funding with solar end-of-life infrastructure, including advanced recycling technologies and regional logistics pilots.

3. Current and projected waste volumes & disposal

3.1 The wave of end-of-life PV

- Australia has around 26–27 GW of rooftop solar across more than 4 million homes and businesses, with NSW holding the largest share.
- Most systems installed during the 2010–2016 boom will reach their 20–25 year end-of-life window this decade and next, creating a predictable surge in removals.

3.2 How end-of-life panels are currently handled

- In practice, ESRA sees panels being:
  - sent directly to landfill
  - stockpiled in depots or on farms due to lack of options
  - shipped interstate or overseas chasing cheaper disposal
  - sold informally second-hand without testing or traceability.
- Only a small fraction are processed by specialist recyclers, reflecting limited capacity, lack of consistent policy signals and the absence of a funded stewardship mechanism.
- Alongside landfilling and stockpiling, a significant number of end-of-life or under-performing panels are being sold into loosely regulated export markets, often via informal brokers. Evidence from industry and NGOs indicates that panels removed from Australian roofs are entering offshore second-hand markets in regions such as Africa and the Middle East, frequently without adequate testing, documentation or end-of-life planning. This risks shifting Australia's solar waste burden to countries with weaker environmental and occupational safeguards, and undermines the development of a domestic circular economy

3.3 Regulatory patchwork and its consequences

- Victoria, South Australia and the ACT have moved to ban some solar panels and related e-waste from landfill, while other jurisdictions still allow landfilling or are only in early policy development.
- This patchwork encourages cross-border disposal and places early-mover recyclers and reuse operators in pioneering states at a competitive disadvantage against landfill in neighbouring jurisdictions.

4. Costs, benefits, and the case for onshore reuse/recycling

4.1 Comparative costs: landfill vs reuse vs recycling

- Today, landfill often appears ‘cheapest’ because gate fees do not reflect environmental and resource value, and because producers do not bear collection and processing costs.
- Our experience suggests that when logistics are coordinated and volumes aggregated, reuse and recycling costs can be competitive, especially under a product stewardship model where manufacturers/importers contribute per-panel fees.

4.2 Benefits of expanding onshore reuse and recycling

- Households and consumers:
    - Trusted second-life panels, sold with testing and traceability, can support lower-income households, community energy projects and remote/off-grid users.
- Environment and health:
    - Avoiding landfilling and uncontrolled stockpiles reduces risks of leachate, breakage and long-term micro-fragment pollution, and allows high-purity recovery of glass, aluminium, silicon and metals.
- Energy security and supply chains:
    - Recovering critical materials domestically reduces reliance on imported raw materials and aligns with ‘Future Made in Australia’ and critical minerals strategies.
- Economy and jobs:
    - Circular PV systems support local jobs in collection, testing, refurbishment, logistics, processing and manufacturing, particularly in regional centres like Bowral where ESRA is based.

4.3 International and domestic innovation signals

- ARENA and research partners (e.g. UNSW) are already demonstrating high-efficiency, low-cost recycling technologies capable of recovering valuable metals and silicon from panels.
- International initiatives such as the Solar Stewardship Initiative show that robust environmental and traceability standards for solar manufacturing and end-of-life management are becoming mainstream expectations.

5. State of the industry, barriers.

5.1 Current reuse and recycling capabilities

- Australia has a small but growing ecosystem of recyclers, refurbishers and logistics providers, alongside government-funded pilots (pending) such as the AU$24.7 million National Solar Panel Recycling Pilot establishing around 100 collection sites.
- However, current capacity and coverage are not yet sufficient to handle projected waste volumes, particularly in regional and remote areas.

5.2 Key barriers we observe

- Policy and regulatory uncertainty: no national stewardship scheme in place yet despite governments agreeing to develop one.
- Inconsistent landfill rules and low landfill pricing, undermining circular solutions.
- Fragmented logistics
- Limited finance and grants for early-stage regional operators; funding tends to favour large capital projects or pure R&D.
- Lack of quality and safety standards for second-hand panels and data standards for reporting reuse/recycling outcomes.

6. Policy options and recommendations

6.1 Recommendation 1 – National landfill bans

  - Phase 1 (e.g. by 2027): ban landfilling of intact modules
  - Phase 2 (early 2028): extend to all PV modules

- Coordinate bans through the Energy and Climate Change Ministerial Council to avoid cross-border dumping and provide industry with clear investment signals.

6.2 Recommendation 2 – Mandatory national product stewardship scheme

- Legislate a mandatory product stewardship scheme for solar PV systems within this parliamentary term, as called for by a broad coalition of industry, unions, local government and community organisations.

    - Obligations on manufacturers/importers to fund collection, logistics, reuse and recycling via per-unit fees.
    - Binding targets for diversion from landfill and material recovery, ramping up over time.
    - A reuse-first hierarchy, with minimum percentages of reusable panels to be redeployed where safe.
    - Accreditation of service providers (recyclers, refurbishers, logistics platforms).
    - Export of functional or end-of-life panels for disposal or low-value 're-use' in poorly regulated markets should be phased out, with any remaining exports required to comply with the Basel Convention.

6.3 Recommendation 3 – Funded network of collection hubs and digital traceability

- Scale up the National Solar Panel Recycling Pilot into a permanent, funded network of regional and metropolitan collection hubs, ensuring that every council has access to affordable, accredited options.
    - regional hub establishment
    - vehicle and logistics costs
    - data and reporting systems

6.4 Recommendation 4 – Standards for testing, safety, and data

- Develop nationally consistent standards for:
    - testing and certifying second-hand panels
    - labelling and traceability (e.g. unique IDs, QR codes)
    - reporting of reuse and recycling outcomes into a central registry.
- Our experience shows that installers and councils are willing to participate when processes are simple, and reporting requirements align with existing ESG and compliance obligations.

6.5 Recommendation 5 – Align innovation and manufacturing programs with solar end-of-life

- Ensure programs such as ARENA's solar end-of-life funding, and Future Made in Australia-style manufacturing initiatives, explicitly support:
    - advanced PV recycling technologies,
    - logistics and digital traceability pilots,
    - regional circular-economy hubs for solar, batteries and EV-related equipment.

- This will help bridge the gap between lab-scale innovation and on-the-ground solutions like ESRA's that convert waste into feedstock for domestic manufacturing and critical-minerals security.

The solar boom is a success story, but without decisive action on end-of-life, it risks becoming a long-term waste and missed-opportunity problem. Landfill bans, mandatory stewardship and investment in practical reuse and recycling infrastructure - can turn PV waste into the backbone of Australia's circular, net-zero economy.