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End of life management of solar PV and the circular economy

Jinlei Feng
Programme Officer, Policy Advice
International Renewable Energy Agency (IRENA)

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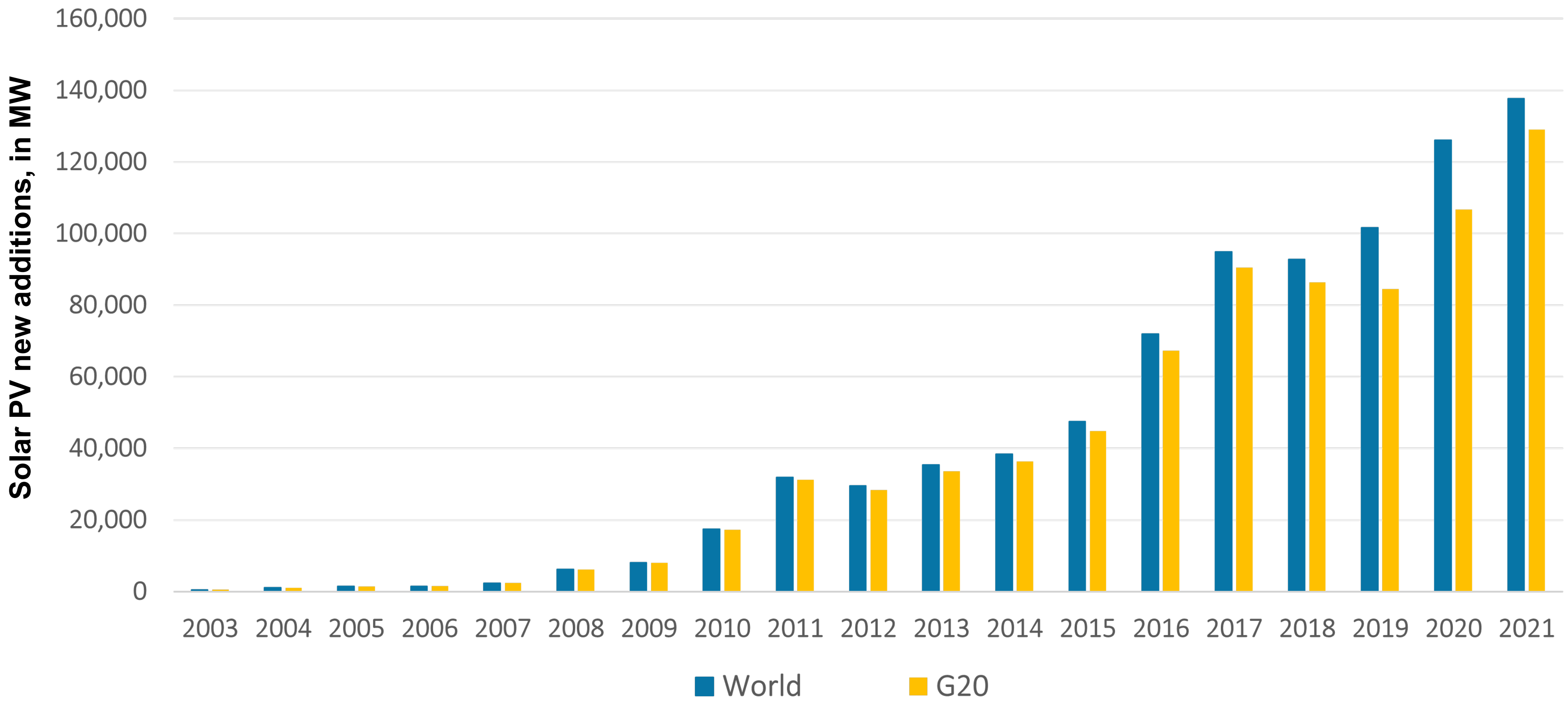
Solar PV has become the second largest renewable capacity in 2022

Solar PV capacity new additions, 2003-2021, in MW



Source: IRENA, 2022

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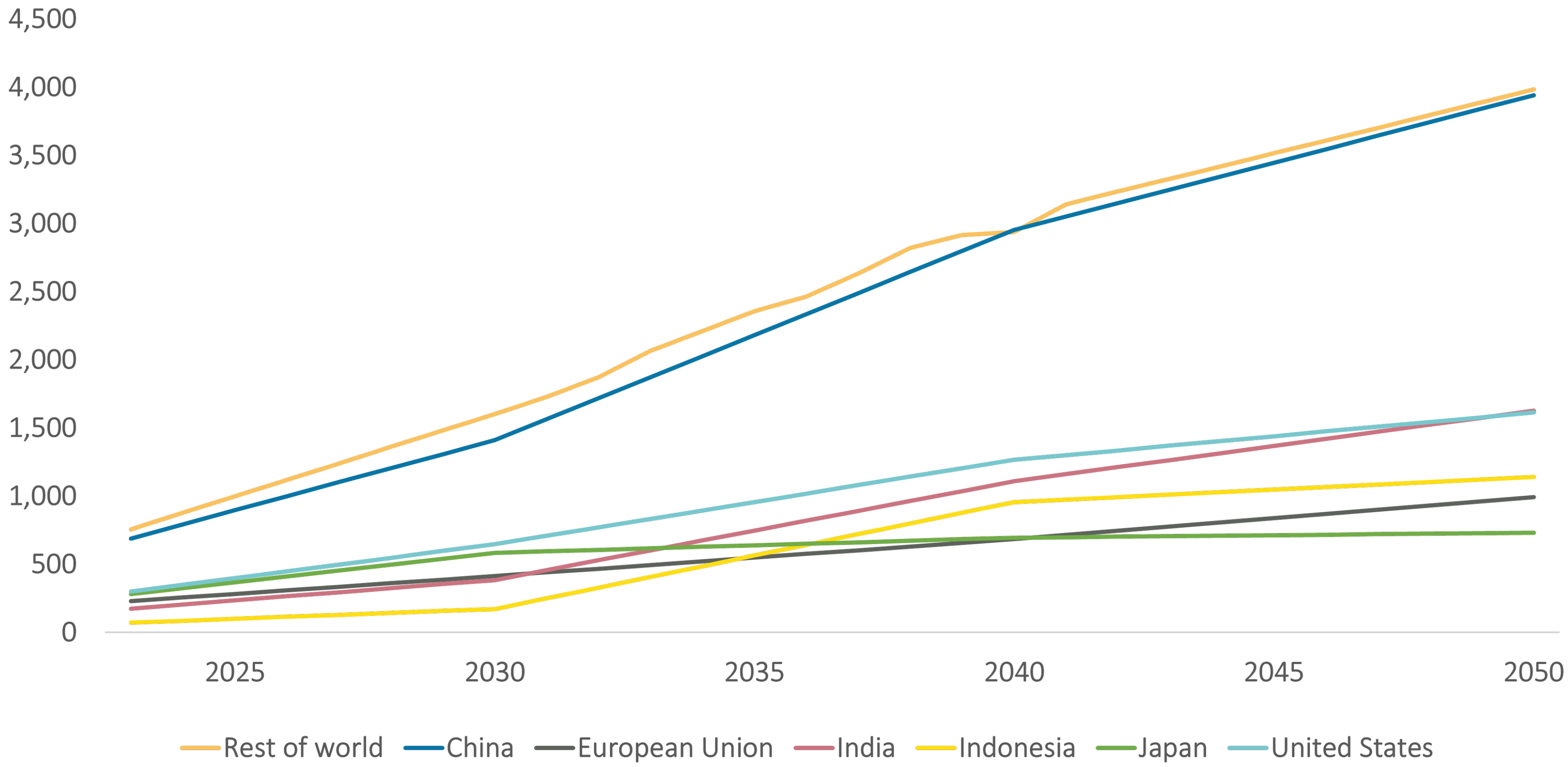
It will contribute around half of total renewables by 2050 in the 1.5ºC Scenario

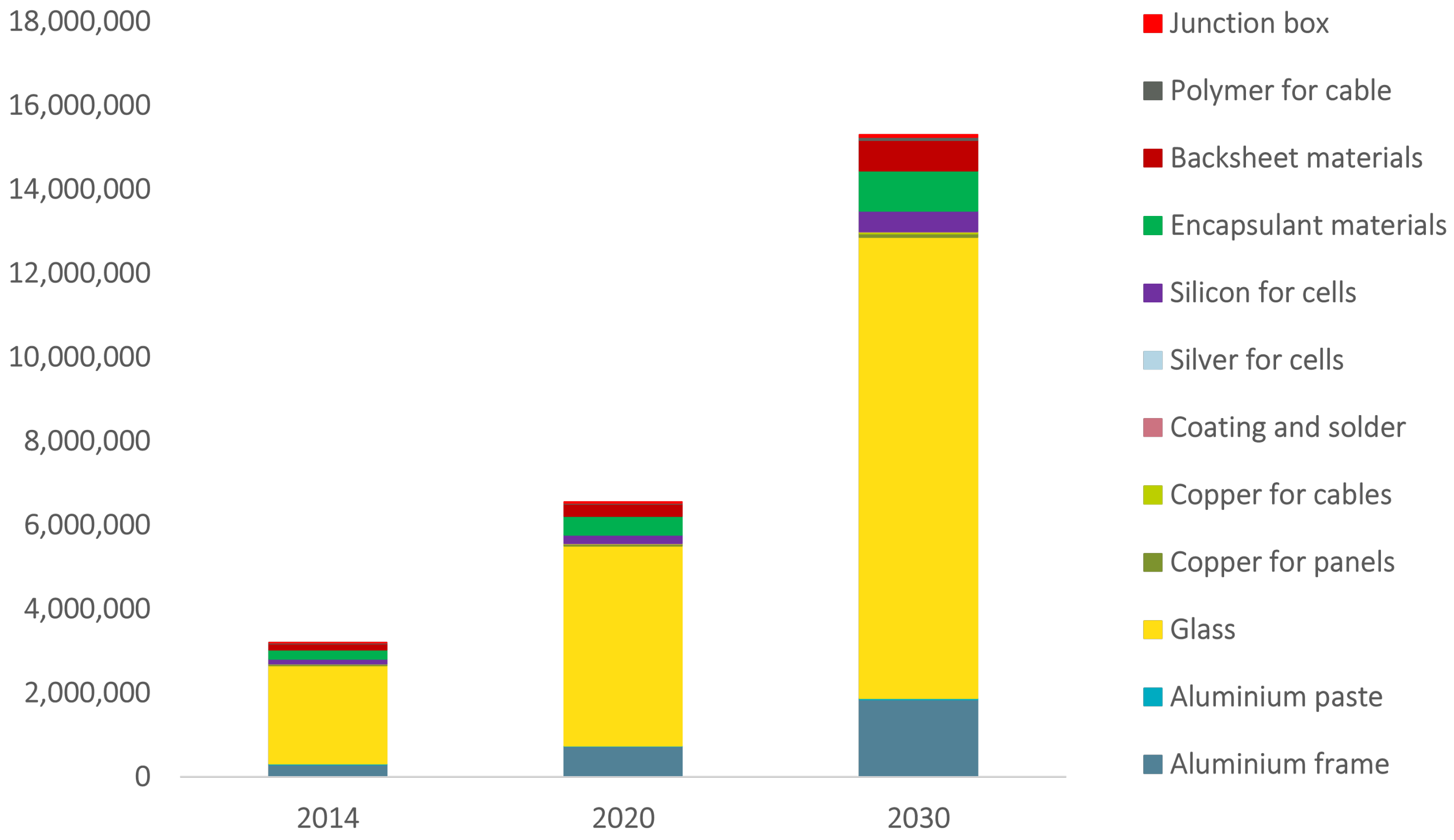
Cumulated solar PV capacity in selected market in IRENA's 1.5ºC Scenario, in GW



Source: IRENA, 2022

Million tonnes of materials are needed for PV deployment

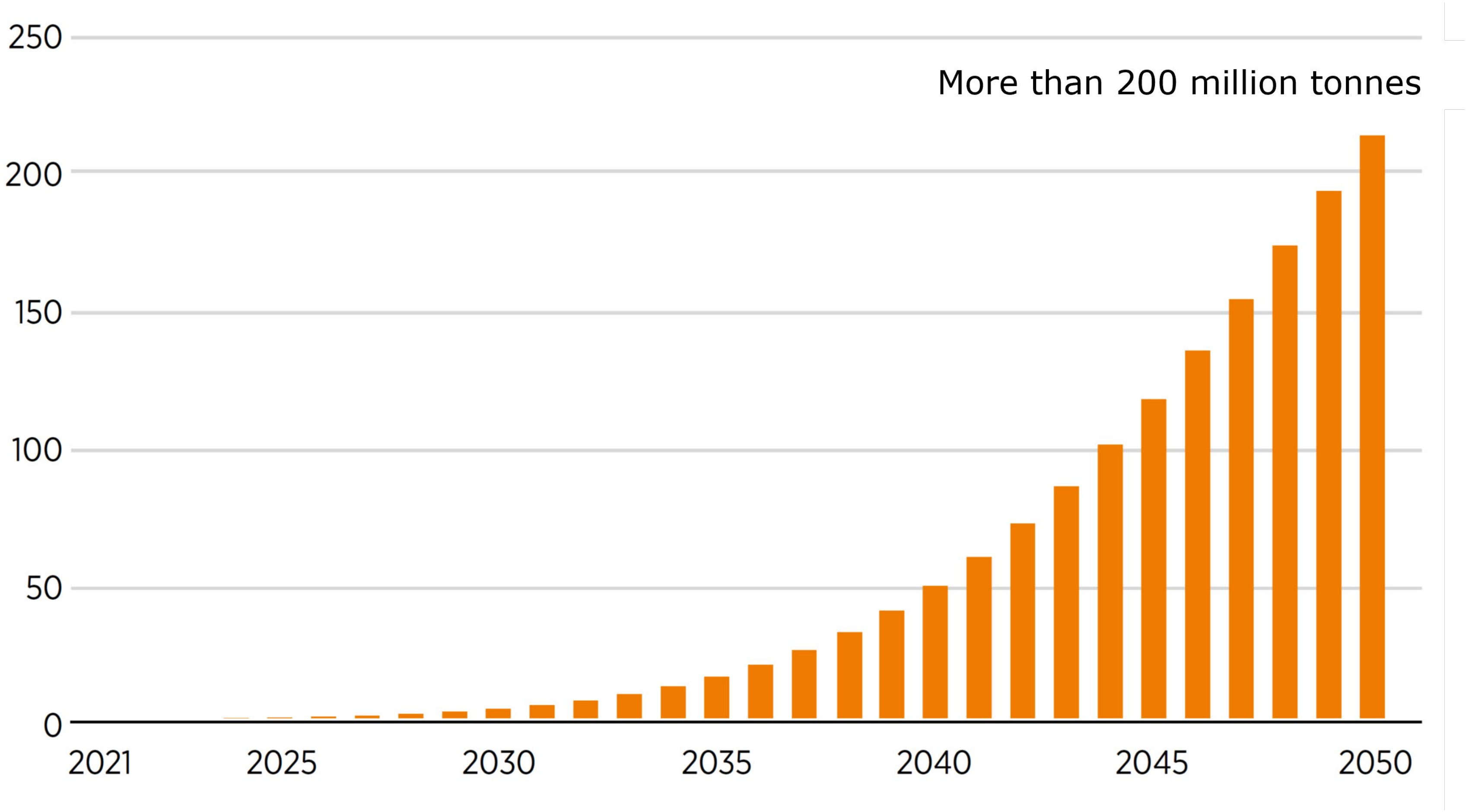
Estimation on material consumption for crystalline silicon PV systems in 2014, 2020 and 2030, in tonne



Source: IRENA, forthcoming

Cumulated solar PV waste will exceed 200 million tonnes by 2050

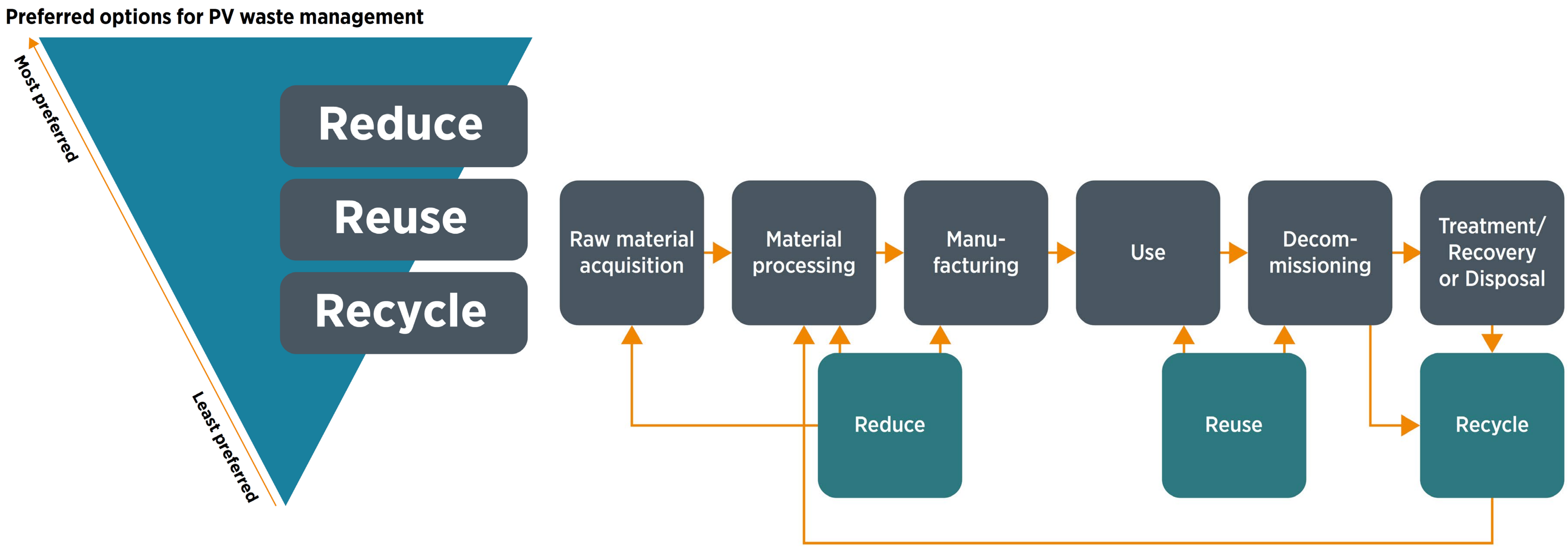
Cumulated solar PV waste in the 1.5°C Scenario, 2021-2050, in million tonnes



Source: IRENA, 2022

Circularity-based strategies and approaches

Circular economy strategies and approaches for solar PV



Source: IRENA, 2016

Key stakeholders: industries, institutes and governments

Stakeholders involved in the circular economy approaches

R&D Organisations

- Public and private institutions
- Producers

Repair/Reuse services industry

- Producers
- Independent service partners
- Producer-dependent contract and service partners (e.g. installation and construction companies
- Waste collectors and companies
- Pre-treatment companies

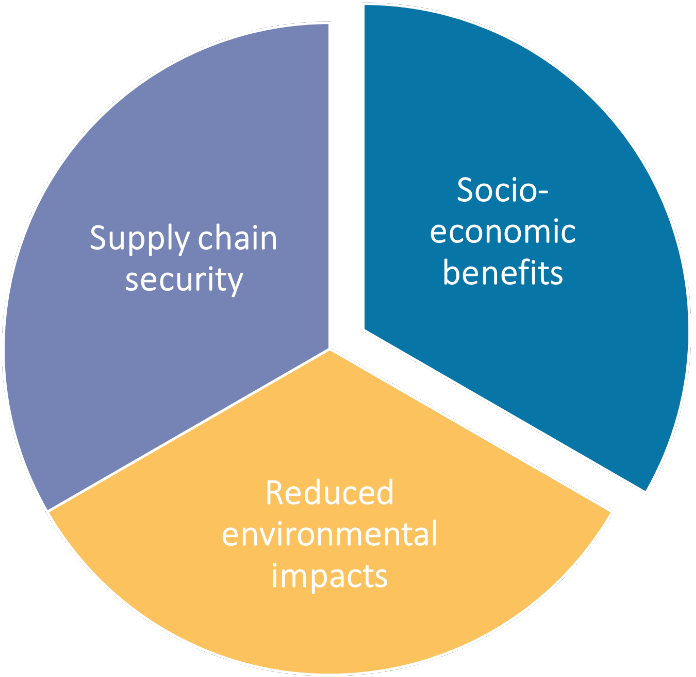
Recycling treatment industry

- Public waste utilities and regulators
- Waste management companies
- Pre-treatment companies
- Producers

Source: IRENA, 2016

Opportunities and barriers to the circular economy for solar PV

Potential benefits of the circular economy for solar PV



Source: IRENA, 2022, Curtis and Heath, 2022

Barriers

Financial barriers

- Limited economic motivation for waste collection and transport
- Lack of incentive for repair, refurbish and reuse of PV panels

Regulatory barriers

- Unclear or complex regulations on solar PV waste management
- Stringent requirements for handling, transport, treatment and recycling

Information and data-related barriers

- Limited information on benefits of circular economy for solar PV
- Lack of data on the volume and composition of retired PV panel systems
- Lack of information on available technologies and infrastructures

Technology and infrastructure-related barriers

- Solar PV production are not optimised for cost-effective reuse and recycling
- Lack of needed infrastructures
- Repair, refurbishment and recycling technologies still need development

Other barriers

- Weak market confidence on repaired and reused solar PV systems
- Weak attention on reduce concepts such as design for circularity

Policies, measures and examples

A circular economy for solar PV: approaches, measures and examples

Approaches	Policies and programmes	Country examples
Government-led policies	• Landfill ban • Extended producer responsibility (EPR) • Government guidance • Financial and fiscal incentives • Labelling and certification • Other programmes and policies	Victoria (Australia) Germany, France European Union China European Union Japan
Industrial programmes and initiatives	• Voluntary standards by industrial associations • Industry-initiated reduce/reuse/recyling programmes • Other industrial initiatives	SERI (United States), RIOS (International) LONGi (China) First Solar (United States) PV Cycle (Japan)

Source: IRENA, 2022, Curtis and Heath, 2022

Circular economy for solar PV and the global trade

- Data and information sharing on solar PV products, components and materials to enable the circular economy practices in importing markets.
- Second-hand solar PV in developing countries: maximising benefits and avoid potential negative impacts.
- PV recycling and potential new trade flows of raw materials
- Standardisation
- International collaboration and technical assistance

THANK YOU!

jfeng@irena.org