IP2.05.03

Creating value from metals and alloys of waste solar panels

Technological roadmap to capture economic benefits and lower carbon emissions

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Sustainable Communities and Waste

National Environmental Science Program

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Why harness waste solar panel resources to create new economic and environmental benefits?

	2016	2020	2030	2040	2050
Australia	900	**2,000**	30,000	**300,000**	900,000
Global	43,500	100,000	1,700,000	15,000,000	60,000,000

Project Overview

Overview Of The Project

Objective

Develop a roadmap to evaluate the sustainability and economic viability of metal recycling from end-of-life (EoL) solar panels.

Focus Areas

- Advanced recycling and remanufacturing.
- Creation of value chains.

Integration

Combine technical, economic, environmental, and social considerations.

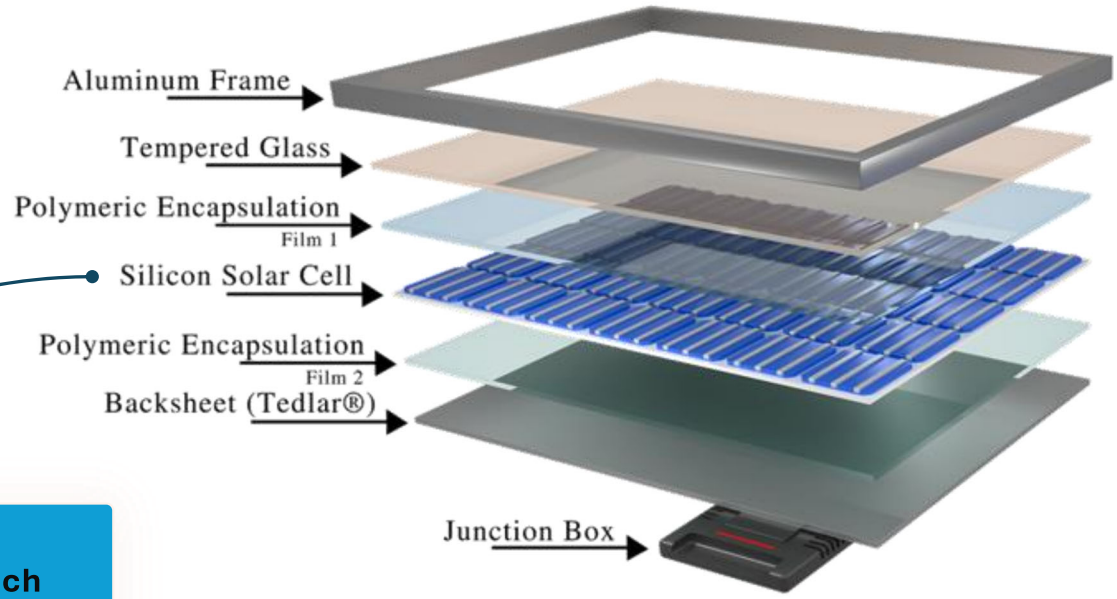
Adaptability

Applicable to remote and urban areas, both short-term (<5 years) and long-term (>5 years) implementation.

Policy Alignment

Provide enabling information for designing and producing circular materials.

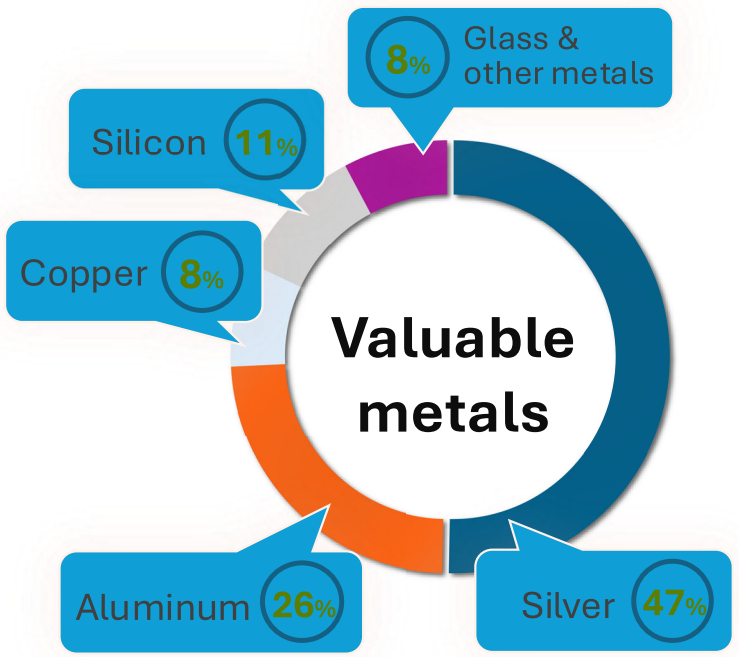
What is the structure of a solar panel?



The solar cell sandwich
consists of solar cells and multiple valuable materials, including silver, silicon, copper, and aluminum.

Why create value from the metal content of waste solar panels?

Component	Percentage (%)
Glass	70
Panel Frame (Aluminium)	18
Encapsulant (EVA)	5.1
Solar Cell (silicon metal)	3.65
Back-sheet Layer (PVF)	1.5
Silver	0.06
Internet (Cu, polymers)	1.11
Other Metals (Sn, Pb, Al, etc)	0.59
Total	100



Concentration of Hazardous Elements
In a waste solar panel?

Generation	From Year	Status	Hazardous Elements
1st-Generation	1970	Commercialised	≈8–10 Lead g m^{-2}
2nd-Generation	2000	Commercialised	≈0.2-7 g Cadmium per m^2
3rd-Generation	2009	R&D and Pilot Scale	≈0.4–0.8 g Lead per m^2
Cover Glass	-	All Generations	≈0.1–1 wt % Antimony compounds (Sb_2O_3/NaSbO)

Why recycling of PV waste is challenging?

- **Complex/composite structure**
- **Extracting metals with low quantity and high value**
- **Ensuring quality and preventing downcycling**
- **Navigating regulatory and policy gaps**
- **Scalability and adaptability**

Project Phases

Workshop for co-design of future pathways value-added metal recovery

Phase 1

Contex[illegible]s and settin[illegible]

- Base[illegible]sessment
- Value cre[illegible]portunities
- Future value assessment

Phase 2

Mappi[illegible]and future[illegible]

- Advance[illegible]thods exploration
- Technology [illegible]ance assessment
- Technology assessment of other jurisdictions

Phase 3

Technology evaluation as a multi-criteria analysis

- Methodology development
- Develop criteria
- Conduct evaluation

Phase 4

Developing strategies for technology adoption

- Regional strategy development
- Technology selection insights

Phase 5

Roadmap development

Thank you

For Your Time and Attention

It’s been a pleasure sharing this with you