Stewardship for Photovoltaics How far have we progressed?



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Product Stewardship Centre of Excellence





Acknowledgement of Country

We acknowledge the Traditional Owners of Country throughout Australia and recognise their continuing connection to land, water and community. We pay respects to elders past and emerging and recognise elders as holders of knowledge and stewards for country.

Today's speakers



Amelia Turcato A/Head of Infrastructure Unit, Major Programs NSW Environment Protection Authority



Darren Johannesen Stewardship Manager Smart Energy Council



Caz Saunders Training & Quality Manager Green Business Audit & Training RTO



Anthony Vippond CEO Lotus Energy

Centre Strategic Partners







NSW ENVIRONMENT PROTECTION AUTHORITY

Towards circularity for solar panels in NSW

Amelia Turcato Infrastructure Unit Head, NSW EPA



Understanding the emerging waste stream

2019 – NSW Government invested

\$10 million to reduce landfilling of solar panels and associated large batteries

Waste stream forecast to reach:

- 2025: 3,000 10,000 tonnes per year
- 2035: 40,000 71,000 tonnes per year

Assumes 15-20 year lifespan



Circular Solar Funding Program – Phase 1 "Trials"

Over \$9.5 million in funding was awarded over two phases

August 2021, Phase 1 awarded over \$2.1 million to 3 projects:

Blue Tribe

- Reuse of decommissioned yet serviceable panels

The Solar Professionals

 Trialling recycling technology to delaminate panels and reuse the constitute parts, including glass and frames in commercial glasshouses

PV Industries

 Building a collection and logistics network to bulk and transport panels across urban and regional NSW



6

Circular Solar Funding Program – Phase 2

May 2022, Phase 2 awarded \$7.4 million to 4 projects for the management of end-of-life solar panels and their associated battery systems within a circular economy:



First two solar panel recycling facilities in NSW - deliver approximately 10,000 tonnes per year of recycling capacity



Reuse of decommissioned panels in community solar gardens - potential to divert 10,000 tonnes of panels from landfill per year 7



A lithium-ion battery recycling facility - process up to 2000 tonnes per year of LiB



Research for mobile recycling technology

Large-Scale Solar Energy Guideline

Revised in 2022 with additional considerations for waste generated during construction and decommissioning

Department of Planning and Environment

Large-Scale Solar Energy Guideline NSW

The applicant should also consider appropriate mitigation measures that include:

 selecting manufacturers, distributors and installers of PV panels that are members of relevant product stewardship schemes

5.4.2 Key principles

Waste management principles

- Construction waste from large-scale solar energy projects must be minimised and the use of reusable and recyclable materials should be prioritised where possible.
- 2. Impacts on local waste management facilities must be minimised as far as practicable during construction, operation and decommissioning.
- 3. Recycling of photovoltaic panels and associated equipment should be prioritised and maximised as far as possible to avoid landfill.

E-waste generation and solar processing capacity

In 2022, the quantity of material recovered was about 77,000 tonnes; or 38% of total e-waste generated in NSW.



By 2040, e-waste generation is ~359,000 tonnes, with PV the largest contributor

Committed capacity is expected to be sufficient until 2035, while a small shortfall is expected by 2040.

What's on the horizon?

- NSW will continue to work closely with the Australian Government and other jurisdictions to advance product stewardship arrangements for solar panels.
- 23/24 EPA Regulatory Priority end-of-life batteries
- Investigating pathways to enable 'end-of-waste' outcomes for recovered materials, including solar panels.





Thank you.

Amelia Turcato

A/Unit Head, Waste Infrastructure Circular Economy Programs Programs & Innovation Division

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Queensland Solar Stewardship Pilots Darren Johannesen

Product Stewardship Manager



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Market Estimates - 2043

Difficult to forecast

APVI data as the source.

https://pv-map.apvi.org.au/postcode

Installations by size by postcode by year and projected estimated decommissioning volumes based on the following assumptions -

Waste Arising Cycle

- Installation losses 1%
- \circ $\,$ In Service incl Warranties .05% (?)
- Commissioned life
 - i. CE 10 years
 - ii. LSS 20 25 years

Module Power output assumptions to estimate units per installation - starting at 180w to 250w average

Queensland - End of life modules forecast to 2043

47 Million modules - 31m Consumer Energy - 16m Large scale and Commercial (940 Million Tonnes)

2024/25 - approx 1.2 million per year (24,000 tonnes = 1000 semi trailer loads)



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Queensland - End of life modules forecast to 2043

47 Million modules - 31m Consumer Energy - 16m Large scale and Commercial 0 tonnes = 1000 semi trailer loads) Material Estimated Recoverable Weight (Metric Tons) CE EOL 592,200 Glass Aluminum 106,920 Copper 16,920 Other materials 75,200

Queensland Solar Stewardship Pilot



Queensland Solar Stewardship Pilot



Re-Use

Small Scale	Commercial	Large Scale
REUSE Desk Study, Testing, Policy and Regulatory recommendations In Queensland: • 800,000 modules being exported currently (60 - 70% of total market) • \$48 Million in exports • \$14 million in revenue to installers	Consol	Desk Study idate findings of all Australian and International Studies into a single set of knowledges Testing /orlds largest testing Study - 5000 modules Using portable, high speed testing rigs
Issues		Blue Tribe, CSIRO, PV Labs
 Unregulated, uncontrolled Exporting dangerous wastes Basel Convention impact? Creates issues for the PR ecosystem 		Policy and Regulatory frameworks

Materials Recovery

Small Scale	Commercial	Large Scale				
Key Elements Collections Traceability Economics	Colle More than 5 sites, Greater Me Brisbane) Regional To Remote - (F Combination of Dis site collections	Collections - commence July 2024 More than 5 sites, Greater Metro Brisbane (Gold Coast, Sunshine Coast and Brisbane) Regional Town - Townsville Remote - (Roma (?) Combination of Distribution partners (retail), Council sites, and on site collections				
Issues • Lack of data	Program partners have a	Traceability Program partners have agreed to end to end traceability. Software system to trace end to end				
Emergent Material recovery ecosystem	allows for the informed doubter develop Na	Economics evelopment of an economic model which can be ational Stewardship initiatives				

KEEP IN CONTACT

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GROUP

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Lotus Energy Recycling

Product Stewardship Centre of Excellence

Webinar

Anthony Vippond Anthony@lotusenergy.com.au





Lotus Energy Recycling is working with Solar **Training Centre, Torus Group Electrical and** Victoria for the Solar PV Reuse Protocols & National Accredited Training Program that has been awarded funding through the Victorian **Government's Circular Economy Innovation Fund.**

The purpose of the project is to create standards for the potential reuse and or repurposing of solar pv. This is paired up with an accredited training program which will provide for industry to have national standards.





State Government

VICTORIA



Recycling & Resource Recovery Hub

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- Lotus has developed a recycling and resource recovery hub to process:
 - Solar panels •
 - Solar mounting equipment ٠
 - Aluminium cladding ٠
 - E-waste ٠
 - Electrical cables ٠
 - Plastics
- Lotus shall duplicate and expand ٠ operations from into Europe, Qld and NSW in the next 24mths.





One solution for the renewables industry



Lotus Energy has created the first fully operational solar recycling facility with 97% recovery of materials



Signing Authority

Date

Lotus has developed a full operational recycling hub with End of Life product manufacturing locally

Lotus Recycling & Resource Recovery Solution

- Lotus has develop end of life products to service manufacturing of other products
- Some of the products include;
 - Carbon black, gas & oils
 - Aluminium
 - Copper
 - Nano Silicon
 - Fire rated tiles
 - Timber look sleepers
 - Solar tilt mounts







\$D



Recycling & Resource Recovery centre in Thomastown Victoria with products from materials made locally in Ferntree Gully and Springvale Victoria



23



Product Stewardship Centre of Excellence Webinar

Caz Saunders

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- **Extensive practical training facilities**

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Solar Training Centre RTO#40352 $\ensuremath{\mathbb{C}}$ 2024









Project objectives

Develop the curriculum for a nationally accredited qualification for accreditation by VRQA

" Course in Decommissioning solar PV for safe reuse"

Project Steering Committee includes representatives from

Solar Victoria Smart Energy Council Southwell Inspections Master Electricians

Lotus Recycling Torus Group Electrical Solar Training Centre

Develop course materials for delivery of the course to students-including testing protocols Mixture of online and face to face learning

Pilot the course materials to 30 participants



Solar Training Centre RTO#40352 $\ensuremath{\mathbb{C}}$ 2024

Course outcomes

Target audience

- solar rooftop and solar farm workers (electricians, non-trades), carriers

Skills and knowledge

- Solar PV and the circular economy, e-waste, reuse, repurpose, recycling
- Working safely
- > Maintaining integrity of solar PV whilst removing them from installation
- > Visual inspection and testing protocols
 - Based on Lotus Recycling/ Vic Uni protocols
 - Flexibility to expand / modify in response to changes in protocols
- Safe transportation



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Project Milestones

Completion of course materials and pilot delivery

01.08.24 - 31.10.24

Completion of the course curriculum development process and presentation to VRQA for accreditation 30.10.24

Completion of the Project

13.12.24



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Questions & Answers



Got a Question? Please post in the Q&A

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Transforming the product value chain

An opportunity to partner with the Product Stewardship Centre of Excellence.







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