AUSTRALIAN PV INSTITUTE

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Design for Recycling' in PV manufacturing could have a cumulative global value of over 15 billion USD

With strong, continued growth in global solar PV deployment, international experts are looking in detail at the opportunities and challenges at the product end of life. With the concern around availability of raw materials, and under the umbrella of 'circular economy', significant attention has been brought to recycling PV technologies.

By 2050, estimates have projected that 78 million tonnes of raw materials will be embodied in the mass of end of life of PV modules.

'Design for recycling' (DfR) and the implications that this has on the future of PV development is explored in a new report "PV Module Design for Recycling Guidelines" from an International Energy Agency PV Power Systems task force.

Several Australian PV researchers have contributed to the report, including Operating Agent for this report and APVI member, Dr Jose Bilbao, who explains, "The aim is to inform the solar industry in general, and module manufacturers in particular, of potential designs and guiding principles to improve recyclability of PV modules, as existing ones are not designed with end-of-life and circularity in mind".

With improved recycling technology, the recovered materials can be used as new feedstocks to the solar industry or other industries. Estimates suggest a possible revenue of US$11-$12 revenue per module, enabling profitable recycling businesses without government support. By 2050, the cumulative recoverable value could exceed 15 billion USD. Furthermore, recycling PV modules can ensure the long-term sustainability of the supply chain, increasing the recovery of energy and materials while reducing the GHG emissions and energy payback time related to PV modules.

After consideration of several general design for recycling guidelines, experts have consolidated a set of specific guidelines for reproducing recyclable crystalline silicon modules:

1. *Durable identification of module construction and composition could enable safer and more efficient recycling processes.*
2. *Backsheet composition has particularly important implications for recyclability.*
3. *Metal choices can have significant impacts on recycling processes and costs.*
4. *Minimizing encapsulant use or using reversible encapsulants can facilitate disassembly of PV modules*
5. *Decreasing the number and complexity of module materials presents trade-offs related to recyclability and economics.*

6. *Using different sealants in the aluminium frame could enable module separation without component damage.*

Thin film PV also represents a small portion of the PV market which currently uses materials that are environmentally sensitive or are in limited supply, and these are recycled using a combination of mechanical and chemical treatments. Large scale treatment processes for recycling are still in early stages and will increase as reliance on thin film technology does.

Recycling and design for recycling are important aspects of this effort, but they should be considered after other circular approaches, such as design for reuse, product longevity, and remanufacturing, which provide better material value retention. Economics, product performance, and environmental impacts must be considered; recycling at EOL may not always be the best solution for the existing manufacturing and recycling ecosystem. Ultimately, it is desirable to achieve system-wide goals, such as ensuring material supply, maximizing material value, or minimizing life cycle impacts.

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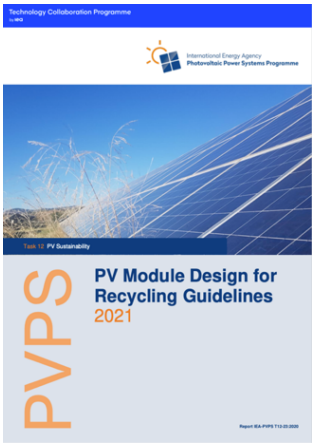
Full Report



PV Module Design for Recycling Guidelines

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About the IEA PV Power Systems Programme Task 12

Australian Engineer Dr Jose Bilbao of UNSW is the Deputy Operating Agent for the International Energy Agency Photovoltaic Power Systems Programme (IEA-PVPS) Task 12. This program aims to foster international collaboration and knowledge creation in photovoltaic (PV) environmental sustainability and safety. The Australian PV Institute, with support from ARENA, leads Australia's engagement in the IEA PV Power Systems program and works with its members to increase the uptake of PV through quality research, data, and analysis.

About the APVI

The Australian PV Institute is a not-for-profit, member-based organisation which focuses on data analysis, independent and balanced information, and collaborative research. Our objective is to support the increased development and use of PV via research, analysis, and information. The APVI promotes solar through its live solar mapping platform [http://pv-map.apvi.org.au], the national solar research conference and Australia's participation in two International Energy Agency (IEA) programs – PVPS (Photovoltaic Power Systems) for solar photovoltaics and SHC (Solar Heating and Cooling), concerned with new solar thermal products and services.

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